PUBLIC REVIEW DRAFT
Remedial Investigation/Feasibility Study
Cornwall Avenue Landfill
Bellingham, Washington

August 16, 2013

Prepared for

Port of Bellingham
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ABBREVIATION/ACRONYM LIST

AETs	Apparent Effect Threshold Values
ARARs	applicable or relevant and appropriate requirements
BEP	bis(2-ethylhexyl)phthalate
BBP	butylbenzylphthalate
BGS	below ground surface
BNSF	Burlington Northern Santa Fe Railway Company
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degrees Celsius
CAP	cleanup action plan
City	City of Bellingham
CFU	colony forming unit
cm	centimeter
cm/s	centimeter per second
cm/yr	centimeter per year
COPC	constituent of potential concern
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CSL	cleanup screening level
CSM	conceptual site model
DCA	disproportionate cost analysis
DGPS	differential global positioning system
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FML	flexible membrane liner
FS	feasibility study
ft	feet
ft/day	feet per day
ft^2	square feet
ft^3	cubic feet
ft^3/day	cubic feet per day
GP	Georgia Pacific West
gpm	gallon per minute
H:V	horizontal to vertical
HDPE	high density polyethylene
HPAHs	high molecular weight polycyclic aromatic hydrocarbons
IHS	Indicator Hazardous Substance
IPA	interim placement area
km^2	square kilometer
LEL	lower explosive limit
LFG	landfill gas
LNAPL	light non-aqueous phase liquid
LPAHs	low molecular weight polycyclic aromatic hydrocarbons
m^3	cubic meter
m/sec	meter per second
MFS	minimum functional standards
mg/kg	milligram per kilogram
mg/L	milligrams per liter

ABBREVIATION/ACRONYM LIST (CONT.)

MHHW	mean higher high water
mi^2	square mile
mL	milliliter
MLLW	mean lower low water
MNR	monitored natural recovery
MTCA	Model Toxics Control Act
ng/kg	nanogram per kilogram
ng/L	nanogram per liter
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity unit
OC	organic carbon normalized
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCL	preliminary cleanup level
PCP	pentachlorophenol
PLPs	potentially liable parties
Port	Port of Bellingham
ppt	parts per trillion
PQL	practical quantitation limit
PRB	permeable reactive barrier
PSDDA	Puget Sound Dredge Disposal Analysis
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
SCUBA	self-contained underwater breathing apparatus
SEPA	State Environmental Policy Act
Site	Cornwall Avenue Landfill Site
SL	screening level
SMS	Sediment Management Standards
SPI	sediment profile imaging
SQS	sediment quality standards
SVOCs	semivolatile organic compounds
TBT	tributyl tin
TEQ	toxicity equivalency
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geologic Survey
VOCs	volatile organic compounds
yd^3	cubic yard
µg/kg	microgram per kilogram
µg/L	microgram per liter

1.0 INTRODUCTION

Under the terms of Agreed Order No. 1778, as amended, the Port of Bellingham (Port) and City of Bellingham (City) have prepared this Remedial Investigation/Feasibility Study (RI/FS) report. The Port and the City have been identified by the Washington State Department of Ecology (Ecology) as potentially liable parties (PLPs) under the Washington State Model Toxics Control Act (MTCA; Chapter 173-340 WAC) for the Cornwall Avenue Landfill Site (Site) in Bellingham, Washington. The Port and the City conducted the RI in accordance with the *Draft Work Plan Supplemental Remedial Investigation, Cornwall Avenue Landfill, Bellingham, Washington* (Landau Associates 2002) and the *Work Plan, Cornwall Avenue Landfill Site, Supplemental RI Groundwater Investigation, Bellingham, Washington* (Landau Associates 2012a).

The RI describes the environmental setting for the Site, identifies the nature and extent of contamination for affected media, identifies potential receptors and develops Site screening levels (SLs) and preliminary cleanup levels (PCLs) for evaluating the nature and extent of Site contamination and identifying Site indicator hazardous substances (IHS). The FS develops and evaluates alternatives for cleanup of Site contamination, and presents a preferred cleanup alternative.

1.1 SITE DESCRIPTION

The Site is located south of downtown Bellingham, at the terminus of Cornwall Avenue, adjacent to Bellingham Bay. The Site is also bordered by an active rail line owned by Burlington Northern Santa Fe Railway Company (BNSF), and by the R.G. Haley site. These features are shown on Figures 1-1 and 1-2.

The Site extends across two separate properties, one owned by the City and the other consisting of Washington state lands administered by the Washington State Department of Natural Resources (DNR), as shown on Figure 1-2. Property-related references in this document use the following conventions:

- DNR property or state land: The upland and in-water area owned by the State of Washington seaward of the Inner Harbor Line.
- Cornwall property: The upland area formerly owned jointly by the Port and the City, and now solely by the City.
- BNSF railway mainline: The upland area owned by BNSF.
- The Cornwall landfill, Cornwall Avenue Landfill, or the landfill: The area containing municipal refuse.

Note: For clarity, a project north has been established for the Site at the northeast Cornwall property line (see Figure 1-2). This convention is used throughout the report when referring to the orientation of Site features.

The Site is defined as the area containing refuse; the area containing wood waste within Cornwall property boundaries; the imported sediment stockpiles, and any adjoining areas impacted by hazardous substance releases from the refuse or wood waste, as shown on Figure 1-2. The Site boundaries are described more specifically as follows:

- West and South Site Boundary: These boundaries are set in Bellingham Bay at the western and southern limits of Site-related impacts to sediment. Figures in this report indicate an approximate boundary to the west and south based on the presence of refuse or wood waste. More specifically, the boundaries with respect to defining the area of cleanup will be established at the point where the concentrations of Cornwall site-related contaminants have declined to a level commensurate with the sediment cleanup levels established for the Site.
- North Site Boundary: This boundary is set at the northern limit of refuse or impacts from refuse. Where refuse is absent, this boundary is established at the northern Cornwall property line.
- East Site Boundary: This boundary is set at the eastern edge of the wood waste fill, which generally coincides with the eastern Cornwall property line (i.e., where it adjoins the BNSF railway mainline).

The Site is approximately 16.5 acres in size, including about 3.5 acres of aquatic lands and 13 acres of uplands. All 3.5 acres of the aquatic lands and approximately 8.4 acres of the uplands are owned by Washington State and managed by DNR; DNR is also a Site PLP. The remaining 4.5 acres of the uplands are owned by the City. The inner harbor line represents the boundary between City-owned land and state-owned land at the Site. Property to the north of the Site is also owned by the City, and is part of the R.G. Haley cleanup site. BNSF owns the property east of the Site for the railway mainline. Figure 1-2 presents the pertinent property boundaries for reference and the approximate Site boundary based on the findings of the RI.

Presently, the only significant features on the Site consist of a stormwater detention basin constructed in 2005 at the south end of the Site, and the interim placement areas (IPAs) located in the western portion of the Site that store stabilized sediment from an interim action conducted in 2011 and 2012. The 2011/2012 interim action is discussed further in Section 3.7 (Interim Action). The Site is largely unpaved, with the exception of a section of asphalt road and other pavement in the northeastern portion of the Site. Current Site features are shown on Figure 1-2.

The R.G. Haley MTCA site is located adjacent and north of the Site. Releases from the R.G. Haley site appear to have impacted soil and groundwater conditions in the northern portion of the Site in an area referred to herein as the overlap area, and refuse from the Site is present in the southwestern portion of the R.G. Haley site uplands. There also appears to be additional overlap between the sites in soil, and sediment. The City is currently conducting an RI for the R.G. Haley site, and is responsible for addressing contamination originating from past wood treating operations at that site. Sections 3.3 (R.G. Haley Site Remedial Investigation/Feasibility Study) and 6.3.2 (Site Interior Groundwater Quality) provide additional information regarding the investigation and environmental conditions in the overlap area. This information is also considered in the FS to ensure that the FS alternatives for this Site do not interfere with or preclude cleanup alternatives for the R.G. Haley site.

Another MTCA site, the Whatcom Waterway sediment cleanup site, borders the Site on the west in Bellingham Bay. That site overlaps the sediment portion of the Cornwall Site. The primary contaminant of concern at the Whatcom Waterway sediment cleanup site is mercury and the required cleanup (under Consent Decree No. 07-2-02257-7) in the area of the Cornwall Site is monitored natural recovery (MNR). Monitoring is expected to begin in 2016 following Phase I implementation of active cleanup measures in other areas of the Whatcom Waterway sediment cleanup site. As discussed in Section 10.2 (Compatibility with R.G. Haley and Whatcom Waterway Remedial Activities), remedial actions for the Cornwall Site will be planned and conducted in coordination with the Whatcom Waterway cleanup activities.

1.2 OBJECTIVES OF THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY

The objective of this RI/FS is to collect, develop, and evaluate sufficient information regarding the Site to enable the selection of a cleanup action (WAC 173-340-350). Specifically, this RI/FS:

- Characterizes the nature and extent of contamination for affected media (i.e., groundwater, sediment, and soil)
- Identifies preliminary cleanup standards for affected media
- Develops and evaluates cleanup action alternatives that protect human health and the environment
- Identifies a preferred cleanup alternative.

This document presents the information collected and the evaluations performed to achieve these objectives.

1.3 REPORT ORGANIZATION

The RI/FS report is organized as follows:

- Section 2.0 (Project Background) presents project background, including a summary of Site history, and a description of previous environmental investigation and interim cleanup action activities.

- Section 3.0 (Remedial Activities) describes the RI activities, including soil, groundwater, surface water, and marine sediment investigations.
- Section 4.0 (Environmental Setting) describes the environmental setting for the Site, including its physical features, geology, hydrogeology, natural resources, and land use.
- Section 5.0 (Development of Site Screening Levels) develops Site SLs for affected media, which are used in Section 6.0 (Nature and Extent of Contamination) to characterize the nature and extent of contamination.
- Section 6.0 (Nature and Extent of Contamination) presents the results of the investigations which delineate the nature and extent of contamination.
- Section 7.0 (Conceptual Site Model) presents the conceptual Site model, including contaminants and sources, and fate and transport processes.
- Section 8.0 (Discussion of Cleanup Standards) presents the development of cleanup standards for the Site, identifies remedial action objectives (RAOs), and identifies potentially applicable laws.
- Section 9.1 (Site Units) identifies specific areas of the Site to be addressed during cleanup activities.
- Section 9.2 (Remedial Action Objectives and Potentially Applicable Laws) identifies the specific goals of the cleanup action to address potential exposure pathways and the State and Federal laws applicable to cleanup of the Site.
- Section 9.3 (Screening of Remedial Technologies) presents the screening of the remedial technologies.
- Section 9.4 (Description of Remedial Alternatives) describes the remedial alternatives for each Site unit.
- Section 9.5 (Feasibility Study Evaluation Criteria) presents the criteria by which the remedial alternatives will be evaluated to determine the preferred alternative.
- Section 9.6 (Evaluation of Alternatives) evaluates the remedial alternatives against the evaluation criteria.
- Section 9.7 (Disproportionate Cost Analysis) presents the disproportionate cost analysis.
- Section 10.0 (Summary and Conclusions) presents the summary and conclusions, including a description of the preferred alternative.

2.0 PROJECT BACKGROUND

This section provides an overview of the history of the Site, including a summary of all environmental investigations conducted at the Site prior to the RI. RI activities are summarized in Section 3.0 (Remedial Activities), and the integrated results of all Site environmental investigations are presented in Sections 4.0 (Environmental Setting) and 6.0 (Nature and Extent of Contamination).

2.1 SITE HISTORY

Historically, the majority of the Site consisted of tide flats and subtidal areas of Bellingham Bay. From about 1888 to 1946, the Site was used for sawmill operations, including log storage and wood debris disposal. Between about 1946 and 1965, the Port held the lease on the state-owned portion, and subleased a portion of the Site to the City from 1953 to 1962. During that time period, the City used the Site for the disposal of refuse. In 1962, the City entered into a lease with another Port tenant (American Fabricators) and continued landfill operations at the Site until 1965. From 1971 to 1985, the Site was leased to Georgia Pacific West (GP) by the Port, including sublease of the state-owned portion of the Site. In 1985, GP purchased a portion of the Site from the Port referred to in previous documents as the "fee-owned portion" of the Site. In January 2005, the Port repurchased the fee-owned property from GP, in conjunction with other waterfront property owned by GP, and in December 2005, the City purchased an ownership interest in the fee-owned portion of the Site from the Port. In 2012, the City acquired the remaining fee-owned portions of the Site from the Port. Additional details regarding the Site history and uses of the Cornwall Avenue Landfill are described in the initial characterization report (Tetra Tech and Historical Research Associates 1995), provided in Appendix A of this report.

Sometime prior to 1953, a wood-framed warehouse was built in the southern corner of the Site, and another smaller wood-framed warehouse was built (date of construction unknown) near the northeastern corner of the Site. The use of the warehouses prior to GP's leasehold is unknown. GP used the warehouses until they were demolished in 2004 and 2005. Because most of the Site investigations were conducted prior to demolition of the GP warehouses, the footprints of the former warehouses are shown on most figures included in this report.

Upon closure in 1965, the landfill was covered with a soil layer of variable thickness, and the shoreline was protected by various phases of informal slope armoring consisting of a variety of rock boulders and broken concrete. Significant shoreline erosion has occurred following closure of the landfill, which resulted in exposure of landfill refuse at the surface and redistribution of landfill refuse onto the adjacent beach area. The toe of the refuse fill slope extends out into Bellingham Bay to some distance beyond the shoreline.

The Site came to public attention in 1992 when a beachcomber reportedly discovered medical waste (including glass blood vials and plastic syringes) along the beach at the toe of the landfill. This discovery led to Ecology's initial Site investigation in 1992, which is discussed later in this section. Subsequent evaluation of the medical waste issue by Whatcom County Health and Human Services (WCHHS 1999) concluded that:

- The medical waste present at the Site was generated 27 to 49 years ago.
- Disposal of medical waste at the Cornwall Avenue Landfill was consistent with Whatcom County Solid Waste Regulations during the years of active landfill operation.
- There is not a potential for pathogens potentially associated with medical waste disposed at the landfill to have survived to the present.
- There is no threat of exposure related to medical waste from prior landfill operation and additional sampling and analyses for pathogens is not necessary.

Based on the Whatcom County Health and Human Services evaluation, the investigation of Site environmental conditions has focused on the environmental parameters discussed in this document.

On the basis of data collected during the initial Site investigation, Ecology performed a site hazard assessment under the Toxics Cleanup Program in 1992. The Ecology site hazard assessment for the Cornwall Avenue Landfill indicated that "... the refuse included household garbage, pulp waste, and other possible waste." A characterization of contaminants and potential post-closure uses for the landfill was initially conducted for the Washington State Attorney General (Tetra Tech and Historical Research Associates 1995), and is provided in Appendix A of this report. The Tetra Tech report provides a detailed description of historical site use and landfilling activities.

Based on the results of the site hazard assessment, Ecology ranked the Site a 2 on a scale of 1 to 5, with 1 being the highest priority. Some of the factors contributing to the ranking included the lack of a landfill liner, leachate collection, and run-on/run-off control; toxic metals detected in the leachate; estimated quantity of waste disposed at the landfill; and the proximity of the Site to populated areas and sensitive environments.

2.2 PREVIOUS SITE INVESTIGATIONS

A number of environmental investigations were conducted at the Site prior to the signing of the Agreed Order and initiation of formal RI activities in 2005. These pre-RI investigations are described below. RI activities conducted subsequent to issuance of the Agreed Order are described in Section 3.0 (Remedial Activities).

In addition to environmental investigations, information obtained during previous geotechnical investigations conducted at the Site is useful in evaluating Site geologic conditions. Therefore, a brief description of these investigations is also provided in this section. Table 2-1 summarizes each of the pre-

RI environmental and geotechnical investigations in chronological order. Elevations for groundwater monitoring wells and seep sampling locations are presented in Table 2-2, and location and elevation data for surface sediment samples are presented in Table 2-3. Applicable results of the pre-RI investigations are integrated with the results of the RI in Sections 4.0 (Environmental Setting) and 6.0 (Nature and Extent of Contamination).

2.2.1 GEOTECHNICAL INVESTIGATIONS

Geotechnical investigations were conducted within or adjacent to the Site in 1960 (Dames & Moore 1960) and in 1985 (Purnell & Associates 1985). Dames & Moore completed five borings (Borings 1 through 5) as part of a geotechnical investigation conducted at and near the Site in 1960. Purnell & Associates completed 14 borings (B-1 through B-14) and 6 test pits (TP-1 through TP-6) and installed piezometers in borings B-2, B-3, B-4, B-5, B-6, and B-12 to evaluate groundwater flow in 1985. The exploration locations for these geotechnical investigations are shown on Figures 2-1 and 2-2 for upland and in-water exploration locations, respectively, and the boring and test pit logs are presented in Appendix B. Generalized environmental impacts were documented during the Purnell & Associates investigation. Notations consisted of an observed oil film near the northeastern corner of the landfill at test pit locations TP-1, TP-2, TP-3, TP-4, and boring B-4. No analytical data were collected as part of this investigation.

2.2.2 INITIAL SITE INVESTIGATION

In 1992, Ecology conducted an initial environmental investigation of the Site (Ecology 1992a), which formed the basis for the site hazard assessment (Ecology 1992b). The investigation consisted of collecting and analyzing four groundwater seep samples at locations E-1 through E-4 within the intertidal zone and two surface sediment samples collected near groundwater seep locations E-2 and E-4, as shown on Figure 2-2.

The seep water samples were analyzed for metals, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and a number of conventional parameters. One or more of the water samples exceeded the marine water quality criteria for a number of heavy metals. The seep samples were not filtered and were described by the analytical laboratory as “turbid and dark in color” (Tetra Tech and Historical Research Associates 1995). The turbidity of the seep samples collected by Ecology may have contributed to the high concentrations of constituents detected. The surface sediment samples were analyzed for metals, volatile organic compounds (VOCs), SVOCs, pesticides, and total polychlorinated biphenyls (PCBs). The Sediment Management Standards (SMS) were exceeded in one or more samples for copper, zinc, lead, bis(2-ethylhexyl)phthalate (BEP), and PCBs. The analytical program did not include analysis for total organic carbon (TOC), so Tetra Tech used an assumed TOC concentration of 1 percent to normalize the sediment analytical results for organics for comparison to the SMS criteria.

2.2.3 EXPANDED SITE INVESTIGATION

An expanded Site investigation was conducted in 1996 to further evaluate environmental conditions (Landau Associates 1997). The investigation included the collection and analysis of groundwater seep samples from three locations (S-1 through S-3) in the intertidal zone and collection of a surface sediment sample from each of the seep sampling locations. The investigation also included a test pit investigation (TP-1 through TP-4) to evaluate the nature of near-surface refuse in the intertidal zone, an assessment of the upland and subtidal cover conditions, and an assessment of shoreline erosion. Expanded Site investigation exploration locations are shown on Figures 2-1 and 2-2 for upland and in-water exploration locations, respectively, and the exploration logs are presented in Appendix B.

The groundwater seep samples were tested for metals, SVOCs, VOCs, pesticides, PCBs, major cations and anions, total cyanide, total phenols, gross alpha/beta radiation, fecal coliform, turbidity, color, hardness, salinity, specific conductance, total dissolved solids, and TPH. One or more seep water samples exceeded the surface water quality standards for a number of metals and fecal coliform. Additionally, the sample from S-2 exceeded the radiochemistry standard for gross beta radiation. The seep samples were not filtered, and although care was taken during collection to minimize turbidity, the turbidity was still significantly higher than that considered acceptable for groundwater samples. The surface water quality exceedances in these samples may have resulted from sample turbidity.

Surface sediment samples were analyzed for total metals, total cyanide, SVOCs, pesticides, PCBs, TOC, grain size, TPH by Ecology Method NWTPH-HCID, and conventional parameters (including total solids, total volatile solids, total sulfides, and ammonia). One or more of the following constituents were detected in each of the sediment samples at concentrations exceeding the SMS Sediment Quality Standards (SQS): silver, copper, lead, BEP, and total PCBs.

Dioxins were not tested for during the Expanded Site Investigation or subsequent investigations because of the low potential for their presence in the waste stream disposed at the landfill. Although GP pulping waste was reportedly disposed at the Site, available information suggests that the material did not likely contain significant concentrations of dioxins. According to GP, pulping waste disposed at another landfill, Roeder Avenue Landfill, primarily consisted of knots and tailing screened out of the pulp prior to bleaching (ENSR 2007). The wastes generated downstream of the bleaching process, which are the wastes most likely to contain dioxins, were handled at other facilities. The Cornwall Avenue Landfill was the refuse disposal facility used by GP prior to construction of the Roeder Avenue Landfill, and GP's disposal practices at the Site were likely the same as those at the Roeder Avenue Landfill. Additionally, the GP chlor-alkali plant was not constructed until 1965, the year the Cornwall Avenue Landfill closed, which further reduces the potential that dioxins were contained in any pulping wastes disposed at the Cornwall Avenue Landfill. Furthermore, the solubility of dioxin/furans is very low and they have a high affinity for soil. Therefore, if dioxin/furans were present in the landfill or in soil at the Site, it is unlikely they would migrate via groundwater to the surface water.

2.2.4 FOCUSED REMEDIAL INVESTIGATION

A focused RI was conducted in 1998 and 1999 by Landau Associates (Landau Associates 2000). The primary objectives identified for the focused RI were to:

- Estimate the flow, direction, and velocity of the groundwater in the upper portion of the aquifer
- Determine whether groundwater is a migration pathway for contaminants from the Site to Bellingham Bay
- Evaluate the extent to which upgradient water quality conditions are affecting the groundwater within the Site
- Evaluate the extent of the contribution to groundwater within the Site from the R.G. Haley site or by previously detected releases near the northeastern corner of the Site.

Five groundwater monitoring wells (MW-1 through MW-5) were installed during the focused RI at the locations shown on Figure 2-1. Boring and well completion logs are presented in Appendix B. Groundwater samples were collected from wells MW-1 and MW-5 during this investigation. MW-1 was analyzed for polycyclic aromatic hydrocarbons (PAHs), diesel- and oil-range petroleum hydrocarbons, copper, lead, zinc, total cyanide, fecal coliform, and turbidity. The groundwater sample collected from well MW-5 was analyzed for PAHs and diesel- and oil-range petroleum hydrocarbons. A strong petroleum odor and heavy sheen were present in soil samples near the water table during the installation of MW-1. The diesel- and oil-range petroleum hydrocarbon detections in the sample from MW-1 and the diesel-range petroleum hydrocarbon detection in the sample from MW-5 exceeded the current MTCA Method A groundwater cleanup levels. Additionally, the copper concentration detected in the sample from MW-1 exceeded the applicable surface water quality standards.

Three groundwater seep sampling devices (S-1, S-2, and S-3) were installed at the Site during the focused RI at the same locations as the 1997 expanded Site investigation seep/sediment sampling locations. The sampling devices were installed to: 1) obtain samples of groundwater seep discharge that are representative of groundwater quality at the point of discharge to Bellingham Bay; and 2) to estimate the potential for a relatively thin sand filter layer (representing a component of intertidal cover material proposed for containment) to improve seep discharge water quality. The seep sampling device construction details are shown on Figure 2-3.

Groundwater seep samples were analyzed for copper, lead, and zinc (total and dissolved), cyanide, fecal coliform, and turbidity. Fecal coliform, copper, and lead were detected in one or more groundwater seep samples at concentrations that exceeded the SLs discussed in Section 5.4 (Groundwater Screening Levels).

2.3 RELATIONSHIP OF REMEDIAL INVESTIGATION/FEASIBILITY STUDY TO OTHER DOCUMENTS

As indicated on Figure 2-1, the R.G. Haley site is located adjacent to the Site. As will be subsequently discussed in this document, there is some overlap of hazardous substances in soils, groundwater, and sediment between the two sites. Because of this overlap, it is important that the remedial actions implemented at the two sites be coordinated to ensure successful remediation at both sites over the long term. The approach to coordinating the Site and R.G. Haley site cleanups is discussed in the FS portion of this document.

Ecology conducted a site hazard assessment during 1992 for the adjacent R.G. Haley site (Ecology 1992c). The R.G. Haley site is a former wood treatment facility located immediately north of the Site. The site hazard assessment identified pentachlorophenol (PCP) and fluorine at levels above MTCA cleanup levels and Ecology ranked the R.G. Haley property a 3 based on these data. The potential impact of the R.G. Haley site on the Site was considered during a previous investigation (referred to as the focused RI), as discussed in Section 6.2.2 (Extent of Petroleum Hydrocarbon Contamination). Data presented in relevant R.G. Haley documents, including the R.G. Haley Interim Cleanup Action Plan (GeoEngineers 2000), Addendum No. 2 to the Interim Cleanup Action Plan (GeoEngineers 2001), the Interim Cleanup Action Report (GeoEngineers 2002), the Draft Final RI/FS Report (GeoEngineers 2007), and RI data collected by GeoEngineers in 2012, were reviewed as part of this RI to evaluate the extent of refuse and petroleum hydrocarbon sheen, as described in Section 6.0 (Nature and Extent of Contamination**)**.

The Site is located within The Waterfront District redevelopment area, which is currently undergoing extensive planning efforts to facilitate a transition from historical industrial activities to a mixed-use urban neighborhood. The remedial alternatives developed for the Site need to protect human health and the environment under future land use. As a result, potential future land use, including the development concept presented in The Waterfront District Draft Sub-Area Plan (Port of Bellingham website 2012), is addressed in the FS portion of this document. Environmental review regarding the proposed land use components is being performed under the State Environmental Policy Act (SEPA) by the Port's SEPA responsible official. The Final Environmental Impact Statement (EIS; Blumen Consulting Group, Inc. 2010) and Final EIS Addendum (EA Engineering 2012) were published in conjunction with the Draft Sub-Area Plan in December 2012 all of which are herein collectively referred to as the Waterfront District EIS. The Waterfront District EIS documents help present an understanding of the relationship between the Site and The Waterfront District redevelopment activities.

3.0 REMEDIAL ACTIVITIES

For the purposes of this document, remedial activities consist of those RI and interim action activities conducted at the Site subsequent to execution of Agreed Order No. 1778. RI activities include both activities conducted specifically as part of the Site RI and environmental characterization conducted for other purposes that generated relevant Site environmental data. RI activities conducted as part of the Site RI include the 2002 Site Supplemental RI, the 2008 Ecology sediment investigation, and the 2012 Supplemental RI Groundwater Investigation. Activities not conducted as part of the Site RI that generated relevant Site environmental data include a 2004 Phase II environmental assessment of GP Bellingham operations, a 2008 sediment quality investigation conducted by the City for the proposed Boulevard Park overwater walkway, and RI activities conducted for the R.G. Haley site, at locations at or adjacent to the Site. Interim action activities consisted of the sediment beneficial reuse interim action conducted in 2011/2012 to store stabilized fine-grained sediment that could potentially be used at the Site in the future as contouring fill material. Brief descriptions of RI and interim action activities for each of these remedial activities are presented in this section.

Because the Site is a former solid waste landfill, it is inherently heterogeneous and hazardous substances tend to be distributed sporadically throughout the refuse. As a result, it was conservatively assumed that all of the soil/refuse and wood waste within the landfill exceeds applicable MTCA cleanup levels and requires remediation. Because of the potential for surface soil contamination from the R.G. Haley site to have been conveyed onto the Site by vehicles and stormwater, and for hazardous substances in refuse to have been entrained in cover soil, it was also assumed that Site cover soil contains hazardous substances above applicable MTCA cleanup levels. Consequently, RI soil characterization was focused on delineating the extent of refuse and wood waste, and investigating the extent of petroleum hydrocarbon present on the Site that appears to be associated with the R.G. Haley cleanup site.

The decomposition of solid waste and wood waste typically depletes oxygen in groundwater and leads to reducing (low oxygen) groundwater conditions. The reducing groundwater conditions often cause naturally occurring metals in soils such as iron and manganese to become mobile and enter the dissolved phase. Additional compounds associated with the breakdown of solid waste and wood waste include tannins and lignins, and common cations and anions such as sulfate, chloride, and ammonia, which are often present at concentrations of concern in landfill leachate or groundwater that is in contact with buried waste. Additionally, some hazardous substances disposed of at municipal solid waste landfills can leach into groundwater, such as VOCs and petroleum hydrocarbons. Some hazardous substances that do not readily dissolve into groundwater, such as many SVOCs (including PAHs) and PCBs, are still considered groundwater constituents of potential concern (COPCs) because they have very low cleanup levels that result in criteria exceedances at very low concentrations. As a result, these constituents were considered likely to be present in Site groundwater and groundwater quality characterization was focused on these constituents, although less prevalent constituents were also tested for during various phases of Site groundwater characterization.

3.1 2002 SUPPLEMENTAL REMEDIAL INVESTIGATION ACTIVITIES

A supplemental RI was performed in 2002 to address data gaps identified in the focused RI. The 2002 supplemental RI consisted of a number of activities to better characterize Site soil, groundwater, and sediment quality, which are briefly described below. Supplemental RI activities were conducted in accordance with the Ecology approved supplemental RI Work Plan (Landau Associates 2002), and are described below in sections specific to the media investigated (soil, groundwater, sediment, and storm drain system).

3.1.1 SOIL INVESTIGATION

Soil borings and test pits were completed during the supplemental RI to delineate the extent of petroleum hydrocarbon sheen encountered during previous Site investigation activities. Fourteen test pits (RITP-1 through RITP-14) were excavated in the vicinity of MW-1 and the northeastern corner of the Site. Four soil borings (RISB-1 through RISB-4) were completed in the vicinity of MW-1 by hollow-stem auger due to the presence of paved surfaces, which precluded the use of test pit explorations in these areas. Boring and test pit locations are shown on Figure 2-1. Test pit and boring logs are presented in Appendix B.

The presence of light non-aqueous phase liquid (LNAPL) was observed in test pit RITP-7. A sample of the LNAPL was collected for chemical analyses. No other samples were collected during the soil investigation for analytical testing. The results of this investigation are discussed further in Section 6.2 (Soil Quality).

3.1.2 GROUNDWATER INVESTIGATION

The following activities were performed as part of the 2002 supplemental RI groundwater investigation:

- Installation of two groundwater monitoring wells (MW-9 and MW-10) in the vicinity of MW-1 to evaluate the nature, extent, and source of TPH contamination that was detected in MW-1 during the focused RI.
- Installation of three groundwater monitoring wells (MW-6, MW-7, and MW-8) to characterize the nature and extent of TPH-impacted groundwater originating from the LNAPL previously observed near the northeastern corner of the Site.

- Installation of three groundwater seep sampling devices (RIS-1, RIS-2, and RIS-3) to replace the ones that were destroyed following completion of the focused RI by a detached log boom. The new devices were installed in approximately the same locations as the previous devices.
- Collection and analysis of groundwater discharge samples from the seep sampling devices for two additional monitoring events to evaluate consistency with the focused RI data. The groundwater seep samples were analyzed for the same parameters investigated during the focused RI, including PCBs, total suspended solids (TSS), TOC, and ammonia.
- Sampling of all groundwater monitoring wells and seep sampling devices at the Site for fecal coliform analysis to determine the origin of fecal coliform detections in seep water samples and MW-1 during the focused RI.
- Sampling of most of the groundwater monitoring wells and seep sampling devices at the Site for PCB analyses to evaluate whether groundwater was a potential source of the PCB detections in Site sediment and to compare PCB concentrations at the groundwater/surface water interface to Site SLs.
- Sampling of MW-3 for diesel- and oil-range petroleum hydrocarbon analyses to evaluate if the sheen observed during the installation of MW-3 was of a petroleum origin.
- Sampling of the LNAPL observed during the excavation of test pit RITP-7 in the northeastern corner of the Site for analysis of PAHs, PCBs, diesel- and oil-range petroleum hydrocarbons, and benzene, toluene, ethylbenzene, and xylenes (BTEX).

The groundwater monitoring well and seep sampling locations are shown on Figures 2-1 and 2-2, respectively. Monitoring well boring logs and construction details are presented in Appendix B.

When groundwater is in contact with landfill refuse, it is often evidenced by elevated conventional parameters such as sulfate, nitrate, ammonia, and low levels of VOCs as discussed in Section 3.0 (Remedial Activities).

A heavy sheen was observed in soil samples collected near the water table during the installation of MW-6. This was confirmed by a groundwater sample obtained from this well that also had a petroleum odor and sheen. A slight sheen was observed in soil samples collected near the water table during the installation of MW-8 that was attributed to the refuse. No sheen was observed during the collection of the groundwater sample from this well. Refuse, including glass, plastic, wood, and metal, was observed during the installation of wells MW-7, MW-8, and MW-10.

Following installation, the location and elevation of each monitoring well was determined using a differential global positioning system (DGPS). The elevations for the wells were referenced to existing wells MW-1 and MW-5, which were surveyed using conventional methods. The elevations for all Site groundwater monitoring wells are provided in Table 2-2.

The newer seep sampling devices were installed at the approximate locations of the previous seep sampling devices, with the exception of RIS-1. RIS-1 was located about 50 feet (ft) southwest of the focused RI groundwater seep sampling location (S-1) because of observations made during the 2002 supplemental RI that indicated a stormwater outfall for the Site was located in the immediate vicinity of

S-1, which could affect groundwater seep quality results collected from this location. RIS-3 was also relocated about 75 ft southeast of S-3 because it was the closest active seep location at the appropriate elevation [above about 2 ft mean lower low water (MLLW) elevation].

Following installation, the groundwater seep sampling devices were surveyed using DGPS and referenced to the known elevations of the existing monitoring wells. The location coordinates and elevations for the seep sampling devices are presented in Table 2-2.

3.1.3 SEDIMENT INVESTIGATION

The sediment investigation completed as part of the supplemental RI consisted of collection of six surface sediment samples (SRI-SED-1 through -6) for chemical analysis and a subtidal survey to better delineate the extent of landfill refuse. Similar to previous sediment sampling events, the depth of sediment characterized during the 2002 supplemental RI consisted of the upper 12 centimeters (cm), consistent with studies for the Whatcom Waterway site which show that the depth of bioturbation generally ranges from 10 to 15 cm (RETEC 2006). Sediment samples were collected approximately 25 ft seaward of the 50 percent refuse line identified during a subtidal diver survey, which was also conducted during the 2002 supplemental RI and is described below. Sediment sample locations are shown on Figure 2-2. The coordinates and elevations for sediment sample locations are provided in Table 2-3.

The six surface sediment samples were analyzed for PCBs, BEP, copper, lead, zinc, and TOC. Samples SRI-SED-3 and SRI-SED-5, which were the furthest from the shoreline, were also analyzed for mercury to evaluate the ubiquitous presence of mercury in Bellingham Bay.

Subtidal cover conditions were investigated during the 2002 supplemental RI to determine the extent of exposed refuse at the limits of 50 percent surface debris coverage and the outermost extent of surface refuse. A subtidal survey was conducted on June 5, 2002, by Parametrix, Inc. of Kirkland, Washington, using a boat and a diver with a self-contained underwater breathing apparatus (SCUBA). While swimming toward shore, the diver recorded the depth, substrate, and type of refuse to identify the limits of 0 and 50 percent surface refuse coverage. Location coordinates along the diver transects were recorded using DGPS. This process was repeated along 10 transects until the outer 0 percent and the 50 percent boundaries of the observable subtidal refuse or debris was delineated. Observations regarding the nature and distribution of wood debris were also recorded within the survey area. The results of the diver survey are presented in Sections 4.4.1.2 (Shallow Subtidal Habitat) and 6.4.1 (Extent of Refuse and Wood Debris).

3.1.4 DRAINAGE SYSTEM EVALUATION

A video survey of the integrity of the existing stormwater system was performed by Applied Professional Services, Inc., of Issaquah, Washington, on August 21, 2002 during the 2002 supplemental RI. The video survey consisted of extending a video recorder through the stormwater lines to evaluate alignment, materials of construction, and existing condition. During the survey, the alignment/location of the system features were marked on the ground surface at regular intervals and surveyed using a DGPS. The results of the drainage system evaluation are discussed in Section 4.1.2 (Drainage and Stormwater).

3.2 GEORGIA PACIFIC WEST PHASE II ENVIRONMENTAL ASSESSMENT

In 2004, Aspect Consulting conducted a Phase II environmental assessment of the GP Bellingham operations to support property transfer negotiations with the Port, which included the Site (Aspect Consulting 2004). Six soil borings (AF-SB01, AF-SB02, AF-SB03, AF-SB04, AF-MW-01, and AF-MW-02) were completed and two monitoring wells (AF-MW-01 and AF-MW-02) were installed at the Site. Thirteen soil samples were collected from the borings and tested for metals, BTEX constituents, PAHs, SVOCs, TPH, and PCBs. Groundwater samples were collected for analyses of conventional parameters, dissolved metals, VOCs, alcohols, PAHs, SVOCs, PCBs, and petroleum hydrocarbons (gasoline-, diesel-, and oil-range). The analytical results for the samples collected at the Site by Aspect Consulting are discussed in Section 6.3.2 (Site Interior Groundwater Quality). A more complete description of the activities associated with the overall investigation is presented in the complete Aspect Consulting environmental assessment report.

3.3 R.G. HALEY SITE REMEDIAL INVESTIGATION/FEASIBILITY STUDY

In 2004, GeoEngineers installed a monitoring well cluster pair (CL-MW-1S and CL-MW-1D), and in 2012 installed three additional monitoring wells (CL-MW-101, CL-MW-102, and CL-MW-103) on the Site as part of the R.G. Haley site RI/FS. The purpose of the wells was to evaluate groundwater quality related to releases from the R.G. Haley site. The R.G. Haley Site monitoring wells and boring locations that are on the Site, or in close proximity, are presented on Figure 2-1. Groundwater samples from the well cluster pair were collected on a quarterly basis from June 2004 to September 2005 and analyzed for diesel- and oil-range petroleum hydrocarbons and for PAHs.

In 2012, GeoEngineers conducted an additional investigation for the R.G. Haley cleanup site. Some of these samples were from wells that are located either on the Site or on the R.G. Haley site near the overlap area. The locations of soil borings and groundwater monitoring wells used during the 2012 R.G. Haley site investigations that provide characterization data for the overlap area are shown on Figure 2-1. The GeoEngineers investigation included analyses of groundwater from groundwater monitoring wells MW-1, CL-MW-101, CL-MW-102, CL-MW-103, CL-MW-1H, MW-6, MW-9, HS-MW-19, HS-MW-7, TL-MW-12, and TL-MW-13.

Groundwater samples from each of these wells were analyzed for diesel- and oil-range petroleum hydrocarbons, SVOCs, and PAHs. Groundwater samples collected from CL-MW-101 were analyzed for dioxins and furans; groundwater samples from HS-MW-7 were analyzed for copper; and groundwater samples collected from HS-MW-7 and TL-MW-13 were analyzed for ethylbenzene, toluene, and benzene.

The analytical results for the samples collected on the Cornwall Avenue Site by GeoEngineers are discussed in Section 6.3.2 (Site Interior Groundwater Quality). However, a more complete description of the activities associated with the R.G. Haley site investigations is presented in the R.G. Haley preliminary draft RI/FS (GeoEngineers 2007). Relevant data collected during the R.G. Haley site investigations are included in this document for completeness, and to evaluate the potential impact of R.G. Haley site releases on Site remedy selection. However, these data will be presented and evaluated relative to R.G. Haley site releases and associated remedial alternatives in a public review draft of the R.G. Haley RI/FS scheduled for completion in the spring of 2014.

3.4 2008 ECOLOGY SEDIMENT INVESTIGATION

In September 2008, a sediment investigation was conducted by Hart Crowser, on behalf of Ecology, to further evaluate the extent of refuse and wood debris in the aquatic portion of the Site. The investigation utilized sediment profile imaging (SPI) and plan view photography to survey the presence of refuse and wood debris within the surface sediment, and collection of sediment core samples to survey the presence of refuse and wood debris in the subsurface sediment. A total of 138 locations were photographed using SPI and plan view photography. Subsurface sediment cores were collected at 62 locations distributed throughout the subtidal areas of the Site. The intertidal aquatic area and a portion of the shallow subtidal aquatic area were not fully characterized, due to penetration resistance, vessel draft requirements, and low visibility, which prevented effective application of the investigation methods.

The sediment investigation was conducted as part of a bay-wide investigation funded by Ecology. A complete description of the study is presented in a report prepared by Hart Crowser for Ecology (Hart Crowser 2009). The Site investigation locations are shown on Figure 3-1 and the results are discussed in Section 6.4 (Sediment Quality).

3.5 BOULEVARD PARK OVERWATER WALKWAY SEDIMENT INVESTIGATION

The City conducted an environmental and geotechnical investigation along the alignment of a proposed overwater walkway between Boulevard Park and the Site in 2008. As part of this investigation, the City collected and tested sediment surface and core samples from a number of locations, including a location in close proximity to the southern end of the Site (BLVD-SS-09), as shown on Figure 2-2. The samples were tested for metals, diesel- and oil-range petroleum hydrocarbons, and PCBs.

3.6 2012 SUPPLEMENTAL RI GROUNDWATER INVESTIGATION

Between July and September 2012, supplemental RI activities were conducted to better characterize groundwater at the Site in proximity to its point of discharge to Bellingham Bay. The investigation was conducted in accordance with the Ecology approved work plan (Landau Associates 2012a) and included the installation and development of six pairs of deep and shallow groundwater monitoring wells (12 wells in total), and conducting two monitoring events to collect and analyze groundwater samples from the newly installed wells.

The shoreline monitoring wells were sampled on July 23 and 24 and again on September 24, 2012 All groundwater samples were analyzed for dissolved metals, VOCs, SVOCs, herbicides, pesticides, tannins and lignins, TPH-HCID with follow up analyses for detected hydrocarbon ranges, conventional parameters, and typical field parameters. The results of this investigation are discussed in Section 6.3.3 (Downgradient Perimeter Groundwater Quality).

3.7 INTERIM ACTION

In 2011 and 2012, an interim action was conducted at the Site under a first amendment to Agreed Order No. 1778. The purpose of the interim action was to take advantage of the availability of low cost capping material to reduce infiltration of rainwater through the municipal waste, therefore reducing the discharge of contaminants to Bellingham Bay. The interim action involved placing stabilized fine-grained sediment from a nearby Port dredging project on the landfill surface. The sediment was placed into two stockpiles and covered with a scrim-reinforced liner to prevent stormwater infiltration. Stormwater runoff from the stockpiles was directed to a series of new drainage ditches connected to an existing stormwater detention basin which discharges to the bay. The effect of this action was to significantly reduce the amount of rainwater infiltrating into the solid waste, and thus reduce the flow of contaminated groundwater into Bellingham Bay. The action also reduced the area where people or terrestrial species could come into direct contact with potentially contaminated surface soil or refuse.

Another benefit of the interim action was to acquire material that could potentially be used as part of the final cleanup for low-permeability capping or as fill for contouring final grades. Using this material as part of a capping system, if that is selected as a remedial alternative for this Site, could also result in lower final costs for cleanup.

In summary, the availability of the dredged material presented an opportunity to address some of the environmental concerns at the Site while potentially reducing the overall cost of cleanup. Although this opportunity presented itself before completion of the remedial investigation and feasibility study for the entire Site, containment was anticipated to be an element of the final cleanup action for the Site.

The Port's Gate 3 Floats F & G Replacement and Outer Harbor Maintenance Dredging project (Gate 3 project) included harbor maintenance dredging to restore navigable water depths at the marina entrances, within the berthing areas, and along the navigation channels. The project was conducted under a U.S. Army Corps of Engineers (USACE) permit and removed about 47,500 cubic yards (yd^3) of dredged material. Because of its fine-grained nature and high moisture content, the sediment was stabilized to attain a soil-like consistency prior to transport to the Site.

The Gate 3 sediment was tested for total metals, tributyl tin (TBT), VOCs, SVOCs, pesticides, PCBs, and dioxins/furans. All hazardous substances in the Gate 3 sediment were below applicable regulatory criteria, except for dioxins/furans, which exceeded the concentration allowed by the USACE for open water disposal. Use of the sediment at the Site to reduce infiltration and to potentially reduce future cleanup costs was identified by the Port as a viable alternative to open water disposal and they proposed this to Ecology as an interim action. Following public review of the proposed interim action in June/July 2011 as part of the first amendment to the Agreed Order, construction began in late 2011. The interim action consisted of the following elements:

- Sediment was stabilized prior to placement at the Site using about a 5 percent (by weight) addition of Portland cement, which eliminated free water in the sediment and achieved a workable, soil-like consistency.
- A perimeter berm, stormwater conveyance ditch, and roadway were constructed around the interim action area from existing cover soil and imported clean material.
- A landfill gas collection system was installed beneath the interim action area prior to sediment placement.
- Sediment was graded for stormwater drainage to the existing stormwater basins to provide interim stormwater management.
- A temporary cover consisting of 20-mil scrim-reinforced polyethylene sheeting was placed over the graded material, and beneath the perimeter roadway and stormwater conveyance ditch, to prevent erosion and allow stormwater to be managed as noncontact stormwater.
- Five samples of the stabilized sediment were collected and analyzed from the two interim placement areas to document the concentrations of dioxins/furans in the stockpiles.

Figure 3-2 shows the primary features of the interim action. The design of the interim action is presented in the Interim Action Plan (Landau Associates 2011), and construction of the interim action is documented in the Interim Action Completion Report (Landau Associates 2012b). The analytical results from the testing of the stabilized sediment are presented in Section 6.2.4 (Interim Action Low Permeability Material). The potential use of the stabilized sediment in applicable cleanup action alternatives is discussed in the FS portion of this report.

4.0 ENVIRONMENTAL SETTING

This section describes the environmental setting of the Site. Information discussed in this section includes physical Site features, Site geology and hydrology, area natural resources, and land/navigational uses.

4.1 PHYSICAL CONDITIONS

Physical conditions of a site are relevant because they have the potential to affect the fate and transport of contaminants. Physical conditions discussed below include the following:

- Site Topography and Bathymetry (Section 4.1.1)
- Drainage and Stormwater (Section 4.1.2)
- Shoreline Features and Erosion (Section 4.1.3)
- Sediment Deposition (Section 4.1.4)
- Surface Water and Circulation Patterns (Section 4.1.5).

4.1.1 SITE TOPOGRAPHY AND BATHYMETRY

The topography and bathymetry of the Site were characterized initially based on 1996 data, but upland topographic conditions were significantly modified in 2004 in conjunction with demolition of the GP warehouse and again during the interim action conducted at the Site in 2012. A topographic survey was conducted as part of the interim action to document placement locations and to calculate the volume of material placed at the Site. Additionally, a bathymetric survey was conducted in 2008 by Anchor Environmental as part of the Whatcom Waterway cleanup action that extended through the in-water portion of the Site. Both current and historical topography and bathymetry are discussed below.

Site topography and bathymetry prior to 2003 are shown on Figure 4-1. The topographic contours are based on a 1996 photogrammetric survey provided by Anchor Environmental. The bathymetric contours are based on soundings collected in 1996 by GP as part of the Whatcom Waterway RI/FS and soundings collected by the USACE in the Whatcom Waterway in 1996. As shown on Figure 4-1, the upland portion of the Site prior to 2003 was relatively flat with a surface elevation of about 14 ft MLLW. The slopes of the intertidal and shallow subtidal zones (above about -10 ft MLLW) range between about 5 Horizontal to 1 Vertical (5H:1V) to 10H:1V, and are generally within 100 to 200 ft of Site uplands. The deeper subtidal zone offshore from the Site has a relatively flat slope of about 20H:1V.

Current Site topography and bathymetry are shown on Figure 4-2. Site upland topography was significantly modified in 2004 in conjunction with the demolition of the GP warehouses and in 2012, during the interim action discussed in Section 3.7 (Interim Action). Demolition of the GP warehouses included grading the Site in the vicinity of the former warehouse locations, and installation of a stormwater detention basin and an outfall at the south end of the Site. These modifications resulted in a significant portion of Site stormwater runoff being directed toward the stormwater detention basin, where it either infiltrates or is discharged to Bellingham Bay. As part of the 2012 interim action, additional surface water drainage features were constructed, as described in Section 4.1.2.5 (Post-Interim Action Drainage and Stormwater Management).

Bathymetric conditions changed appreciably between the 1996 and the 2008 bathymetric surveys. The 2008 bathymetric data indicate that the intertidal and shallow subtidal surface became flatter and more uniform over the 12-year period between surveys. Intertidal and shallow subtidal slopes range from between about 6H:1V to 15H:1V and extend away from the Site uplands for approximately 250 ft. The changes are particularly apparent at the southern end of the Site, where 2008 bathymetric data indicate a significant increase in the mud line elevation from the elevations obtained during the 1996 survey.

4.1.2 DRAINAGE AND STORMWATER

Surface water and stormwater management at the Site was evaluated based on visual reconnaissance of general site drainage conditions and the roof drainage system for the main GP warehouse prior to demolition during the expanded Site investigation and the focused RI, and by a video survey of the stormwater management system during the supplemental RI. However, due to subsequent Site modifications including building demolition and completion of the interim action, characterization of the surface water and stormwater drainage based on these previous surveys does not represent current Site drainage conditions. Therefore, drainage and stormwater conditions are discussed below in terms of pre-demolition, post-demolition, and post-interim action conditions.

4.1.2.1 General Site Drainage

The upland portion of the Site is situated at the base of a bluff to the east and is adjacent to Bellingham Bay to the west. The bluff rises steeply about 60 ft and is a vegetated band of forested land that is bounded by the BNSF railroad right-of-way on the west and Boulevard Street on the east. Stormwater from Boulevard Street and residential areas to the east is intercepted by the City stormwater system and is conveyed for discharge away from the Site. Some portion of the stormwater discharge occurs through an outfall to Bellingham Bay located on the adjoining R.G. Haley property. Stormwater to the west of Boulevard Street either infiltrates or is conveyed via overland flow to the base of the bluff on the east side of the BNSF railroad tracks, where it either infiltrates or is conveyed to the west via a culvert underlying the railroad tracks to the north of the Site, as discussed below.

As previously mentioned, the upland portion of the Site is relatively flat. Prior to demolition of the GP warehouses, surface water was primarily directed toward catch basins in the paved portion of the GP property. However, the remainder of the Site was not graded to promote surface water drainage. As shown on Figure 4-3, flowing water was observed northeast of the Site between the railroad tracks and the hillside that trends northeast-southwest of the Site and near the gravel road that parallels the western side of the former main GP warehouse. The area between the railroad tracks and hillside is not graded to provide adequate drainage. Ponding of water in this area may contribute to recharge of the groundwater in the upper portion of the aquifer upgradient of the Site (Stasney 1997). The contribution of this potential recharge in relation to other sources is discussed further in Section 4.3.1.4 (Groundwater Recharge and Water Balance).

More recent reconnaissance by both Ecology and Landau Associates personnel confirmed the presence of ponded and flowing water on the east side of the BNSF railroad tracks near the northeast corner of the Site, and identified the presence of a culvert that conveys a portion of the surface water to an excavated depression on the west side of the tracks immediately east of the R.G. Haley site fence in the northeast corner of the Site. Surface water has been observed running in the ditch and discharging to the culvert as late as early October, indicating that recharge in this area is not seasonal. The presence of ponded and flowing water during the dry season is indicative of springs or other sources of ongoing recharge to surface water ponding that may contribute to Site groundwater recharge. The relative contribution of this recharge source to the Site is discussed further in Section 4.3.1.4 (Groundwater Recharge and Water Balance).

4.1.2.2 Pre-Demolition Warehouse Roof Drainage

The roof drainage collection system for the main GP warehouse was in a state of disrepair during the focused RI and the supplemental RI. Stormwater runoff from the roof was conveyed to the northwestern side of the warehouse via a series of downspouts that discharged stormwater directly to the ground surface. The ground surface in this area drained toward the building. The downspouts on the southeastern side of the building were connected to an 8-inch-diameter header line. The header line extended underneath the building and discharged stormwater to the ground surface beneath the building near the eastern corner. Relatively large areas of ponded water were observed beneath the warehouse floor at both the northeastern and southwestern sides of the warehouse, consistent with observations of the stormwater discharge from the roof drain system. These conditions contributed to shallow groundwater recharge upgradient of the landfill refuse. It could not be determined from the site reconnaissance performed during the supplemental RI and previous investigations if the roof drainage system for the warehouse was connected to the stormwater management system.

4.1.2.3 Pre-Demolition Stormwater Management System

The stormwater management system located north of the main GP warehouse was evaluated during the supplemental RI based on visual observations and a video survey of the underground piping. The video survey identified the materials of construction and the condition of portions of the stormwater conveyance system that were accessible to the video camera. Four catch basins were observed near the central portion of the Site (CB-1 through CB-4) and two near the warehouse (CB-5 and CB-6). The four catch basins appeared to be connected by stormwater pipelines that appeared to be routed toward Bellingham Bay. This was determined by the direction of the pipeline from catch basin CB-4 which was pointing toward the north.

The majority of the piping between the catch basins near the northern side of the main GP warehouse was accessible. The sediment accumulation in the two catch basins closest to the main GP warehouse (CB-5 and CB-6) prevented a video survey from being performed. The video camera could only travel about 150 ft from the outlet of catch basin CB-4 due to sediment accumulation and the resulting blockage in the pipeline from breaks and joint separations. The stormwater management system is shown on Figure 4-3.

The underground piping inspected during the video survey was constructed of concrete bell and spigot pipe. The stormwater management system appeared to be in a state of disrepair with several areas blocked due to offsets, leaking connections, or cracks in the lines. The numerous gaps observed in the pipelines would be sources of groundwater infiltration from the surrounding landfill material or points of stormwater discharge to the landfill subsurface, depending on the elevation of the piping relative to the groundwater table.

The stormwater outfall to Bellingham Bay was not visible on the shoreline and could not be accessed from the nearest catch basin during the video survey because of sediment accumulation in the pipeline. However, the approximate location of the outfall was determined during the Supplemental RI after a significant upwelling of water [estimated to be 30 gallons per minute (gpm), or greater] was observed near former seep sampling location S-1 during a rainstorm. Although the location was obscured by rock and debris, it appeared to be the outfall location for the GP stormwater system. This conclusion was confirmed based on the following observations:

- Flow was not observed from this location the previous day, which preceded the precipitation event.
- The magnitude of the flow was significantly greater and located higher than that observed at any other seepage location along the beach face.
- The flow rate appeared to be similar to the flow rate observed in the closest accessible manhole.

- The location is consistent with the projected end point of the stormwater conveyance system, based on the results of the video survey.

The approximate location of the stormwater outfall was determined by projecting the video surveyed portion of the pipeline extending from catch basin CB-4 toward the shoreline. The projected location of the stormwater outfall matched the location on the shore where the significant upwelling of water was observed during the rainstorm. This location is likely where the outfall discharges to Bellingham Bay. The projected stormwater discharge line and the apparent location of the stormwater outfall are shown on Figure 4-3. Even though the stormwater pipeline running from the vicinity of the warehouse to the outfall appeared to be in poor condition, the discharge of water from the shoreline bank during a heavy precipitation event was significant enough to indicate that the pipeline has sufficient integrity to convey a portion of the collected stormwater to the outfall.

Based on visual inspections conducted during the supplemental RI, roof drains from the smaller warehouse north of the main GP warehouse may have been connected to the stormwater management system. Two pipelines from catch basins CB-3 and CB-4 extended toward the smaller warehouse but the endpoints of these pipelines could not be accessed during the video survey due to obstructions in the pipelines.

One pipeline extended north from catch basin CB-4. The endpoint of the line could not be observed due to blockage in the pipeline. The material forming the blockage appeared to be a black fine-grained material mixed with fecal matter with the presence of insects. These insects were not seen on footage from other segments of the survey, and may have been attracted by the apparent fecal-containing material. A feature that appeared to be the concrete top of a septic tank was observed during the excavation of RITP-6 and appeared to be in direct alignment with the pipeline that extends north from CB-4. If this feature is a septic tank, the sludge observed in the pipeline may have been leakage from the tank that has entered the pipeline, or the pipeline could be directly connected to the septic tank. Alternatively, the apparent fecal material may originate from a broken sanitary sewer line. Additional discussion of this issue is provided in Section 6.3.1 (Overlap Area Groundwater Quality).

4.1.2.4 Post-Demolition Drainage and Stormwater Management in the Former Main Georgia Pacific West Warehouse Area

As previously indicated, the main GP warehouse was demolished in 2004. Following demolition, the footprint of the warehouse was graded to drain to a stormwater detention basin located along the southeastern side of the former warehouse, parallel to the fence line adjacent to the BNSF railway mainline. The detention basin is designed for the collection and temporary storage of stormwater runoff and allows for emergency overflow to Bellingham Bay during heavy storm events.

It is unlikely that the demolition of the main GP warehouse and construction of the stormwater detention basin significantly affected stormwater runoff or groundwater recharge at the Site. The roof drain system for the former warehouse was not functioning properly prior to demolition, and was discharging stormwater runoff beneath and to the northwest of the building [see Section 4.1.2.2 (Pre-Demolition Warehouse Roof Drainage)]. Thus, in the vicinity of the warehouse, the majority of stormwater runoff infiltrated into the subsurface during both pre- and post-demolition conditions at the Site. The installation of the stormwater detention basin and modifications to topography at the Site directs stormwater runoff toward the southern portion of the Site. As such, groundwater recharge is more appreciable in this area compared to the pre-demolition conditions at the Site.

4.1.2.5 Post-Interim Action Drainage and Stormwater Management

The implementation of the interim action in 2011 and 2012 placed a low permeability cover over about 4.5 acres of the Site where the IPAs and the associated roadways and stormwater ditches were covered or lined with 20-mil scrim-reinforced polyethylene sheeting. The placement of this low permeability cover resulted in a reduction of infiltration of about 35 percent for the upland portion of the Site, and about 65 percent through the portion of the Site where refuse is present.

Figure 4-4 presents the current Site topography and drainage features at the Site, including the excavated depression observed in the northeast corner of the Site that appears to collect the ponded or flowing water adjacent to the BNSF railroad tracks via a corrugated pipe from the east. The figure shows the location of the stormwater detention system constructed following demolition of the main GP warehouse, and conveyances constructed during implementation of the interim action. The stormwater management system in the paved area to the north of the former GP warehouse is still present, although it is in disrepair and does not appear to be functional.

4.1.3 SHORELINE FEATURES AND EROSION

The steep portion of shoreline near the top of the bank is partially protected by informal slope armoring consisting of a variety of rock boulders and broken concrete. Below the steep portions (i.e., the lower intertidal areas), riprap coverage is less dense and absent in some areas. This portion of the shoreline consists predominantly of soil (gravel, sand, and silt) with occasional concrete cobbles and landfill debris. The armoring along the steep portions of the shoreline was placed following closure of the landfill in 1965; however, despite the armoring, significant shoreline erosion has occurred. The erosion resulted in exposure of landfill refuse at the surface and redistribution of landfill refuse onto the beach area. The amount of shoreline erosion since landfill closure has been estimated during previous investigations using aerial photographs from 1969, 1994, and 2007, and a topographic survey of the Site in 2012. During the expanded Site investigation, the distance between the top of the shoreline slope and fixed points at the Site (e.g., permanent building) were measured. The differences between these measurements from the 1969 and 1994 aerial photographs indicated significant shoreline erosion occurred over this time period. The shoreline erosion is estimated to have ranged from approximately 60 ft at the southwestern corner of the landfill to 10 to 30 ft at the northern edge of the landfill between 1969 and 1994. The amount of shoreline accretion or filling at the southeastern tip of the landfill appears to be limited compared to the significant shoreline erosion noted throughout the remainder of the Site. The approximate positions of the landfill shoreline boundaries (assumed to be the top of slope) in 1969 and 1994, which were presented in the expanded Site investigation, are shown on Figure 4-5.

Stasney reviewed the 1969 and 1994 aerial photographs and estimated the shoreline erosion along the southwestern corner of the landfill to be about 125 ft (Stasney 1997). The significant difference between the shoreline erosion estimated by Stasney and that determined in the expanded Site investigation prompted Landau Associates to reevaluate the extent of shoreline erosion during the focused RI. It appears that the primary difference between the two interpretations is that Stasney used the approximate location of the mean high tide as the basis for defining the shoreline, while the top of the shoreline bank was used in the expanded Site investigation. The top of the shoreline bank is considered more reliable for evaluating shoreline erosion because it can be more definitively identified through stereo photographs and is a more consistent feature than mean high tide. As a result, the top of the bank measurements were used in this RI for evaluating shoreline erosion.

A comparison of the location of the top of the shoreline bank in the 1994 aerial photograph to the location/position observed in a 2007 aerial photograph indicates that only limited shoreline erosion occurred between 1994 and 2007. As indicated on Figure 4-5, the shoreline did not retreat more than about 10 ft at any given location during this period and did not change along much of the shoreline, though it did advance slightly waterward at the extreme southeastern corner of the Site.

In 2012, a topographic survey of the Site was conducted following implementation of the interim action. The top of the shoreline slope based on this survey is presented on Figure 4-5. The survey indicates the shoreline has retreated significantly in most locations since the 2007 evaluation. However, a direct comparison of the surveyed location to other approximate shoreline locations presented on Figure 4-5 could exaggerate the actual retreat since the other approximate shoreline locations were based on interpretations from aerial photographs and the new data is from a topographical survey. What is apparent from the comparison of the approximate shoreline locations shown on Figure 4-5 is that significant erosion has occurred along the Site shoreline over the years since the landfill was closed that will likely continue if not addressed by an engineered shoreline erosion protection system.

4.1.4 SEDIMENT DEPOSITION

The results of the 2008 Ecology sediment investigation indicate that significant sediment accumulation has occurred throughout much of the subtidal portion of the Site (deeper than approximately – 4 ft MLLW). Sediment accumulation was observed at 38 of the 43 sediment core locations. Sediment accumulation ranged from 0.5 to 3.5 ft, with an average thickness of 2.0 ft. Based on these observations and the period of time since the landfill was closed (approximately 43 years), the average sedimentation rate for the subtidal portion of the Site is about 1.4 centimeters per year (cm/yr). This rate is similar to the sedimentation rates reported for inner Bellingham Bay, which range from 1.52 cm/yr to 1.77 cm/yr (RETEC 2006).

Sediment deposition is further evidenced by the natural recovery exhibited in sediment core samples tested for mercury and PCBs from sediment sampling location BLVD-09. Sediment core samples show progressively lower concentrations for mercury and PCBs in samples collected from 3 to 4 ft below mudline up to the sediment surface. Mercury concentrations decreased from 3.8 milligrams per kilogram (mg/kg) to 0.4 mg/kg and PCB concentrations decreased from 21.47 mg/kg (organic carbon-normalized; OC) to 4.47 mg/kg.

4.1.5 SURFACE WATER AND CIRCULATION PATTERNS

This section describes watersheds that contribute to Bellingham Bay, regional bottom and surface currents throughout the bay, as well as tidal salinity and temperature information for the bay. Information provided in this section was compiled from information provided in the Whatcom Waterway Site RI/FS report (RETEC 2006). The Whatcom Waterway RI/FS report provides a more complete description of surface water and circulation patterns for Bellingham Bay.

4.1.5.1 Watershed Characteristics

The Bellingham Bay near-shore area is primarily influenced by the drainage from three watersheds: the Nooksack River, Whatcom Creek, and Squalicum Creek. Five other smaller watersheds also contribute water to Bellingham Bay, including the Padden Creek watershed. Whatcom Creek is the closest significant drainage course to the Site and discharges to the bay about 1 mile northeast of the Site as shown on Figure 4-6. Information on the Nooksack River, Whatcom Creek, Squalicum Creek, and Padden Creek watersheds is provided below:

- The Nooksack River Watershed drains approximately 1,500 square kilometers [km^2; 580 square miles (mi^2)] and is the primary source of sediments to Bellingham Bay, with an annual discharge of 650,000 cubic meters [m^3; 7,000,000 cubic feet (ft^3)]. All of the Nooksack flow does not, however, reach Bellingham Bay. Part of it enters Lummi Bay by way of the Lummi River. The Nooksack River is influenced by anthropogenic factors that include agriculture and logging. The discharge to Bellingham Bay is approximately 4.4 miles northwest of the Site.

- The Whatcom Creek Watershed drains an area of approximately 26 km² (10 mi^2). Whatcom Creek flows from Lake Whatcom through the City to Bellingham Bay. The City occupies much of the watershed. Presently, Whatcom Creek is influenced by areas of channelization, vegetation removal, and urban stormwater runoff.
- The Squalicum Creek Watershed drains an area of 65 km² (25 mi^2). Squalicum Creek originates at Squalicum Lake and flows through the City. The creek is influenced by areas of channelization, vegetation removal, and urban stormwater runoff. The discharge to Bellingham Bay is approximately 1.6 miles north-northwest of the Site.
- The Padden Creek Watershed drains an area of 16 km² (6.2 mi^2). Padden Creek originates at Lake Padden and flows entirely within City limits to Bellingham Bay. The primary land uses in the watershed include residential, forestry, agricultural, commercial, and industrial (NSEA website 2008). The discharge to Bellingham Bay is approximately 1.2 miles southwest of the Site.

4.1.5.2 Regional Bottom Currents

Most oceanic water enters Bellingham Bay at depth through the northern end of Rosario Strait between Lummi and Vendovi Islands (Figure 4-6). Some water enters through Bellingham Channel. Exchange of water to the west through Hale Passage is limited by a shallow sill. The residence time for water in Bellingham Bay is typically 4 to 5 days, but varies between 1 and 11 days. The available data indicate that there is a net southward flow throughout Bellingham Bay at depth, largely resulting from the lateral and vertical spreading of the Nooksack River discharge. Overall, bottom currents are relatively consistent throughout the year and typically range from 0.2 to 0.3 meters per second (m/sec). Deep current velocities typically range from 0.04 to 0.18 m/sec in the inner bay and can be as high as 0.40 m/sec. Based on generalized relationships between bottom current velocities and sediment re-suspension thresholds, bottom velocities above approximately 0.3 to 0.4 m/sec may be capable of re-suspending fine-grained sediments (i.e., silt and clay particles). Accordingly, inner Bellingham Bay appears to be primarily a net depositional environment, though periodic re-suspension of sediments in the inner bay is possible, particularly in shallow water areas where bottom velocities can be influenced by wave action. This interpretation is consistent with the predominance of fine-grained sediment textures throughout the inner bay, except in higher-energy shallow-water areas.

4.1.5.3 Regional Surface Currents

Surface currents throughout Bellingham Bay vary primarily in response to wind stress. Winds over the bay are from the south or southwest during much of the year, typical of foul-weather low-pressure systems in winter months, resulting in the forcing of surface water toward the northern part of the bay with return flow along the shorelines of the Lummi Peninsula, Portage Island, and Lummi

Island (Figure 4-6). Fair-weather winds from the west or northwest cause surface flow to the east and south along the eastern shoreline. In response to seasonal wind forcing, both clockwise and counter-clockwise circulation patterns are set up in Bellingham Bay. Salinity distribution maps delineate freshwater discharges from the Nooksack River. The brackish river plume sometimes exits the bay along the western shoreline near Lummi Peninsula and Lummi Island (counter-clockwise circulation), but at other times exits primarily along the eastern shoreline near the City of Bellingham and Post Point where it is then directed southwestward across the bay toward the southern tip of Lummi Island (clockwise circulation). In both configurations, surface water enters Rosario Strait mainly near the southern tip of Lummi Island and Vendovi Island. The compensating inflow of seawater to Bellingham Bay occurs partly via surface waters along the opposite shoreline from the brackish river plume and partly via bottom waters. Typical surface currents range between 0.02 to 0.06 m/sec in the inner bay, reaching maximum velocities of 0.36 m/sec.

4.1.5.4 Tides, Flooding, Storm Surge, and Tsunamis

The mean tidal range within Bellingham Bay is 5.44 ft. According to the National Oceanic and Atmospheric Administration (NOAA), the typical diurnal tidal range is about 8.51 ft (NOAA website 2008). Flooding, storm surge, and tsunamis (in decreasing order of probability of occurrence) may increase the water levels in Bellingham Bay on rare occasions. Additionally, the Port is planning for a 2.4 ft rise in sea level in response to the changing climate over the next 100 years. This estimate is based on a variety of projections made by the University of Washington Climate Impacts Group (University of Washington Climate Impacts Group and the Washington Department of Ecology 2008) and the Inter Governmental Panel on Climate Change (IPCC 2007). As discussed elsewhere in this report, the existing shoreline at the Site is eroding and any cleanup strategy implemented at the Site will include a shoreline stabilization system and finished Site grades designed to accommodate the current estimate of sea level rise.

In the Whatcom Waterway Site RI report, empirical estimates of storm surge were obtained by subtracting the highest observed tide on January, 5 1975 from the predicted tide for that day. The predicted high tide, as obtained from NOAA for January 5, 1975, was 9.6 ft. The actual measured high tide was 10.4 ft above MLLW. The difference is a storm surge of 0.8 ft. The effects of storm surge on final water elevations vary with wind speed, wind direction, and tidal cycle (e.g., storm surges only produce extraordinary water elevations if they occur coincident with a high tide that is already near the maximum for the water body).

Tsunamis are earthquake-generated waves that occur in open water bodies. Results of a modeling study conducted by NOAA and DNR indicate that a magnitude 9.1 earthquake caused by the Cascadia

Subduction Zone located in the Pacific Ocean basin could result in a tsunami wave that could cause a depth of inundation of 0 to 1.6 ft over much of the Site. It should be noted, however, that the study acknowledges limitations and uncertainties associated with the modeling.

4.1.5.5 Salinity, Temperature, and Total Suspended Solids

Salinity varies with depth and varies over time in the top 30 ft of the Bellingham Bay water column. The observed variability is primarily the result of fresh water input, wind-induced circulation, and wind-induced mixing. Because most freshwater comes from the Nooksack River, brackish water (salinity less than about 26 parts per thousand) is most extensively distributed in the northern part of Bellingham Bay, but a lower salinity surface layer has been observed to extend throughout the bay and south of Post Point, which is located to the south of the Site. This surface layer is typically less than 6 ft thick, but high winds may occasionally deepen the surface layer to 12 ft. The deepest waters in Bellingham Bay are similar in character to those of Rosario Strait. Bottom water salinities typically range from 29 to 31 parts per thousand, and are relatively stable throughout the year. Surface salinities in inner Bellingham Bay have been recorded to range from approximately 10 to 25 parts per thousand. Higher surface salinities have been observed during the incoming tide. Deep water salinities in the inner Bellingham Bay area have been recorded in the range of 26 to 30 parts per thousand.

Water temperatures in Bellingham Bay vary with depth and vary over time, primarily as the result of seasonal air temperature changes. Water temperatures range from 8 to 13 degrees Celsius (ºC) and are warmest in the summer and early fall and coldest during winter and spring.

TSS within the inner Bellingham Bay area has been measured at concentrations ranging from 3 to 25 milligrams per liter (mg/L). Deep water TSS concentrations have been measured from between 1 to 32 mg/L. Measured TSS concentrations average approximately 10 mg/L in both surface and deep waters.

4.2 GEOLOGY

Geologic conditions at the Site were characterized using information presented in:

- Previous geotechnical reports (Dames & Moore 1960; Purnell & Associates 1985)
- Information summarized by Stasney (Stasney 1997)
- Information contained in the Draft Final RI/FS report for the R.G. Haley site (GeoEngineers 2007)
- Data from construction of the focused RI and supplemental RI monitoring wells
- Data from the supplemental RI borings and test pits
- Data from the 2008 RI sediment investigation.

The Site geology is discussed from the deepest (oldest) unit to the shallowest unit and is shown on east-west and north-south trending cross sections. The alignments of the cross sections are shown in plan view on Figure 4-7. Figures 4-8 and 4-9 present a north-south trending cross section (A-A’) and an east-west trending cross section (B-B’) of the Site, respectively. Bedrock underlies the entire Site at varying depths and consists of sandstone and carbonaceous shale of the Chuckanut Formation. The Chuckanut Formation is exposed on the hillside located immediately southeast of the Site and is present at depths beneath the Site that increase toward Bellingham Bay, as shown on Figure 4-8.

Overlying the Chuckanut Formation beneath the Site and Bellingham Bay is glacial marine drift. These sediments were deposited as rising sea levels floated and melted Pleistocene glacial ice (Stasney 1997). Boring log data from Purnell & Associates (1985) and Dames & Moore (1960; Appendix B) indicate that this unit generally consists of gray, silty clay with occasional gravel and marine shells. The top of the glacial marine drift ranges from 20 ft below ground surface (BGS) near the eastern edge of the landfill refuse to about 40 ft BGS near the existing shoreline. The thickness of the glacial marine drift varies from greater than 30 ft thick near the existing shoreline until it tapers out near the eastern extent of the refuse.

Fine-grained sediments deposited in Bellingham Bay by the Nooksack River (Stasney 1997) typically overlie the glacial marine drift. Boring logs indicate that this unit generally consists of green-gray silt, or green-gray silty clay and sandy silt. The silt deposited by the Nooksack River ranges in thickness from about 8 ft near the existing shoreline to near depletion at the eastern edge of the refuse. The top of the Nooksack deposits are encountered at a depth of about 20 ft BGS near the eastern edge of the refuse and at a depth of about 30 ft BGS near the existing shoreline. The Nooksack deposits generally increase in thickness toward Bellingham Bay and become absent toward the northern and eastern portions of the Site. The Nooksack deposits represent the uppermost native deposits underlying the Site and Bellingham Bay.

Sawdust and wood debris overlie the Nooksack deposits and the older units within the southwestern portion of the Site, and generally bounds the eastern edge of the refuse. Wood waste was encountered as shallow as 2 to 3 ft BGS east of the refuse and about 15 ft BGS within the southwestern portion of the Site.

Landfill refuse overlies the wood waste within the southwestern portion of the Site and the Nooksack deposits or Chuckanut Formation within the northeastern portion of the Site. The refuse thickness generally increases toward Bellingham Bay, ranging in thickness from 0 to 40 ft at the eastern Site boundary to the existing shoreline. The top of the refuse was typically encountered between 2 and 5 ft BGS.

Overlying the refuse is the landfill cover soil and traffic surfaces. The cover soil consists primarily of granular material (sand and gravel), wood debris, and occasional areas of cobble ballast.

4.3 HYDROGEOLOGY

Hydrogeologic conditions at the Site were evaluated using geologic data from previous investigations, data collected during the RI, and available literature regarding hydrogeologic characteristics of geologic units present at the Site. Soil boring logs and test pit information, along with groundwater analytical data obtained during the focused and supplemental RIs, indicate three principal hydrostratigraphic units can be identified beneath the Site. The three units are described below from shallow to deep.

- The uppermost unit consists of the landfill refuse, sawdust, and wood debris, and other fill materials placed at and near the Site. Groundwater is first encountered in this unit.
- The second unit consists of fine-grained silts and clays of both the Glacial Marine Drift and Nooksack deposits, which form the uppermost aquitard throughout most of the Site.
- The third unit is the sandstone of the Chuckanut Formation. This unit could act as an aquifer within portions of the formation that exhibit limited fracturing. The potential for salt water intrusion from Bellingham Bay likely prohibits the shallow portions of the Chuckanut Formation from being a practicable source of potable water. The hydrogeologic properties of the Chuckanut Formation are discussed further below.

Because of its potential to function as either an aquifer or an aquitard, a literature review was conducted on the hydrogeologic properties of the Chuckanut Formation to assess the potential that it is functioning as an aquifer and contributing recharge to the Site shallow groundwater flow system. Although the literature review did not identify any publications or other information that evaluated the hydrogeologic properties of the Chuckanut Formation in the immediate vicinity of the Site, a limited number of references were identified that either provided general information on the hydrogeologic properties of the Chuckanut Formation, or more detailed information for areas located at distance from the Site.

The references reviewed were generally consistent in their characterization of the hydrogeologic properties of the Chuckanut Formation. A U.S. Geologic Survey (USGS) evaluation of the hydrogeologic conditions in Whatcom County characterized the Chuckanut Formation as a semi-confining unit that is not highly productive, but capable of yielding useable quantities of water locally (USGS 1999). A Western Washington University geology masters thesis that evaluated the hydrogeology of northern Lummi Island collected and evaluated an extensive amount of data on domestic wells completed in the Chuckanut Formation (Sullivan 2005). The Chuckanut Formation was characterized as highly fractured and the primary source of groundwater for northern Lummi Island.

The Lummi Island study also estimated the mean horizontal hydraulic conductivity of the Chuckanut Formation to be 1.1 x 10^{-4} centimeters per second (cm/s), which is in the same range as sandy silt. A 2005 groundwater study conducted in the Lake Whatcom area (Ecology 2005) concluded that the small number of water supply wells that have been successfully developed in the bedrock (including the Chuckanut Formation) supported the conclusion in an earlier evaluation (Newcomb et al. 1949) that bedrock formations in the Lake Whatcom area have a limited capacity for groundwater movement and supply. The 2005 Ecology report went on to say that a significant percentage of the boring logs reviewed from wells completed in bedrock indicate abandonment of the borehole after drilling due to a lack of adequate yield.

All of these references are consistent in identifying that the Chuckanut Formation is capable of producing usable amounts of water for domestic purposes, but generally exhibits a low bulk permeability. Based on the observations of surface water flow and ponding along the base of the exposed Chuckanut Formation bluff discussed in Section 4.1.2.1 (General Site Drainage), it appears that the Chuckanut Formation exhibits localized areas of discharge near the base of the bluff. These observations are consistent with the literature and indicate that the Chuckanut Formation likely functions as a semi-confining unit with localized areas of discharge, rather than as an aquitard.

Figure 4-10 is an elevation contour map of the surface underlying the refuse/wood debris fill, which forms the uppermost hydrostratigraphic unit. The surface underlying the refuse/wood debris unit is considered an aquitard where the Nooksack or Glacial Marine Drift deposits are present in the western portion of the Site and a semi-confining unit where the Chuckanut Formation is the underlying geologic unit in the eastern portion of the Site. As discussed above, the Chuckanut Formation likely conveys some groundwater via fracture flow, but its bulk hydraulic conductivity is significantly lower than that of the refuse/wood debris fill, and as such, it functions as a semi-confining unit.

As Figure 4-10 illustrates, the surface underlying the refuse/wood debris unit dips steeply downward from the northeastern corner of the Site, flattens out near the north-central portion of the Site, and then dips steeply downward in the southwestern portion of the Site (and presumably in the northwestern portion of the Site, although data regarding the depth of refuse in this area is not available). The contact surface appears to influence the groundwater flow direction in the northeastern corner of the Site, as discussed in the following section. The uppermost hydrostratigraphic unit is of primary interest for evaluating groundwater conditions at the Site and will be addressed in the remainder of this section.

4.3.1.1 Saturated Thickness, Flow Direction, and Tidal Influence

The depth to groundwater observed at the Site varied between 4 to 16 ft BGS during the supplemental RI activities and is shallower during the wet season. The saturated thickness of the uppermost hydrostratigraphic unit ranges from about 2 ft at the eastern edge of the Site to almost 30 ft at some locations along the shoreline in the southern portion of the Site. The saturated thickness of the uppermost hydrostratigraphic unit is generally thinner in the northern portion of the Site and thicker in the southern portion of the Site, as shown on Figure 4-10.

Groundwater elevations measured from 10 monitoring wells on August 21, 2002; 19 wells on August 14, 2012; and 23 wells on September 26, 2012 are provided in Table 4-1. The 2012 groundwater elevations are considered more accurate than the 2002 data because a recent elevations survey documented up to 1.2 ft of change in well reference elevations due to settlement for wells that were installed prior to the 2012 supplemental RI activities, as documented in Table 4-1. Because the wells installed in 2002 (MW-6 through MW-10) were surveyed using one of the wells installed in 1998 for the reference elevation, the water elevations calculated for the 2002 water level gauging are likely only approximate due to changes in the elevation of monitoring wells MW-1 through MW-5 between 1998 and 2002. A groundwater contour map based on the elevation data from the September 2012 monitoring round is shown on Figure 4-11. From the August 2012 elevation data, the direction of groundwater flow in the uppermost hydrostratigraphic unit was determined to be generally to the west. In the northern portion of the Site, adjacent to the R.G. Haley site, groundwater flow is toward the southwest with a relatively steep hydraulic gradient (0.006 ft/ft) compared to the gradient in the southern portion of the Site (0.003 ft/ft). The higher hydraulic gradients in the northern portion of the Site correlate to an average saturated thickness of about 8 ft, while the flatter hydraulic gradient in the southern portion of the Site correlates to an average saturated thickness of about 23 ft. Thus, the variation in hydraulic gradient for these two areas is partially related to the variation in saturated thickness rather than variations in recharge and/or hydraulic conductivity.

It should be noted that these hydraulic gradients and saturated thicknesses are based on dry season recharge conditions, which result in flatter gradients and lower saturated thicknesses than would be anticipated during the wet season. Based on precipitation data from the Western Regional Climate Center (Desert Research Institute 2012), the average monthly recharge for Bellingham in the wet season (October through March) is 4.06 inches compared to an average monthly precipitation of 1.83 inches in the dry season (April through September). Thus, wet season precipitation is about 2.2 times greater than dry season precipitation, and a similar increase in a combination of hydraulic gradient and saturated thickness would be anticipated for wet season measurements because precipitation is the primary source of recharge to shallow Site groundwater [as discussed in Section 4.3.1.4 (Groundwater Recharge and Water Balance)].

The tidal influence on groundwater was evaluated during the 1998 focused RI using elevation data obtained from wells MW-1, MW-2, and MW-3, as summarized in Table 4-2, and from MW-11 through MW-16 shallow and deep wells in the 2012 supplemental RI as summarized in Table 4-3. Water elevations for MW-1, MW-2, and Bellingham Bay collected between March 15 and 20, 1999 are presented on Figure 4-12. Water elevations for MW-2, MW-3, and Bellingham Bay collected between June 26 and July 13, 1998 are shown on Figure 4-13. The groundwater elevation in MW-2 fluctuated as much as 0.3 ft and corresponded with tidal fluctuations, while minor fluctuations in the groundwater elevation were observed at MW-3. Tidal influences were not observed for the groundwater elevations in MW-1, as shown on Figure 4-12. Groundwater levels in wells MW-11 through MW-16 fluctuated by up to 0.17 ft between high and low tides on July 30, 2012, although the fluctuations were generally less than 0.1 ft, as presented in Table 4-3 and shown on Figure 4-14.

4.3.1.2 Hydraulic Conductivity

Hydraulic conductivity of the uppermost hydrostratigraphic unit was estimated from the data collected in 1998 using a technique for estimating transmissivity in tidally-influenced aquifers. Transmissivity using this technique is computed from the following equation (Ferris 1951):

$$T = (x^2\ S\ t_0)/(4\pi\ t_1^2)$$

where:

T = transmissivity (L^2/t)

S = storativity (dimensionless)

x = distance from well to subaqueous outcrop (L)

t_0 = time between tidal maxima or minima in Bellingham Bay (t)

t_1 = time lag between the occurrence of the maxima or minima in Bellingham Bay and in the monitoring well (t).

This evaluation utilized the electronic data collected during the focused RI for MW-2 and Bellingham Bay, as presented on Figure 4-13 and in Table 4-2. It should be noted that the elevations presented in Table 4-2 are incorrect because an incorrect reference elevation was used to convert groundwater gauging data to elevations. However, the analysis is based on time lag and change in elevation, so an accurate reference elevation is not needed for the analysis.

The time (t_0) between tidal maximum and minimum in Bellingham Bay was computed using water elevation data from June 26 to July 12, 1998, as presented in Table 4-2. The time lag (t_1), or difference between the maxima or minima of a cyclical tidal fluctuation, was also computed for this same time period and is listed in Table 4-2. The time lag determined by the tidal minima was used for estimating t_1 because it was more consistent than the lag time for the tidal maxima. The distance from MW-2 to the mean tidal level of Bellingham Bay adjacent to the Site was estimated at 75 ft. Aquifer storativity/specific yield was assumed to be 0.05. Borehole logs and depth to groundwater measurements for MW-2 provided an estimate of 20 ft for the aquifer saturated thickness (B) in the MW-2 vicinity.

Based on the 1998 focused RI data and assumptions described above, the transmissivity is estimated to be about 510 square feet (ft^2)/day. This yielded a value for the hydraulic conductivity (K) of 25 ft per day (ft/day) (9×10^{-3} cm/s) using the relationship K = T/B.

Based on generally accepted hydrogeologic references (Driscoll 1986; Freeze and Cherry 1979), a hydraulic conductivity of 9×10^{-3} cm/s is typical of clean, medium sand. A review of over 40 Site boring logs indicate that the refuse unit is predominantly composed of refuse in a silty sand matrix and wood waste is primarily composed of sawdust. Although some zones of courser soil and larger dimension wood waste are present, these courser zones appear to be limited in extent. Based on textural composition of the refuse and wood waste materials, the estimated hydraulic conductivity appears to be on the upper end of what would be expected for functionally silty sand.

4.3.1.3 Groundwater Flow

The groundwater average linear velocity (v) is estimated from the equation:

$$v = Ki/n$$

where:

K = hydraulic conductivity (L/t)
i = hydraulic gradient (dimensionless)
n = effective porosity (dimensionless).

The Site was divided into northern and southern flow regimes for estimating groundwater flow because of the significant difference in hydraulic gradient and saturated thickness in the northern and southern portions of the Site. The hydraulic gradient for the Site was estimated from the groundwater elevation difference between the 7.5 ft and 8.5 ft contours in the northern flow regime and between the 6.5 ft and 7.5 ft contours in the southern flow regime, as shown on Figure 4-15. The distance between the subject elevation contours is about 180 ft in the northern flow regime and about 320 ft in the southern flow regime. This indicates a hydraulic gradient across the northern flow regime of about 0.006 and about 0.003 in the southern flow regime, as shown on Figure 4-15.

As previously discussed, these gradients are based on dry season water elevation data. If the saturated thickness is assumed to remain unchanged, the wet season gradients would be about 2.2 times the dry season gradients, or between 0.013 in the northern flow regime and about 0.0066 in the southern flow regime. Because saturated thickness increases during the wet season, these represent upper bound estimates of the wet season hydraulic gradient.

Assuming an effective porosity of 0.25 yields an estimate for the average linear velocity of about 0.6 ft/day in the northern flow regime and 0.3 ft/day in the southern flow regime during the dry season. During the wet season, the upper bound estimate of average linear velocity is about 1.3 ft/day and 0.7 ft/day for the northern and southern flow regimes, respectively.

Groundwater flow can be estimated from Darcy’s Law:

$Q = KiA$

where:

$Q =$ groundwater flow (L^3/t)
$K =$ hydraulic conductivity (L/t)
$A =$ cross-sectional area perpendicular to flow (L^2)
$i =$ hydraulic gradient (dimensionless).

Based on the saturated thicknesses estimated on Figure 4-10, the average saturated thicknesses for the areas over which the hydraulic gradients were estimated are 8 ft and 23 ft for the northern and southern flow regimes, respectively. Based on a cross-sectional width of 450 ft for the northern flow regime and 650 ft for the southern flow regime, the cross-sectional areas are estimated to be 3,600 ft^2 and 15,000 ft^2, respectively, as illustrated on Figure 4-15. Based on the estimated hydraulic conductivity of 25 ft/day, the groundwater flow for the northern and southern flow regimes are estimated to be 540 cubic feet per day (ft^3/day; 2.8 gpm) and 1,125 ft^3/day (5.8 gpm), for a total estimated dry season flow rate of 1,660 ft^3/day (8.6 gpm).

As previously discussed, precipitation during the wet season is about 2.2 times greater than during the dry season, and a similar relationship between wet season and dry season groundwater flow likely exists because precipitation appears to be the primary source of recharge to Site groundwater [see Section 4.3.1.4 (Groundwater Recharge and Water Balance)]. As a result, groundwater flow during the wet season is estimated to be about 19 gpm, and the average groundwater flow rate is estimated to be about 14 gpm based on the average of wet season and dry season flow. The estimated average groundwater flow rate of 14 gpm is used in the next section for the water balance evaluation.

The above estimate of groundwater flow does not account for groundwater recharge from precipitation that occurs downgradient from the portion of the upland area used to estimate hydraulic gradients and cross sectional areas (i.e., downgradient of the 7.5 ft groundwater elevation contour for the northern flow regime). The contributory recharge areas for the northern and southern flow regime groundwater flow estimates are shaded on Figure 4-15, and the un-shaded upland area on Figure 4-15 is the portion of the Site for which precipitation recharge is not accounted for in the groundwater flow estimate. Total groundwater flow at the point of discharge to surface water is estimated in the following section based on the estimated groundwater recharge for the entire upland area that contributes to Site groundwater flow.

4.3.1.4 Groundwater Recharge and Water Balance

Groundwater recharge appears to be predominantly from the infiltration of precipitation, although a portion of the recharge may be coming from fracture zones in the Chuckanut Formation, as discussed earlier in this section. A water balance is conducted in this section to evaluate the relative contribution of potential sources of recharge to Site groundwater.

Recharge from precipitation is estimated by calculating the amount of precipitation over the drainage basin for the Site. The estimated Site drainage basin is shown on Figure 4-16, and encompasses the upland portion of the Site and the area upgradient of the Site to Boulevard Street to the east. This area is estimated to be 16.4 acres, and is designated Area A_1 on Figure 4-16. However, as shown on Figure 4-15, the area over which groundwater flow was estimated does not include a portion of the upland area near the shoreline. So, for water balance estimating purposes, the smaller area that is consistent with the area used to estimate groundwater flow (12.4 acres) was used for the water balance evaluation, and is designated Area A_2 on Figure 4-16.

Based on MTCA Equation 747-5, the estimated groundwater recharge resulting from infiltration within the area relevant to the water balance estimate is 15.7 gpm, based on the following:

- Upland Area A_2: 12.4 acres (540,000 ft^2)
- Annual Precipitation: 35 inches/year
- Precipitation Infiltration: 70 percent
- Groundwater Recharge from Infiltration = (540,000 ft^2)(35 inches/year)(0.70)(1 ft/12 inches)(7.48 gallons/ft^3)(1 year/365 days)(1 day/1,440 minutes) = 15.7 gpm.

Based on the average groundwater discharge rate of 14 gpm estimated in Section 4.3.1.3 (Groundwater Flow), recharge from precipitation is slightly greater than the estimated groundwater discharge, although the difference of about 10 percent is not significant considering the approximate nature of many of the input parameters that go into estimating both groundwater recharge from precipitation and groundwater discharge. Based on the water balance, precipitation is the dominant source, if not the sole source, of Site groundwater recharge. However, some of the precipitation that falls in the portion of the Site drainage basin upgradient from the Site may infiltrate into the Chuckanut Formation and then discharge via springs and seeps near the base of the bluff on the east side of the BNSF railroad tracks, as were observed during reconnaissance of the bluff area.

The total Site recharge to groundwater from precipitation that ultimately discharges to Bellingham Bay is estimated to be 21 gpm based on the entire Site drainage basin area (Area A_1 = 16.5

acres) and MTCA Equation 747-5. As previously discussed, this represents the average recharge and would be significantly lower in the dry season and higher in the wet season. Based on the estimated relationship that wet season recharge is 2.2 times the dry season recharge, the wet season recharge for the entire Site is estimated to be about 29 gpm and the dry season recharge is estimated to be about 11 gpm.

The amount of groundwater recharge that originates upgradient of the Site from the area between the eastern edge of the Site to Boulevard Street to the east is estimated to be about 5.8 gpm based on Equation 747-5 and an estimate of 4.6 acres for this area, designated Area A_3 on Figure 4-16. Thus, about 28 percent of Site groundwater recharge is estimated to originate upgradient of the Site.

4.3.1.5 Groundwater Use

Ecology has determined that groundwater at the Site is classified as nonpotable in accordance with WAC 173-340-720(2) as discussed further in Section 5.0 (Development of Site Screening Levels). Drinking water supply wells are not present at the Site or in the Site vicinity. Drinking water to the Site is currently supplied by the City of Bellingham.

4.4 NATURAL RESOURCES

This section summarizes information on natural resources in the Cornwall Avenue Landfill Site area, including fish and wildlife, existing habitats, and plant and animal species.

4.4.1 TYPES AND FUNCTIONS OF HABITATS

Information provided in this section about the types of habitats found in the Bellingham Bay area was obtained from the Whatcom Waterway RI/FS (RETEC 2006) and the Waterfront District EIS. Additional detail is available in the complete RI/FS and EIS reports.

Most of the habitats in Bellingham Bay are used by a variety of marine and terrestrial species for feeding, reproduction, rearing, and refuge, as well as providing habitat or passage for various fish species (both bottom fish and pelagic species such as salmon). The different elevations of habitat are discussed below in three groups: intertidal, shallow subtidal, and deep subtidal. Although separated by only a few feet, these three strata have distinct soil textures and support varying plant and animal communities. Each stratum has two types of substrata: sand/mud/cobble and gravel/rocky shore. The habitat typically found in these strata is summarized here to preface more detailed descriptions of fish and wildlife habitat in Bellingham Bay.

4.4.1.1 Intertidal Habitat

As described in Section 4.1.3 (Shoreline Features and Erosion), substantial amounts of riprap (predominantly concrete slabs and other concrete debris with occasional logs) are present along most of the shoreline at the steep portion of the shore face near the top of the bank. Below the steep portion of the shore face (below about 9 ft MLLW), riprap coverage is typically less dense and is absent in some areas. Soil (gravel, sand, and silt), with occasional concrete cobbles and landfill debris is predominant in the lower intertidal areas of the landfill shore face. The habitat typically found in these strata includes native eelgrass and benthic organisms, although an eelgrass survey for Bellingham Bay conducted in 1999 did not identify eelgrass in the intertidal zone at the Site (Marine Resources Consultants 1999). Also, except for rock crabs present beneath riprap or other large surface material, shellfish or other benthic organisms were not observed in the intertidal zone during previous investigations.

4.4.1.2 Shallow Subtidal Habitat

Native eelgrass is typically more common within the shallow subtidal zone (-4 to -10 ft MLLW). This is true for the shallow subtidal zone at the Site, where intertidal and subtidal surveys conducted in 1996, 2002, and 2008 have identified areas of eelgrass at the southwestern and northwestern ends of the Site. The locations where eelgrass was identified during these surveys are as shown on Figure 4-17. An eelgrass survey of Bellingham Bay conducted in 1999 identified a 0.28-acre patch of eelgrass near the southwestern corner of the Site. A 2008 eelgrass survey conducted by Grette Associates for a City project in the vicinity of the Site indicates that the eelgrass present at the southwestern end of the Site is the northern extreme of a continuous eelgrass bed that extends over 2400 ft to the south along the shoreline. The results of the 2008 Grette Associates eelgrass survey indicate that the eelgrass bed observed in 1999 significantly expanded during the 9-year interim period.

Mudflats within the shallow subtidal zone of Bellingham Bay typically support epibenthic prey that is consumed by juvenile salmon migrating through the area. The substrate within this elevation can also provide suitable habitat for Dungeness crab mating and egg brooding (RETEC 2006).

4.4.1.3 Deep Subtidal Habitat

In deep subtidal habitat with a sand or mud bottom, native eelgrass can still be relatively common at elevations between -10 and -20 ft MLLW; however, below -20 ft MLLW, light is limited and eelgrass and macroalgae are less prevalent (RETEC 2006). A limited amount of eelgrass was observed at depths greater than elevation -10 ft MLLW at the northwestern end of the Site, as indicated on Figure 4-17. The eelgrass bed at the southwestern end of the Site does not extend to depths below elevation -10 ft MLLW.

Some varieties of hard-shell clams are less abundant with increased depth, while the geoduck clam tends to be more abundant in deeper water. The substrate within this elevation can provide suitable habitat for Dungeness crab mating and egg brooding. The substrate and water column are also used for feeding by a variety of fish, including sub-adult and adult juvenile salmon. Most portions of the Site consist of subtidal habitat with sand or mud bottom.

4.4.1.4 Upland Habitat

The upland habitat of the Site is sparse. The Site consists of a soil cover over the former landfill area and traffic surfaces. The cover soil consists primarily of granular material (sand and gravel), wood debris, and occasional areas of cobble ballast. The stormwater detention basin is located in the southeastern corner of the Site. Intermittent vegetation is present near the shoreline, but the interior of the site is largely devoid of vegetation, aside from sparse grass groundcover established following the demolition of the GP warehouse. Although the Site may not provide quality habitat for significant plant or animal species, a steep and forested hillside is located east of the Site and east of the BNSF railroad tracks, which could potentially provide limited habitat for the plant and animal species discussed below. This hillside is located between the BNSF railway mainline and adjacent residential development to the east.

4.4.2 PLANT AND ANIMAL SPECIES

As documented in the Whatcom Waterway Site RI/FS and the Waterfront District EIS, the Bellingham Bay area is utilized by a wide range of plant and animal species. The significant plant and animal species are summarized below.

4.4.2.1 Plants

Vegetation at the Site consists of weedy herbaceous species such as red clover (*Trifolium pratense*), curly dock (*Rumex crispus*), yarrow (*Achillea millefolium*), Canada thistle (*Cirsium arvense* – Class C noxious weed), common tansy, and various grasses. A row of Himalayan blackberry with some interspersed native shrubs and small trees is present along the shoreline. The hillside east of the Site contains a 150-ft-wide band of native deciduous and evergreen trees and shrubs bordered by Boulevard Street on the east. The hillside rises beyond Boulevard Street into an established residential neighborhood with mature landscaping.

4.4.2.2 Fisheries and Invertebrate Resources

As reported in the Whatcom Waterway RI/FS, documented fisheries resources for Bellingham Bay include the following:

- **Surf Smelt and Sand Lance:** Surf smelt and Pacific sand lance are common fish that spawn in the high intertidal portions of coarse sand and gravel beaches. Surveys by the Washington Department of Fish & Wildlife have documented spawning beaches in Bellingham Bay.
- **Pacific Herring:** Pacific herring spawn in inland marine waters of Puget Sound between January and June in specific locations. There is typically a 2-month peak within the overall spawning season. Herring, which deposit their eggs on marine vegetation such as eelgrass and algae in the shallow subtidal and intertidal zones between 1 ft above and 5 ft below MLLW, are known to congregate in the deeper water of Bellingham Bay. However, only relatively low-density spawning deposition occurs in Bellingham Bay.
- **Salmonids:** Bellingham Bay is used extensively by anadromous salmon species. Each of the streams flowing into Bellingham Bay is used by one or more of the following species: coho, chum, Chinook, pink, sockeye, steelhead, cutthroat, and bull trout. The Nooksack River has the largest salmon runs in Bellingham Bay, followed by Squalicum and Whatcom creeks. Concentrations of chum, coho, and Chinook salmon along the shoreline and in offshore waters in Bellingham Bay peak annually about mid-May. Juvenile coho and Chinook salmon appear to have different migration habits. Coho remain in the bay for approximately 30 to 35 days, while Chinooks remain about 20 days. More recent studies on the distribution of Chinook salmon (Ballinger and Vanderhorst 1995) indicate relatively high numbers of juvenile Chinook salmon and average numbers of coho salmon use the area in the vicinity of the Whatcom Waterway.
- **Groundfish:** Several species of groundfish occur in both shallow and deep waters in Bellingham Bay for part or all of their life. Detailed information on groundfish species and their timing and use of Bellingham Bay is not available. Key characteristics of groundfish occurring in northern Puget Sound are generally applicable to Bellingham Bay.

Bellingham Bay supports a variety of marine invertebrates, ranging from infauna (worms, clams, and small ghost shrimp that penetrate benthic sediments) to epibenthic plankters (organisms such as very small crustaceans that move off the substrate surface) to larger invertebrates such as oysters, crabs, and shrimp.

- **Clams, Geoduck, and Oysters:** The predominant bivalves in Bellingham Bay are intertidal and subtidal hard-shell clams. Intertidal shell clam types include butter, littleneck, horse, and soft-shell clams and cockles. Subtidal clam resources consist of butter, littleneck, and horse clams. Native oyster and Pacific geoduck are also known to occur in Bellingham Bay. Shellfish densities are relatively low along the eastern shore of Bellingham Bay. Geoduck is only present in a handful of locations in the Bay.
- **Shrimp:** Seven species of pandalid shrimp, including, pink, coonstripe, dock, and spot shrimp, occur in nearshore and deeper waters of Bellingham Bay. Coonstripe shrimp have been observed in intertidal areas immediately offshore of the Site, and this species is common around piers and floats.
- **Crab:** Crab trawls conducted for the Puget Sound Dredge Disposal Analysis (PSDDA) investigations indicate that the predominate crab resources in Bellingham Bay are the non-edible purple or graceful crab, the edible red rock crab, and the edible Dungeness crab.

The highest densities of rock crab occur in relatively shallow water (30 to 45 ft below MLLW) in areas extending from the Lummi Peninsula to inner Bellingham Bay. Rock and Dungeness crab are likely to occur in shallower waters of Bellingham Bay not sampled as part of the PSDDA investigations. Dungeness crab is generally abundant in most areas of Bellingham Bay. The northern and eastern shorelines of Bellingham Bay serve as nursery/rearing areas for juvenile Dungeness crab. A shell substrate is a preferred habitat for the first 8 to 10 weeks after larvae settle. However, other substrates, such as small cobbles and gravel, algae, and eelgrass, are also recognized as important rearing habitat for juvenile crab.

4.4.2.3 Sea Birds and Marine Mammals

The greater Bellingham Bay area and its shallow estuarine habitats support a number of birds in all seasons. Although Bellingham Bay is not used extensively by large populations of waterfowl, wintering populations tend to be 10 to 15 times larger than summer populations for migratory species. Bellingham Bay is located on the flight path between the Fraser River estuary and Skagit Bay, and is used as a stopover for seabirds and waterfowl migrating between these two areas. Waterfowl sited in Bellingham Bay include brant, snow geese, mallard, widgeon, green-winged teal, and pintail. Bellingham Bay is also used as an over-wintering area for diving birds such as scoter and golden eye. A variety of both natural and man-made habitats provide protection from winter storms to migrant and wintering birds. Glaucous-winged gulls use inner Bellingham Bay for resting and foraging. Pigeon guillemonts use the shoreline area in and around the Whatcom Waterway for nesting and foraging.

Limited information is available on the presence and residence time of marine mammals in Bellingham Bay. Bay-wide, several species have been reported: the harbor seal, sea lions, Orca whale, gray whale, and harbor porpoise. As described below, the local population of Orca whale is being listed as endangered under the Endangered Species Act (ESA). The other marine mammals are not threatened or endangered species under ESA, but they are protected from hunting under the Marine Mammal Protection Act. Seals and sea lions have been noted using the Site shoreline for resting areas. Migrating gray whales have been noted to enter Bellingham Bay and to feed in subtidal areas of Puget Sound. Orca whales are occasionally observed in and near Bellingham Bay, though they are more typically observed in Rosario Strait and near the San Juan Islands.

4.4.2.4 Threatened, Endangered, Sensitive, and Candidate Species

Under the ESA, a species likely to become extinct is categorized as “endangered.” A species likely to become endangered within the foreseeable future is categorized as “threatened.” This section provides information on the occurrence of threatened and endangered bird, fish, and marine mammal species in Bellingham Bay.

- **Bald Eagle:** The majority of bald eagle nest sites occur in the northern or eastern portion of Bellingham Bay, primarily in the Nooksack River delta along the shoreline and in inland areas of the Lummi Peninsula. There are also some nests along the shoreline of Portage Island and Chuckanut Bay. Nest trees in the Pacific Northwest are typically tall conifers located in forested or semi-forested areas within about 1 mile of large bodies of water with adequate food supplies. Marine and freshwater fish are eagles' preferred prey; birds contribute a smaller proportion of the eagle diet. Prey may also include small mammals. Nesting eagles generally forage within 10 square miles of their nest site. Thus, while the Site does not appear to provide eagle habitat, it may serve as a food source. The bald eagle was proposed for delisting as of July 6, 1999 due to apparent recovery of the species in the U.S. (Federal Register 50 CFR Part 17). The bald eagle was delisted on June 28, 2007, effective August 9, 2007. The bald eagle is included in this RI/FS due to the delisting occurring during the RI process. The bird is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The United States Fish and Wildlife Service (USFWS) also works with state wildlife agencies to monitor the status of the species as required by the ESA.

- **Peregrine Falcon:** Peregrine falcons are also found in the vicinity of Bellingham Bay. They feed almost exclusively on birds captured in flight, particularly waterfowl, shorebirds, and game birds. Peregrine falcons typically nest on cliff ledges greater than 150 ft in height that are close to the water. The Site has no Peregrine falcon nests.

- **Marbled Murrelet:** Open water concentrations of marbled murrelets have been recorded in the central portion of Bellingham Bay. Murrelets forage in the marine environment typically up to 2 miles near a coastline. The species forages year round in waters generally less than 90 ft deep, sometimes congregating in well-defined areas where food is abundant. These birds generally do not utilize shallower waters less than 30 ft deep. Marbled murrelets reportedly feed on a wide variety of prey, including sand lance, Pacific herring, and other marine taxa such as crustaceans. Murrelets require old growth or mature forest composed of conifers, including Douglas fir, western red cedar, Sitka spruce, and western hemlock. There are no known nest sites along the shoreline of Bellingham Bay, and no clear association between these birds and the Site.

- **Salmon:** On March 16, 1999, NOAA Fisheries added nine West Coast salmon to the Endangered Species List. Of the nine listed species, one occurs within the vicinity of the Site; Puget Sound Chinook salmon was listed as a threatened species. Two races of Chinook salmon (spring and fall) are found in Bellingham Bay. The timing of adult migration to freshwater differs between these two races, but the timing of the return of adult fish, spawning, and emigration of juveniles overlap. Fall Chinook is the most common run of Chinook salmon observed in Puget Sound. Juvenile fall Chinook generally emigrate to the estuary between February and August as sub-yearlings (within the first year after being spawned) or as yearlings. Individual fish may only use Bellingham Bay for a period of days to a few weeks before heading into the greater Puget Sound estuary. They may use the estuaries and intertidal areas between April and November for further rearing and growth. As juvenile fish move into neritic habitats, they preferentially consume emergent insects and epibenthic crustaceans in salt marsh habitat or decapod larvae, larvae, and other prey.

- **Bull Trout:** Bull trout, listed as a threatened species under the ESA by the USFWS, are a member of the North American salmon family. Bull trout occur in the Nooksack River, and presumably spend some time in Bellingham Bay. Many are resident to a single stream; others migrate on a fluvial (i.e., spawn in headwaters streams and live downstream in larger rivers) or adfluvial basis (spawn in streams but live in lakes). Bull trout tend to prefer cold, clear waters (no more than 64°F).

- **Orca Whales:** On November 15, 2005, NOAA Fisheries announced its decision to list the North Pacific Southern Resident Orca whale (*Orcinus orca*) population as endangered under the ESA. The listing was effective on February 6, 2006 (50CFR 223/224). The listing is specific to the three resident whale pods (J, K, and L pod) with spring through fall ranges in Puget Sound and the Straits of Georgia and Juan de Fuca. This population was previously (December 16, 2004) proposed for listing as threatened. NOAA Fisheries has announced that they are preparing language for proposed Orca whale critical habitat for this population. A number of factors have been identified by NOAA Fisheries as having resulted in the listing of these Orca whales as endangered. Sound and disturbance from vessel traffic, toxic chemicals which accumulate in top predators, and uncertain prey availability (primarily salmon) all have been identified as concerns for the continued survival of this population. The small number of whales in this group, and relatively slow rate of population recovery since a 20 percent population decline during the 1990s, also puts this historically small group at risk of extinction during a catastrophic event such as an oil spill or disease outbreak.

4.4.2.5 Other Terrestrial Animals

Other terrestrial animals likely present at and near the Site are those typically found in urban settings, such as robins, pigeons, woodpeckers, raccoons, squirrels, possums, rats, mice, and moles. These terrestrial animals are not believed to be present at the Site itself in significant numbers, because of the low quality of habitat, but are likely common in the adjoining forested hillside and in the residential area with mature landscaping.

4.5 HISTORIC AND CULTURAL RESOURCES

Historic and cultural resources for this Site were evaluated by the Port as part of the Waterfront District redevelopment project and are presented in the Waterfront District EIS. No archaeological cultural resources have been identified in the area of the Site. Although no known archaeologically significant cultural resources were identified, the Site is located in a potentially archaeologically-sensitive landscape that once included tideflats or beach areas. The bluff area east of the Site and the area below the bluffs were noted as having the potential to retain archaeological resources. However, usage of the Site for the disposal of wood waste and refuse, then as an industrial area with warehouse buildings has likely resulted in the removal, destruction, or burial of any cultural resources that may have been present near the historical shoreline near the railroad alignment. Additionally, the area immediately below the bluff is occupied by the BNSF railway mainline, the construction of which likely displaced or buried cultural resources that may have been present near the original shoreline for Bellingham Bay. More recent historical uses of the Site are discussed in the initial characterization report (Tetra Tech and Historical Research Associates 1995), provided in Appendix A of this report.

4.6 LAND AND NAVIGATION USE

Land use planning activities for the Site and surrounding areas are currently underway as part of the Waterfront District master planning, as described in Draft Sub-Area Plan (Port of Bellingham website 2012). The Waterfront District planning efforts are being performed by the Port and the City, and anticipate an area-wide rezoning from industrial to a mix of light industrial and mixed-use. Environmental review has been performed under SEPA by the Port's SEPA-responsible official and is documented in the Waterfront District EIS.

The Waterfront District extends from the southern end of the Site to the northern end of the I&J Waterway, as shown on Figure 4-18. The Site is part of the Cornwall Beach planning area which is currently anticipated to include a significant amount of open park space and habitat. Additional development in the Site vicinity may include residential mixed use and a small amount of goods and services associated with the residences and park. Other property uses could include mixed use development or light industrial or commercial use.

Navigation uses offshore of the Site are largely transitory, with vessels coming into and traveling out of the Whatcom Waterway or to the Bellingham Shipping Terminal and barge docking area located northwest of the R.G. Haley Site. Vessels are generally not anchored offshore of the Site and there are no permanent dock structures or mooring dolphins at the Site. It is not anticipated that docks or other in-water structures will be constructed as part of Site redevelopment, except an over-water walkway from Boulevard Park to the southern end of the Site uplands proposed by the City. The over-water walkway would connect Boulevard Park with a City park constructed on a portion of the Site uplands, which is one of the land use alternatives for the Waterfront District redevelopment. The walkway is currently under design and the proposed alignment is shown on Figure 4-17. Site redevelopment is discussed further in Section 9.3.1 (Integration of Remedial Alternatives with Future Development).

5.0 DEVELOPMENT OF SITE SCREENING LEVELS

This section develops Site screening levels (SLs) for use in evaluating the nature and extent of contamination, which is discussed in Section 6.0 (Nature and Extent of Contamination). Site SLs have been developed for those constituents detected in one or more of the Site media (groundwater, soil, and sediment). The SLs are based on potential contaminant exposure pathways, potential receptors, and applicable regulatory criteria, which are discussed below.

The SLs for media of potential concern that are adequately protective of the potential receptors and exposure pathways identified herein were developed in accordance with MTCA requirements, subject to the limitations of the currently available data, and Site-specific considerations. Preliminary SLs for sediment, groundwater, and soil are presented in Tables 5-1, 5-2, and 5-3, respectively. Note that although surface water is a potentially affected medium, it is addressed through the development of groundwater SLs that are protective of surface water rather than developing surface water SLs directly.

Some of the hazardous substances detected in affected media at the Site are associated with releases from the R.G. Haley site. Diesel- and oil-range petroleum hydrocarbons, and wood treatment-related SVOCs such as PCP and carcinogenic polycyclic aromatic hydrocarbons (cPAHs), appear to be related to releases at the R.G. Haley site. Although SLs are developed herein for these constituents for the purposes of interpreting the RI data, cleanup levels for hazardous substances released from the R.G. Haley site will be developed by Ecology during the cleanup process for that site. As a result, the SLs developed herein for hazardous substances associated with the R.G. Haley site may differ from values developed during the R.G. Haley cleanup process.

Both wood waste and municipal solid waste degrade anaerobically in landfills, creating a reducing groundwater environment that generates ammonia as part of the nitrogen cycle, and mobilizes some metals such as manganese that are naturally present in the surrounding soil. These hazardous substances, and other hazardous substances detected in affected Site media such as heavy metals, PCBs, non-carcinogenic PAHs, and VOCs, are associated with the Cornwall Avenue Landfill Site.

By its nature of use as a municipal waste landfill, Site soil is assumed to be contaminated and RI characterization was focused on other media of potential concern (i.e., groundwater and marine sediment). So, while soil SLs were developed for those hazardous substances detected in the limited number of soil samples collected at the Site, it is understood these do not likely represent the full range of soil contaminants at the Site, and will not be used to define areas requiring cleanup. Areas assumed to exceed cleanup standards and therefore require cleanup include those containing refuse and wood waste, beneficial reuse sediment, and cover soils, as described further in Section 5.5 (Soil Screening Levels).

5.1 POTENTIAL EXPOSURE PATHWAYS

Potential exposure pathways must be identified for both human and environmental impacts. The potential exposure pathways are presented below, along with an indication of whether or not the exposure pathway is potentially complete:

- **Ingestion of groundwater – incomplete pathway.** As discussed in Section 4.3.1.5 (Groundwater Use), Ecology has determined that Site groundwater is not considered a potable water source.
- **Groundwater discharge to surface water – potential pathway.** Discharge of contaminated groundwater to surface water could affect receptors in surface water or sediment.
- **Groundwater discharge through marine sediment – potential pathway**. Discharge of contaminated groundwater through marine sediment prior to discharge to surface water could affect sediment quality, which in turn could affect benthic organisms through uptake of contaminants contained in sediment.
- **Direct human contact with soil – potential pathway.** Potential pathways include exposure to subsurface soil along the shoreline, in areas with limited soil cover, and during construction that involves intrusive activities. Currently, access to the Site is restricted.
- **Direct terrestrial contact with soil – potential pathway**. Terrestrial receptors have the potential to contact subsurface soil during current and future exposure scenarios.
- **Leaching from soil to groundwater – potential pathway.** Soil contaminants can leach to groundwater in unpaved areas where stormwater can infiltrate through shallow contaminated soil or at locations where soil contamination is in direct contact with groundwater.
- **Soil erosion and discharge to marine sediment or surface water – potential pathway**. The upland portion of the Site exhibits ongoing erosion along the shoreline, resulting in the release of refuse and wood waste to Site sediment and surface water. The potential also exists for soils inland from the shoreline to be eroded and transported in storm water runoff to Site sediment and surface water.
- **Soil vapor discharge to indoor and ambient air – potential pathway.** Soil vapor has the potential to migrate and expose indoor and ambient air receptors to VOCs for future use exposure scenarios.
- **Direct human contact with sediment – potential pathway.** The current potential exposure pathway includes contact with surface sediment and the future potential exposure pathway includes contact with dredged sediment during construction.
- **Uptake of contaminants in sediment by benthic organisms – potential pathway.** Potential exposure pathways include uptake of contaminants in sediment by benthic organisms.
- **Higher trophic level organism (seals, birds) consuming aquatic organisms – potential pathway.** Potential exposure pathway consists of higher trophic level organisms consuming benthic, epibenthic, or fish organisms, which can bioaccumulate contaminants present in sediment and/or contaminants present in groundwater discharging from the Site.
- **Human consumption of seafood – potential pathway.** Potential exposure pathways include human ingestion of benthic, epibenthic, or fish organisms, which can bioaccumulate contaminants present in sediment and/or contaminants present in groundwater discharging from the Site.

As mentioned in Section 4.3.1.5 (Groundwater Use), Ecology has determined that the uppermost groundwater in fill at the Site is classified as nonpotable. This determination is in accordance with WAC 173-340-720(2)(d) as follows:

> (2)(a) *The ground water does not serve as a current source of drinking water.* [Drinking water to the Site is currently supplied by the City. Drinking water supply wells do not exist at the Site or in the Site vicinity.]
>
> (2)(c) *The department determines it is unlikely that hazardous substances will be transported from the contaminated ground water to ground water that is a current or potential future source of drinking water, as defined in (a) and (b) of this subsection, at concentration which exceed ground water quality criteria published in chapter 173-200 WAC.* [RI work at the Site indicates that contaminated groundwater occurs primarily in the uppermost water-bearing zone. This zone occurs in manmade fill placed in Bellingham Bay and in the upper part of the underlying native sediments. The uppermost water-bearing zone discharges directly into Bellingham Bay. Contaminated groundwater in the uppermost water-bearing zone will not flow laterally inland toward a current or potential future source of drinking water because any inland aquifer would be hydraulically upgradient. Similarly, contaminated water in the uppermost water-bearing zone will not flow vertically downward into deeper current or potential future source of drinking water, because groundwater flow between aquifers at the shoreline is upward, reflecting increasing hydraulic heads with depth.]
>
> (2)(d) *Even if ground water is classified as a potential future source of drinking water under (b) of this subsection, the department recognizes that there may be sites where there is an extremely low probability that the ground water will be used for that purpose because of the site's proximity to surface water that is not suitable as a domestic water supply. An example of this situation would be shallow ground waters in close proximity to marine waters such as on Harbor Island in Seattle. At such sites, the department may allow ground water to be classified as nonpotable for the purposes of this section if each of the following conditions can be demonstrated. These determinations must be for reasons other than that the groundwater or surface water has been contaminated by a release of a hazardous substance at the site.*
>
> (i) *There are known or projected points of entry of the ground water into the surface water.* [RI work at the Site indicates that groundwater enters Bellingham Bay.]
>
> (ii) *The surface water is not classified as a suitable domestic water supply source under chapter 173-201A WAC.* [Bellingham Bay is a marine surface water body and does not classify as a suitable domestic water supply under Chapter 173-201A WAC.]
>
> (iii) *The ground water is sufficiently hydraulically connected to the surface water that the ground water is not practicable to use as a drinking water source.* [RI work at the Site indicates that groundwater is hydraulically connected to Bellingham Bay. It is not practicable to utilize Site groundwater for water supply due to the potential for drawing saline water into the water-bearing zone (salt water intrusion).]

As a result, groundwater as a source of drinking water is not carried forward for the development of Site SLs.

5.2 POTENTIAL RECEPTORS

There is potential exposure to human and ecological receptors at the Site. Potential human receptors are:

- **Site upland recreational visitor/general public.** Potential exposure of Site visitors or individuals to contaminants in surface soil can occur through ingestion, dermal contact, or inhalation of particulates.
- **Site aquatic recreational visitor/fisher.** Potential exposure of Site visitors and seafood gatherers/fishers to contaminants in marine sediment can occur through ingestion or dermal contact with contaminated sediment, or ingestion of benthic, epibenthic, or fish organisms containing bioaccumulative compounds originating from Site marine sediment. Current exposure could occur to beachcombers and shellfish gathers in the intertidal zone. Because all viable remedial alternatives include either complete removal of contaminated soil and marine sediment or shoreline stabilization, future exposure is limited to seafood consumption of epibenthic organisms or fish.
- **Site construction workers.** Potential exposure of future Site construction workers to contaminants in surface and subsurface soil can occur through ingestion, dermal contact, or inhalation of particulates, through dermal contact with groundwater, and through inhalation of soil vapors. The Port maintains internal controls to ensure that workers conducting excavations at the Site receive appropriate training and monitoring. Potential exposure to contaminants in sediment could occur through ingestion and dermal contact during sediment dredging.
- **Site residential, commercial, or industrial occupants.** Structures could be occupied by residential, commercial, or industrial parities under future development scenarios. Occupants could be exposed to volatile contaminants (if present) and methane that could migrate into buildings via soil gas, particularly for redevelopment and/or remedial action activities that include construction of a low permeability cap.

Ecological receptors may also be exposed to affected Site media. Potential ecological receptors include:

- **Benthic/epibenthic organisms.** Based on data from the Whatcom Waterway RI/FS, benthic macro-invertebrates most actively colonize the upper 12 cm of sediment in Bellingham Bay (RETEC 2006).
- **Aquatic species.** Fish species potentially use marine surface water that is potentially affected by Site groundwater discharge.
- **Terrestrial plants and animals.** Future land use at the Site could include mixed residential/retail, parks, or industrial uses. Development for all of these potential future uses will include low permeability covers and/or clean soil caps, which will preclude contact of terrestrial plants and animals with refuse or contaminated soil, and appropriate institutional controls. Implementation of a cleanup for this Site is anticipated to occur by 2015. As a result, the Site qualifies for an exclusion under WAC 173-340-7491(1) and terrestrial plants and animals are not considered potential receptors for the Site.

5.3 SEDIMENT SITE SCREENING LEVELS

Site SLs for sediment were developed based on SMS cleanup standards, and are presented in Table 5-1. The SMS cleanup standards (Chapter 173-204 WAC) marine chemical criteria can range from the SQS (the level expected to cause no adverse effects to biological resources and does not pose a significant health threat to humans) to the cleanup screening level (CSL; the level expected to cause only minor adverse effects to human health or biological resources). The SQS marine chemical criteria were selected as the SLs for Site sediment. Both SQS and CSL criteria for detected constituents are presented in Table 5-1, and in conjunction with the analytical results, in Section 6.4 (Sediment Quality).

Some SQS and CSL marine chemical criteria are presented "carbon normalized" (OC), or expressed on a TOC basis. To normalize concentrations to TOC, the dry weight concentration is divided by the decimal fraction representing the percent TOC content of the sediment. In cases where TOC was not available for a particular sample, an average value for the Site (2.8 percent) was used for comparative purposes. As shown in Table 5-1, metals and phenol are evaluated on a dry weight basis, and PAHs, phthalate esters, and PCBs are evaluated on an OC basis. Ecology recommends the use of dry weight equivalents to the SMS OC SQS and CSL criteria be considered along with the OC criteria for marine sediment samples that have TOC concentrations less than 0.5 percent or greater than 3.5 percent, because lower TOC values tend to elevate the reporting limits above the SMS criteria and higher TOC values may not result in adequately protective SLs. Additionally, dry weight criteria are available for some hazardous substances that do not have SMS OC criteria. As a result, the Apparent Effects Threshold values (AETs), which are the dry weight equivalents to the SMS SQS and CSL criteria, are also presented in Table 5-1.

The current SMS regulations do not contain numeric criteria to address three of the potential exposure pathways associated with sediment identified in Section 5.1 (Potential Exposure Pathways): 1) human consumption of seafood, 2) human direct contact with sediment, and 3) higher trophic level organism (seals, birds) consuming benthic organisms. However they do contain narrative criteria stating that Ecology may determine the criteria, methods, and procedures necessary to protect human health on a case-by-case basis. The primary concern with these potential exposure pathways are bioaccumulative effects of certain compounds.

The revised SMS regulations that go into effect on September 1, 2013 provide for establishing SLs protective of human health by selecting the highest of: a background concentration, a risk-based concentration or the practical quantitation limit (PQL). In the absence of a background concentration and sufficient data to calculate a risk-based concentration, the PQL will be used for PCBs in sediment.

PCBs are considered the only constituent present in Site sediment that requires the development of a sediment SL to address human health for bioaccumulative affects. The PQL for PCBs in sediment recommended in Ecology's Sediment Sampling and Analysis Plan Appendix (Ecology 2008) is 6 micrograms per kilogram (µg/kg) dry weight. When adjusted by the average TOC value for this Site of approximately 2.8 percent, the resulting carbon normalized value comparative to the PQL is 0.21 mg/kg. Other constituents considered to be bioaccumulative include arsenic, cadmium, lead, mercury, and cPAHs. The bioaccumulative affects of arsenic are addressed by selecting the natural background concentration of arsenic (11 mg/kg; DMMP et al. 2009) as the SL for marine sediment, and based on this SL, there were no exceedances of the arsenic SL in sediment at the Site. For mercury, previous studies for the Whatcom Waterway have determined that the 0.41 mg/kg SQS for mercury adequately addresses all sediment exposure pathways and receptors, including human consumption of seafood and protection of higher trophic level species. Cadmium, lead, and cPAHs SLs addressing potential bioaccumulative affects were not developed for the RI/FS because a SL has already been established for another bioaccumulative constituent, PCBs, which serves as a surrogate for these other bioaccumulatives in the development and evaluation of cleanup alternatives. However, all bioaccumulatives will need to be considered during development of the CAP, and cleanup levels based on bioaccumulative affects may be developed for cadmium, lead and cPAHs at that time.

Sediment SLs protective of direct human contact were not developed for the Site because direct human contact will be prevented under all remedial alternatives. Because the Site shoreline is currently eroding, all remedial alternatives other than complete removal would require shoreline stabilization that will isolate contaminated sediment in the intertidal and shallow subtidal zones from direct human contact. Because of the high energy marine environment present at the Site, stabilization will require erosion protection measures that would prevent penetration of the capping system by excavation using hand equipment. Further, institutional controls would prohibit excavation in any manner without proper health and safety protocols to prevent direct human contact with contaminated marine sediment.

In addition to the chemical parameters presented in Table 5-1, physical criterion has been established for Site sediment that is considered protective of aquatic organisms. The physical criteria for the sediment SLs consist of the following Site-specific criteria for refuse and wood debris in the aquatic environment that Ecology considers adequately protective of benthic organisms (Kovacs 2008):

- No less than 1 ft of accumulated thickness of sediment where wood debris (sawdust or wood chips) constitutes greater than 50 percent of the sediment by volume
- No detectable refuse
- No less than 1 ft of clean sediment cover over sediment that exceeds the above criteria for wood debris and refuse.

This criterion is discussed in greater depth in Section 8.1.3 (Sediment Cleanup Standards).

5.4 GROUNDWATER SCREENING LEVELS

Site SLs protective of the potential receptors identified in Section 5.2 (Potential Receptors) were developed for those constituents detected in groundwater during the RI activities and previous investigations. The constituents detected include metals, SVOCs, VOCs, PCBs, ammonia, and petroleum hydrocarbons.

As discussed in Section 5.1 (Potential Exposure Pathways), Site groundwater is considered nonpotable. As a result, groundwater SLs were developed based on groundwater discharge to adjacent marine surface water and sediment. Applicable federal and state groundwater cleanup criteria protective of marine surface water were used to develop the SLs, except for total petroleum hydrocarbons.

Since surface water criteria have not been established for total petroleum hydrocarbons, MTCA Method A cleanup levels for groundwater were used for these constituents for evaluation of risk to human health, as provided for in WAC 173-340-730(3)(b)(iii)(C). The Method A groundwater cleanup levels for petroleum hydrocarbons are not applicable to surface water for protection of aquatic life. Consequently, risk to aquatic species was evaluated with respect to individual constituents of TPH, such as naphthalene. The applicability of the Method A groundwater cleanup levels to protection of surface water is discussed further in the context of petroleum hydrocarbon distribution near the shoreline in groundwater in Section 6.3.3.2 (Downgradient Perimeter Groundwater Quality).

The most stringent of the applicable federal and state criteria were selected as the groundwater SL. These criteria were then adjusted upward, if necessary, such that the criteria are not below PQLs or background concentrations. The potentially applicable regulatory criteria and the selected Site groundwater SLs are presented in Table 5-2.

Groundwater SLs for a few detected constituents were adjusted upward to the PQL, specifically indeno(1,2,3-cd)pyrene, BEP, PCP, and PCBs. The only groundwater SL adjusted upward for background was arsenic. The MTCA Method A groundwater cleanup level for arsenic of 5 micrograms per liter (µg/L) is based on natural background for Washington State. Arsenic is a naturally occurring element present in soil throughout Washington State, and as such is commonly present in groundwater aquifer matrices.

The groundwater SLs developed above consider protection of sediment recontamination by applying the SLs developed for marine sediment in Section 5.3 (Sediment Site Screening Levels), which address both protection of benthic organisms and human health. Additionally, standard MTCA Method B surface water levels used as the basis for developing Site groundwater SLs were adjusted downward to account for a higher fish/shellfish consumption rate developed for the Whatcom Waterway sediment cleanup for protection of recreational/tribal fishers.

A number of VOCs and SVOCs that do not have promulgated cleanup criteria were detected in Site groundwater at low concentrations, primarily during the 2012 supplemental groundwater sampling activities. The concentrations of these constituents are near the method reporting limits and are orders of magnitude lower that the concentrations of more ubiquitous hazardous substances present in Site groundwater, such as manganese and ammonia. As a result, any cleanup actions that adequately address COPCs such as manganese and ammonia will result in concentrations below the PQL for these hazardous substances that lack applicable cleanup criteria. As a result, groundwater SLs were not developed for these hazardous substances.

5.5 SOIL SCREENING LEVELS

Soil SLs protective of the potential receptors identified in Section 5.2 (Potential Receptors) were developed for those constituents detected in soil during the RI activities. Only limited Site soil data were collected because landfill refuse is by nature a very heterogeneous material and for the purposes of Site cleanup is assumed to be contaminated. One of the distinguishing features of landfill cleanups under MTCA, as compared to MTCA cleanups at other sites, is that landfills are assumed to contain hazardous substances at concentrations above applicable cleanup levels. As such, there is no need to establish the existence and concentration of constituents of concern in the refuse and it is understood that individual SLs or cleanup levels are not necessary because the entire mass of refuse (and wood waste in this case) is to be treated as exceeding cleanup levels, as previously noted. Additionally, as requested by Ecology, cover soils across the Site will be assumed contaminated unless proven otherwise through additional sampling based on the close proximity of wood treating operations at the nearby R.G. Haley site which may have resulted in contamination of surface soils at the Site. However, limited soil data were collected during the course of the RI, primarily for purposes other than the Site RI (e.g., Aspect Consulting), and soil SLs were developed to evaluate these ancillary soil data.

The constituents detected in surface and subsurface soils include metals, SVOCs, VOCs, PAHs, and petroleum hydrocarbons. MTCA Method B standard formula values for direct contact were used in developing Site SLs for soil to provide a conservative basis for evaluating Site soil quality. MTCA soil concentrations protective of surface water quality, calculated using the 3-phase partitioning model (equation 747-1), were also used in developing Site SLs for soil. Method A soil cleanup levels for unrestricted site use were used as soil SLs for TPH. The most stringent of the above criteria, adjusted for soil background concentrations or the PQL, as appropriate, were identified as soil SLs for the Site. SLs were not developed for protection of terrestrial species because all remedial alternatives developed in the FS will consist of complete removal or include a separation layer between contaminated soil and overlying clean soil to prevent terrestrial species from contacting contaminated soil. The potentially applicable criteria and selected soil SLs are presented in Table 5-3.

Some hazardous substances were also present in the stabilized sediment imported and stockpiled on the Site, as discussed in Section 3.7 (Interim Action). Imported stabilized sediment contains PAHs, metals, BEP, and dioxins/furans. SLs were developed for all of these hazardous substances. For dioxins/furans, an SL protective of groundwater was not developed because all of the remedial alternatives evaluated in the FS [see Section 9.0 (Feasibility Study)] either completely remove the dioxins/furans-bearing sediment or isolate it from the environment in a manner that largely eliminates leaching. Additionally, dioxins/furans have a low solubility in water and are unlikely to be leachable at detectable concentrations, as described further in Section 7.2.1.

Although the soil to vapor pathway is acknowledged as a potential exposure pathway, Site SLs protective of this potential pathway were not developed. The extensive refuse and wood debris present at the Site generates a sufficient amount of methane gas that landfill gas will need to be managed as part of any cleanup action that includes a low permeability cover, including buildings.

Landfill gas is a decomposition product of solid waste and contains methane and other organic and inorganic gases. It is therefore defined under MTCA as a hazardous substance (WAC 173-340-200). MTCA also requires that cleanup standards be set if air emissions at a site pose a threat to human health or the environment [WAC 1730340-750(1)(A)]. Emissions at the Cornwall Landfill may pose a potential threat, as methane has been detected, and other VOC contaminants may be present.

MTCA does not provide cleanup levels for methane or landfill gas, because the reference doses and cancer potency factors necessary to calculate cleanup levels are not available. In lieu of cleanup levels, MTCA does establish an explicit upper bound, based on explosivity, for any air cleanup level that might be developed – “Standard Method B air cleanup levels shall not exceed ten percent (10%) of the lower explosive limit for any hazardous substance or mixture of hazardous substances” [WAC 173-340-750(3)(b)(iii)]. MTCA also invokes closure requirements under applicable landfill closure regulations, and establishes those under Chapter 173-304 WAC as the minimum. The following specific requirements from Chapter 173-304 WAC could apply to the Cornwall Landfill [WAC 173-304-460(2)(b)(i)]:

- The concentration of explosive gases cannot exceed 25% of the lower explosive limit (LEL) in site structures. The LEL for methane is 5% by volume.
- The concentration of explosive gases cannot exceed the LEL in the subsurface at or beyond the property boundary.
- The concentration of explosive gases cannot exceed 100 ppmv of hydrocarbons (expressed as methane) in off-site structure.

The standard point of compliance is ambient air throughout the Site, and in structures on and off the Site large enough for a person to fit into. Although personal exposure monitoring during work at the

Site has not indicated that ambient air is impacted, the potential risk will be addressed as part of Site cleanup and redevelopment by installation of a landfill gas mitigation system. As such, hazardous substances in soil vapor will be addressed in conjunction with methane gas as part of Site cleanup.

Soil SLs for the protection of marine sediment were considered because of the potential for soil in the vicinity or the shoreline to continue eroding into Bellingham Bay and contaminating marine sediment. However, because all remedial alternatives will either remove all contaminated soil from the Site or contain upland soil in conjunction with stabilizing the shoreline, the potential for soil erosion to marine sediment following implementation of the Site final cleanup action will be eliminated. Additionally, any remedial alternatives that do not remove all contaminated soil from the Site will also include institutional controls requiring the maintenance of a containment system in perpetuity. As a result, soil SLs protective of marine sediment were not developed for the Site.

6.0 NATURE AND EXTENT OF CONTAMINATION

This section describes Site environmental conditions, including groundwater, soil, and sediment quality, and the extent of refuse and wood waste throughout the upland and in-water portions of the Site. The environmental conditions were evaluated based on analytical results for soil, groundwater, and sediment generated during the RI and pre-RI activities and the results of Site cover assessments (i.e., extent of exposed landfill refuse) conducted during the RI and pre-RI investigations.

6.1 CONSTITUENTS OF POTENTIAL CONCERN

As discussed in Section 3.0 (Remedial Activities), soil, refuse, and wood waste within the landfill is assumed to contain hazardous substances above applicable MTCA soil cleanup levels and extensive soil quality testing was not conducted during the RI. As a result, a comprehensive list of COPCs was not developed for Site soil, although soil COPCs are identified for those constituents that have been detected at the Site at concentrations exceeding the Site SLs. These include dioxins/furans present in the interim action material stockpiled on the Site as well as the constituents detected in Site soil and refuse.

In addition to those compounds typically associated with landfills, some constituents detected during the RI activities are attributable to the R.G. Haley site, such as petroleum hydrocarbons in the diesel and oil ranges, SVOCs (such as PCP and cPAHs), and dioxins/furans. Contamination at the Site that appears to be associated with the R.G. Haley site will be addressed during cleanup of that site, although cleanup activities for the two sites will be coordinated to ensure that Cornwall Site cleanup does not preclude any remedial actions that may be selected for the R.G. Haley site, and vice versa.

In order to conduct a complete and comprehensive evaluation of Site environmental conditions, all detected compounds having concentrations above the SLs established for this Site are presented herein as COPCs. COPCs have been identified based on a comparison of detected constituents in Site groundwater, soil, and sediment samples to the Site SLs presented in Section 5.0 (Development of Site Screening Levels). Constituents exceeding the Site SLs in one or more of the samples have been identified as COPCs with one exception. Because samples for total metal analyses are not filtered, there is potential for soil particulates containing metals to be entrained in these water samples. As a result, total metal concentrations may not be representative of actual groundwater conditions. Therefore, metals with total concentrations in groundwater exceeding the Site SL, but with dissolved concentrations in groundwater below the Site SL, were not identified as COPCs.

The constituents detected in soil at the Site during RI activities are presented in Table 6-1 and the constituents detected in groundwater are presented in Table 6-2. The results of an underwater survey of sediment conditions at the Site are presented in Table 6-3 and the results of chemical analyses of sediment samples are presented in Tables 6-4 and 6-5. Laboratory analytical results are provided in Appendices C, D, and E. The constituents detected in soil on the R.G. Haley site near the overlap area with the Site are presented in Table 6-6 and the analytical results for the interim action material placed on the Site are presented in Table 6-7. The constituents exceeding the Site SLs, the apparent source of the constituent (if other than this Site), and the media containing the exceedance are listed below:

Soil

- Refuse and wood waste
- Metals (copper, chromium, , mercury, nickel, and zinc)
- Dioxins/furans in stabilized sediment stockpiled on the Site
- SVOCs (BEP, di-n-butyl phthalate, and n-nitrosodiphenylamine)
- (R.G. Haley) – PAHs (cPAHs and naphthalenes)
- (R.G. Haley) –PCP
- (R.G. Haley) – Diesel-, and oil-range petroleum hydrocarbons
- (R.G. Haley) – Dioxins/furans in cover soil.

Groundwater

- Metals (copper and lead)
- Conventionals (manganese, fecal coliform, and NH_3 – ammonia)
- PCBs
- (R.G. Haley) – PAHs (cPAHs and naphthalene)
- (R.G. Haley) – Diesel- and oil-range petroleum hydrocarbons

Sediment

- PCBs
- Metals (copper, silver, lead, mercury, and zinc)
- SVOCs (BEP, dimethylphthalate)
- (Whatcom Waterway) – Mercury

6.2 SOIL QUALITY

As previously mentioned, except for the soil investigation conducted in 2004 by Aspect Consulting and the soil samples collected by GeoEngineers during RI activities conducted for the adjacent R.G. Haley cleanup site, the quality of Site soil was not evaluated through chemical analyses during the RI. Instead, as described in Section 5.5 (Soil Screening Levels), it is assumed that refuse poses a threat to human health or the environment through direct contact or release to the environment, and will be addressed in general accordance with regulatory requirements for solid waste landfills. As such, the extent of refuse and wood waste is the primary basis for delineating the extent of Site soil contamination, as discussed in Section 6.2.1 (Extent of Refuse and Wood Waste).

The majority of soil chemical analyses were conducted on samples collected from the portion of the Site affected by releases from the R.G. Haley site, and the majority of soil SL exceedances are associated with petroleum hydrocarbons and other wood treating-related chemicals. The extent of petroleum contamination at the Site (based on the visual presence of sheen) is presented in the soil quality section of this report because it was primarily characterized as part of the test pit and soil boring exploration program conducted during the supplemental RI rather than the groundwater characterization element. Discussion regarding the impact of petroleum hydrocarbon-impacted soil on groundwater is generally discussed in Section 6.2.2 (Extent of Petroleum Hydrocarbon Contamination) and petroleum hydrocarbon impacts on groundwater quality are discussed in greater detail in Section 6.3.1 (Overlap Area Groundwater Quality).

Chemical analytical results for COPCs in soil unrelated to petroleum hydrocarbons, including wood treating chemicals associated with releases from the R.G. Haley site, are discussed in Section 6.2.3 (Non-Petroleum Hydrocarbon Soil Analyses).

6.2.1 EXTENT OF REFUSE AND WOOD WASTE

The extent of exposed refuse in the upland portion of the Site was evaluated during the expanded Site investigation and the focused RI. During these investigations, no exposed refuse was observed at the surface of the upland portion of the Site. The extent of *in situ* landfill refuse and wood waste in the upland portion of the Site was estimated from the interpretation of boring logs and test pits. The approximate limits of *in situ* landfill refuse, the observed thickness at boring and test pit locations, and the approximate depth to the base of refuse are shown on Figure 6-1.

Based on the estimated areal extent and thickness of refuse, the total volume of refuse in the upland portion of the Site is estimated to be about 215,000 yd^3. Approximately 80,000 yd^3 of refuse is estimated to be present in the marine portion of the Site, as discussed in Section 6.4 (Sediment Quality).

As indicated on Figure 6-1, the approximate upland boundary of landfill refuse extends from the northwestern side of the former main GP warehouse to the northwestern side of the former buildings on the R. G. Haley site. Although other types of fill material such as sawdust, wood debris, and soil are present, no landfill refuse has been observed beyond this lateral boundary. Approximately 7.2 acres of the upland area are located within the landfill refuse boundary. The thickness of landfill refuse in the upland portion of the Site generally increases toward Bellingham Bay, with a maximum observed refuse thickness of 38 ft at Dames & Moore boring location 5. Although this location is outside the limits of what is generally considered upland, the thickness of refuse at this location likely provides a good estimate of the maximum refuse thickness for the upland portion of the Site, near Bellingham Bay. The depth to the base of refuse in the upland portion of the Site generally ranges from 8 to 40 ft BGS.

The estimated thickness of wood waste (including sawdust and wood debris) is also presented on Figure 6-1. The wood waste is often comingled with refuse and was observed throughout most of the Site including the area north of the former GP warehouse, farther inland than refuse was observed. In this area, wood waste thickness is variable, ranging from not present to a thickness greater than 16 ft. The total volume of wood waste in the upland portion of the Site is estimated to be about 94,000 yd^3. The volume of wood waste in the marine portion of the Site was not estimated because data regarding wood waste thickness in this area are limited and the difficulty in differentiating between wood waste originating from Site releases and other sources in the marine environment.

Landfill cover thickness generally ranges between 2 and 5 ft, as shown on Figure 6-2. Landfill cover generally consists of granular material (sand and gravel), wood debris from log decking operations, occasional patches of cobble ballast, and limited areas of asphalt paving. In addition to the existing landfill cover depicted on Figure 6-2, a significant portion of the uplands area containing refuse is now under the cover of the interim placement material and liner, as described in Section 6.2.4 (Interim Action Low Permeability Material).

6.2.2 EXTENT OF PETROLEUM HYDROCARBON CONTAMINATION

Petroleum hydrocarbon soil contamination in the diesel and oil ranges detected at the Site appears to be associated with the adjacent R.G. Haley cleanup site to the north. The extent of petroleum hydrocarbon contamination was delineated based on visual observations during the supplemental RI and the results of soil quality data collected by others (Aspect Consulting and GeoEngineers), and groundwater quality monitoring data [discussed in Section 6.3 (Groundwater Quality)]. For the purposes of this RI, petroleum hydrocarbon results are discussed by petroleum product fractions (gasoline-, diesel-, or oil-range) for clarity because the diesel-range fraction is the dominant fraction detected.

A total of 22 soil samples collected from the petroleum hydrocarbon-affected area by Aspect Consulting and GeoEngineers were tested for petroleum hydrocarbons. Additionally, over 30 test pits, borings, and monitoring wells were completed in this area that were used in evaluating the extent of petroleum hydrocarbon sheen. Results for constituents detected in the Aspect Consulting and GeoEngineers soil samples are summarized in Table 6-1 and compared to the soil SLs. A complete summary of analytical results for the Aspect Consulting soil samples is provided in Appendix C.

As indicated on Figure 6-3, the extent of the visibly-impacted soil covers a large area, and its distribution is consistent with groundwater quality results. The majority of this area is to the north and east of the landfill boundary, and hydraulically upgradient or cross-gradient, although it extends a significant distance south of the boundary between the two sites to the east of the refuse. It should be noted that Figure 6-3 does not show the full extent of impacted soil on the R.G. Haley site because the intent is to show where impacted soil is contiguous between the two sites, and not to show the full extent of soil contamination on the R.G. Haley site.

A review of the petroleum hydrocarbon analytical results in Table 6-1 indicates that diesel-range petroleum hydrocarbons are the dominant hydrocarbon range present in the area affected by the R.G. Haley site. Diesel-range petroleum hydrocarbons were detected above the SL in six of eight borings from which soil samples were tested for petroleum hydrocarbons in the petroleum hydrocarbon-affected area, and oil-range petroleum hydrocarbons were detected above the SL in three of eight borings. Gasoline-range petroleum hydrocarbons samples were detected above the SL in two of three soil borings from which soil samples were tested for this petroleum hydrocarbon range within the petroleum hydrocarbon-affected area, although the ratio of gasoline-range to diesel-range concentrations suggest that the gasoline-range detections may be associated with the lower molecular weight fraction of the diesel-range contamination rather than a gasoline release.

An isolated area of nonaqueous product was observed in the central portion of the Site, near the northern corner of the former main GP warehouse that appears to be unrelated to the sheen observed in the northeastern portion of the Site. During the supplemental RI, a black, highly viscous liquid that had a similar appearance to Bunker C fuel oil was observed at RITP-12. The material was 2 to 4 inches thick and was contained within a wood structure located above the water table at about 4 ft BGS. The excavation exposed a portion of the wooden structure about 3 ft by 3 ft. The extent of the wooden structure was unknown because it was left intact and backfilled with the excavated materials. A sample of the black liquid was collected and allowed to sit overnight in an open container under a vented hood. By the next morning the liquid had dried to a hard, brittle material that appeared to be a plastic. As such, the black viscous material does not appear to be a petroleum hydrocarbon product and its composition is unknown.

It should also be noted that minor sheen associated with refuse solids, rather than the petroleum hydrocarbon contamination associated with the R.G. Haley site, was encountered during the RI and previous investigations in some wells and test pits. In some instances, the sheen appeared to be biogenic and not associated with petroleum hydrocarbons. These locations were not included within the petroleum hydrocarbon sheen area delineated on Figure 6-3, but are bounded by the groundwater monitoring wells installed during the supplemental RI, as discussed in Section 6.3 (Groundwater Quality).

As previously discussed, the source of the petroleum hydrocarbon impact in the northern portion of the Site does not appear to be related to Site releases. Petroleum hydrocarbon contamination is contiguous with the petroleum hydrocarbon contamination found on the southern portion of the R.G.

Haley site. As shown on Figure 4-11, current groundwater elevation data indicate that the groundwater flow direction in the petroleum hydrocarbon-affected area is primarily to the west, which does not have as much of a southerly direction of flow as the distribution of the petroleum hydrocarbon contamination would suggest. However, petroleum hydrocarbon contamination releases likely occurred over decades of operation, and historical groundwater flow in the northeast corner of the Site was likely very different during operation of the R.G. Haley facility. The wood treating wastewater seepage pit where wood treating wastes were discharged was located near the northeast corner of the Site, which would have caused a groundwater mound near the boundary between the two sites, resulting in a more southerly direction of groundwater flow in this portion of the Site, as well as discharge of wood treating wastes to the south onto the Site.

It is also important to note that the Bellingham Bay shoreline was historically located much farther to the east prior to landfilling operations. Petroleum hydrocarbon contamination in LNAPL form tends to spread out laterally along the shoreline in tidally influenced groundwater flow systems. This migration pathway would likely have resulted in southerly direction to LNAPL migration from the R.G. Haley site onto the Site during historical shoreline conditions. A detailed evaluation of the nature and extent of contamination associated with the R.G. Haley site will be conducted in a forthcoming R.G. Haley-specific RI/FS.

6.2.3 NON-PETROLEUM HYDROCARBON SOIL ANALYSES

This section describes the analytical results for soil samples collected at the Site for analyses other than petroleum hydrocarbons. These analyses include metals, BTEX, PAHs, SVOCs, and PCBs. Some of these analytes appear to be related to releases associated with wood treating activities at the R.G. Haley site (e.g., PCP and cPAHs) and other analytes are reflective of soil/refuse quality. Analytical results for soil samples collected on the R.G. Haley site near the overlap area between the two sites are presented in Table 6-6 to provide a basis for better correlating those COPCs that originate from the R.G. Haley site. Wood treating and non-wood treating analytes are discussed separately below.

As shown in Table 6-6, PAHs, including cPAHs, in conjunction with diesel-range petroleum hydrocarbons, are indicative of releases from the R.G. Haley site. In addition, dioxins/furans were detected in concentrations as high as 98,550 nanograms per kilogram (ng/kg) on the R.G. Haley site. PCP was not detected in any Site soil samples collected from locations outside of the petroleum hydrocarbon-affected area shown on Figure 6-3. cPAHs above the soil SL were detected at one location (AF-SB02) outside of the petroleum hydrocarbon-affected area, but cPAHs are ubiquitous in the environment so its presence at the Site is not considered anomalous.

Analytes detected in Site soil at concentrations exceeding the soil SLs that appear to be unrelated to releases from the R.G. Haley site include certain heavy metals (chromium, copper, mercury, nickel, lead, and zinc). However, the Site soil SLs for heavy metals are all driven by the protection of surface water, and with the exception of copper, the groundwater SLs were not exceeded in groundwater samples considered representative of Site groundwater quality [see Section 6.3 (Groundwater Quality)]. The only SVOC detected above the soil SLs that does not appear to be associated with R.G. Haley releases is a single exceedance of the n-nitrosodiphenylamine at AF-MW-02. No BTEX or PCB analytes were detected above the Soil SLs.

6.2.4 INTERIM ACTION LOW PERMEABILITY MATERIAL

As described in Section 3.7 (Interim Action), an interim action was implemented to store fine-grained sediment at the Site which could potentially be used for cap or sub-cap material during future cleanup at the Site, and which significantly reduces the amount of surface water infiltrating through the soil cover where it could contact landfill refuse and then discharge to Bellingham Bay.

Three sediment samples were collected prior to dredging to characterize the sediment for possible open water disposal and five samples of stabilized sediment were collected from the interim placement areas. The pre-dredging samples were tested for heavy metals, TBT, SVOCs, pesticides, PCBs, dioxins/furans, and conventional parameters, and the stabilized sediment samples were analyzed for dioxins/furans. The results for detected constituents are summarized in Table 6-7. Sample locations from the interim placement areas are shown on Figure 3-2.

No TBT, PCBs, or pesticides were detected in the pre-dredging sediment samples. One non-PAH SVOC (BEP) was detected at a concentration below the soil SL. A number of heavy metals were detected at concentrations above the soil SLs based on protection of groundwater, but the concentrations are similar to those detected in Site soil/refuse that do not appear to have impacted groundwater quality. A number of PAHs were detected in the pre-dredging sediment samples. The concentrations of two cPAHs [benzo(a)anthracene and chrysene] were above the soil SL, but the toxicity equivalency (TEQ) value for the sample with those detections remains below the SL. The concentration of dioxins/furans in the pre-dredging samples ranged from 6.2 to 27.3 ng/kg TEQ and averaged 14.7 ng/kg, which slightly exceeds the soil SL of 11 ng/kg. The dioxin concentrations for the stabilized sediment samples ranged from about 9.5 to 21.9 ng/kg TEQ and averaged 13.9 ng/kg. These results demonstrate that the dioxin/furan concentrations for the stabilized sediment samples are consistent with the dioxin/furan concentrations for the pre-dredge sediment samples.

6.3 GROUNDWATER QUALITY

For the purposes of this report, groundwater quality is categorized and discussed below in terms of location relative to the Site. Section 6.3.1 (Overlap Area Groundwater Quality) discusses groundwater quality in the overlap area between the R.G. Haley site and the Site in the northeast portion of the Site. Section 6.3.2 (Site Interior Groundwater Quality) discusses groundwater quality in the interior portion of the Site outside of the overlap area, and Section 6.3.3 (Downgradient Perimeter Groundwater Quality) discusses groundwater quality at the downgradient perimeter of the Site near the point of groundwater discharge to Bellingham Bay. Section 6.3.3 (Downgradient Perimeter Groundwater Quality) also discusses the results of groundwater seep sampling, which provides additional groundwater quality data at the point of groundwater discharge to surface water during low tide. However, the shoreline monitoring wells installed in 2012 are primarily relied upon for evaluation of groundwater quality near its point of discharge to surface water.

Concentrations of constituents detected in groundwater samples from monitoring wells on the Cornwall property are provided in Table 6-2. Concentrations of constituents detected in groundwater samples collected from monitoring wells located on the R.G. Haley site near the property line separating the R.G. Haley and Cornwall properties are presented in Table 6-8. Figures 6-3, 6-4, and 6-5 provide plan views of the Site with the concentrations of petroleum hydrocarbons, NH_3-ammonia, and manganese plotted for all wells that have been tested for these constituents during RI activities.

6.3.1 OVERLAP AREA GROUNDWATER QUALITY

This section describes groundwater quality observed in the overlap area portion of the Site, where groundwater quality appears to be primarily impacted by the adjacent R.G. Haley site. Monitoring wells MW-1, MW-5, MW-6, CL-MW-101, CL-MW-102, CL-MW-103, CL-MW-1S, CL-MW-1D, CL-MW-1H, and AF-MW-02 are located in the overlap area portion of the Site, as indicated on Figure 6-3.

Groundwater samples from this portion of the Site were analyzed for diesel- and oil-range petroleum hydrocarbons (each well); PAHs and SVOCs (each well except CL-MW-1D); BTEX (MW-1, MW-5, MW-6, and HS-MW-7); VOCs (AF-MW-02); PCBs (MW-1 and MW-5); and fecal coliform (MW-1, MW-5 and MW-6). Investigations in this area have focused on these constituents based on the elevated concentrations observed during sampling in 1996 and 1998. Although the groundwater appears significantly impacted by releases of petroleum and other hydrocarbons, it is assumed that since groundwater in this area is in contact with refuse, it is also likely impacted by elevated concentrations of ammonia, manganese, and other leachate compounds.

The concentration of diesel-range petroleum hydrocarbons detected was above SLs at each of the groundwater monitoring locations sampled in this area, except at MW-1 and MW-5. The concentration of oil-range petroleum hydrocarbons detected was above the SL at MW-1, CL-MW-1S, and CL-MW-1D. Fecal coliform was detected above the SL at MW-5. PAHs were detected above the SL at CL-MW-1S, CL-MW-101, CL-MW-103, CL-MW-6, and CL-MW-1H. Other monitored parameters were below the SLs. The following paragraphs summarize the results of groundwater analyses for this area.

Detected diesel-range petroleum hydrocarbons in this area ranged in concentration from 740 to 41,000 micrograms per liter (μg/L) and detected oil-range petroleum hydrocarbons ranged in concentration from 500 to 104,000 μg/L. The SL for diesel- and oil-range petroleum hydrocarbons is 500 μg/L, as discussed in Section 5.4 (Groundwater Screening Levels). As shown on Figure 6-3, the concentrations of these petroleum hydrocarbon-related constituents are higher in this portion of the Site than elsewhere at the Site and the only portion of the Site where the petroleum hydrocarbon concentrations exceeded the SLs, which is consistent with the documented release of nonaqueous phase liquid and dissolved-phase petroleum hydrocarbon contamination from the adjacent R.G. Haley site. Trace LNAPL was observed in samples collected from CL-MW-1S, which is the probable cause of the more elevated diesel-range petroleum hydrocarbon concentrations at this location. As evidenced in the monitoring results plotted on Figure 6-3 and discussed in Sections 6.3.2 (Site Interior Groundwater Quality) and 6.3.3 (Downgradient Perimeter Groundwater Quality), concentrations of these constituents decrease with distance from this area, and are mostly below laboratory reporting limits at the downgradient perimeter of the Site uplands. Additionally, petroleum hydrocarbon sheen was consistently observed in explorations completed in this area.

The oil-range petroleum hydrocarbon SL was only exceeded at one location (CL-MW-1) in both the deep and shallow wells at that location. Oil-range petroleum hydrocarbons were detected above the SLs in four of five samples collected from CL-MW-1S, and in one of five samples collected from CL-MW-1D. The oil-range petroleum hydrocarbon concentration at CL-MW-1D (580 μg/L) only slightly exceeded the SL of 500 μg/L. The oil-range petroleum hydrocarbon concentrations at CL-MW-1S were all quite elevated, with the highest detected concentration of 104,000 μg/L. The diesel-range petroleum hydrocarbon concentrations at CL-MW-1S were also quite elevated, and both diesel- and oil-range concentrations at this location appear to be associated with the presence of LNAPL in the CL-MW-1S samples. Oil-range petroleum hydrocarbon concentrations are shown on Figure 6-3, and indicate a more limited distribution than diesel-range petroleum hydrocarbons, which is consistent with a more limited source and lower migration potential in both LNAPL and dissolved form.

PCP was detected multiple times in MW-6, at a maximum concentration of 78.5 μg/L. PCP detections from other wells on the Site were below the SL of 10 μg/L. The highest concentration of PCP detected in groundwater monitoring wells on the R.G. Haley property was 1,350 μg/L at TL-MW-10.

The concentration at MW-6 is significantly higher than other detections on the Site, and based on these data and the location of MW-6 relative the R.G. Haley site, the limited PCP groundwater contamination present in the overlap area appears to be related to releases from the adjacent R.G. Haley site.

PAHs were detected above the SL in groundwater samples from CL-MW-1S, Cl-MW-101, CL-MW-103, CL-MW-6, and CL-MW-1H on the Site. At CL-MW-6 and CL-MW-1S, the total cPAH (TEQ) concentration exceeds the Site SL of 0.018 µg/L. The PAH detections are consistent with the petroleum hydrocarbons confirmed in groundwater in this area, and with the analytical results of the LNAPL sample, as discussed below. The presence of PAHs is also consistent with groundwater analytical results for the R.G. Haley site, which also exhibited the detection of several PAHs, including cPAHs, as indicated in Table 6-8. These results are consistent with the R.G. Haley site being the source of PAH groundwater contamination detected in Site groundwater.

In addition to the groundwater samples, the LNAPL collected from the water table in test pit RITP-7, also located upgradient of the landfill refuse, was tested for PAHs, PCBs, BTEX, and diesel- and oil-range petroleum hydrocarbons. The LNAPL that was observed over most of the petroleum hydrocarbon-impacted area during the Supplemental RI was limited to a thin sheen. The LNAPL accumulation on the water table (about 0.25 inch) in test pit RITP-7 was sufficient to allow collection of a sample. As indicated in Table 6-9, the LNAPL sample was 99 percent (990,000 mg/kg) diesel, which is consistent with the individual compounds detected in the LNAPL sample. A number of short chain PAHs, ethylbenzene, and xylenes were detected in the LNAPL sample, all of which are present in diesel fuel. PCBs were not detected in the LNAPL sample.

Dioxins/furans were detected at CL-MW-101 during an investigation conducted by GeoEngineers in 2012 for the R.G. Haley site at a total dioxin/furan TEQ of 0.004 nanograms per liter [ng/L, or parts per trillion (ppt)], as summarized in Table 6-2. Based on the detected concentration being very low, and the extremely low solubility of dioxins and furans in water, detections of dioxins and furans are potentially due to minute amounts of dioxin-containing soil particles being entrained in the groundwater sample, rather than actual dissolved concentrations. The field measurement of turbidity in this groundwater sample was reportedly 7.2 nephelometric turbidity units (NTUs). Although this turbidity measurement is not excessively high, it does suggest that soil particles were present and given the low detection and reporting limits achieved for dioxin and furan analysis, may impart a high bias to the sample result. Dioxins/furans were detected in groundwater from the R.G. Haley site near the overlap area between the sites at HS-MW-10 (which is located in approximately the same location as the more recently installed HS-MW-19) at a concentration of 0.117 ng/L, as presented in Table 6-8. Based on these data, dioxin/furan groundwater contamination, if not an artifact of the sampling process, appears to result from the R.G. Haley site.

Fecal coliform was detected in the sample collected from MW-5 at 19,000 colony forming unit per one hundred milliliter (CFU/100 mL), which is significantly above the Site SL of 14 CFU/100 mL. The source of elevated fecal coliform detected at MW-5 is unknown. It is not clear whether the GP warehouses or the R.G. Haley site were served by sanitary sewer. Discussions with City personnel indicate that available City drawings do not show a sanitary sewer connection to either the R.G. Haley site or the GP warehouse facilities, and that a sewer trunk line is not present in close proximity to the Site. However, GP paid for sewer service which suggests that service was provided but the connection is not documented. As described in Section 4.1.2.3 (Pre-Demolition Stormwater Management System), a structure that appeared to be a septic tank was encountered during excavation of test pit RITP-6, located just east of MW-5. Leakage from a septic tank or sanitary sewer conveyance line would be a likely source for the elevated fecal coliform detections in the groundwater sampled from MW-5. As indicated in Section 4.1.2.3 (Pre-Demolition Stormwater Management System), the biogenic conditions encountered in the stormwater drainage system near MW-5 also suggest the possible impact from a septic tank or sewage conveyance line leakage or failure. Although the source of upgradient fecal coliform is unknown, it appears to be unrelated to the former landfilling activities associated with the Site. Because the GP warehouse and other former Site structures have been demolished, and the Site is currently vacant, it is unlikely that ongoing releases of sewage, or other potential anthropogenic sources of fecal coliform, are occurring.

6.3.2 SITE INTERIOR GROUNDWATER QUALITY

For the purposes of this report, we discuss groundwater quality conditions for this portion of the Site in terms of being upgradient of the shoreline wells and downgradient of the overlap area. During the natural degradation of both refuse and wood in the subsurface, oxygen is consumed and reducing conditions are created while the soil microbes break down the organic content in both refuse and wood. Under reducing conditions, some metals, which might otherwise be bound within the soil matrix, become mobile in the dissolved phase. Manganese and iron are metals commonly found in soil that become soluble when reduced and thus would be anticipated to be present in groundwater at the Site. Groundwater within the landfill refuse may be additionally impacted by contaminants that were disposed of with the refuse leaching into groundwater.

Site interior groundwater quality was evaluated based on data from monitoring wells MW-3, MW-4, MW-7 through MW-10, and AF-MW01. Figure 2-1 shows the locations for each of these monitoring wells. It should be noted that evaluation of Site groundwater quality was primarily focused on evaluated groundwater quality near the point of groundwater discharge to surface water, and in evaluating the extent of petroleum hydrocarbon impact in the overlap area. As a result, groundwater quality data for the interior portion of the Site is limited, which is reflected in the limited discussion presented in this section.

Groundwater monitoring wells in the interior of the Site were sampled during one or more of the following sampling events: 1) 1998 during the focused RI, 2) 2002 as part of the supplemental RI, 3) 2004 as part of the Phase II environmental site assessment for GP, and 4) 2004, 2005, and 2012 as part of the R.G. Haley site RI. Groundwater samples collected in this area have been analyzed for diesel- and oil-range petroleum hydrocarbons and VOCs (each well, except MW-4), dissolved metals (AF-MW01), PAHs and SVOCs (AF-MW01 and MW-7), and PCBs and fecal coliform (each well except AF-MW01). Analytical results for these wells are presented in Table 6-2.

Petroleum hydrocarbons in the diesel and oil ranges were only detected above the reporting limit at interior well MW-7, where diesel was detected at 409 µg/L. This location is downgradient from the overlap area, so the detection is consistent with upgradient groundwater quality. BTEX components were not detected in any of the samples tested for BETX or VOCs. However, a number of gasoline-related VOCs were detected at low concentrations in the sample collected from AF-MW-02, which is on the edge of the overlap area. Based on the gasoline-related VOC analytical results, it does not appear that significant releases of gasoline-range petroleum hydrocarbons occurred at the Site.

At AF-MW01, arsenic and nickel were detected below SLs, iron was significantly elevated but does not have an associated SL, and manganese was elevated above the SL of 100 µg/L. Iron and manganese concentrations are commonly associated with refuse and wood waste sites due to the reduced groundwater oxidation state typically associated with these types of waste. As a result, elevated iron and manganese groundwater concentrations are consistent with Site usage.

PAHs and SVOCs were below reporting limits at most locations, and where it was detected, concentrations were below the SLs at all interior wells.

PCBs were not detected in the groundwater samples collected from interior wells MW-3, MW-8, MW-9, and MW-10. PCBs were detected at a concentration of 0.053 µg/L in a sample collected from MW-7, which is above the total PCB SL of 0.025 µg/L. The detection of Aroclor 1254 in the sample from MW-7 may be an artifact of the sample turbidity (50 NTUs), and as such, may be biased high. This conclusion is supported further by the absence of Aroclor 1254 detections in groundwater samples collected from MW-8 and seep sampling device RIS-1, both of which are located downgradient of MW-7. These considerations strongly suggest that the PCB detection in MW-7 is not the source of PCBs detected in the surface sediment.

The fecal coliform concentration detected in the sample collected from MW-4 (820 CFU/100 mL) is significantly above the site SL of 14 CFU/100 mL, but lower than the detections at MW-5 discussed in Section 6.3.1 (Overlap Area Groundwater Quality). The source of the elevated fecal coliform level at this location is unknown, but may be attributed to the accumulation of bird fecal matter on the ground surface near the well. The main GP warehouse also had a significant accumulation of bird fecal matter on the roof and stormwater run-off from the roof likely contributes to groundwater recharge in the MW-4 vicinity. Fecal coliform was also detected in a sample collected from MW-10 at a concentration of 41 CFU/100 mL, which is above the SL of 14 CFU/100 mL. A specific source for the fecal coliform detection at MW-10 has not been identified. However, it could be attributed to the same source causing the high fecal coliform detections at MW-5, given the relative position of these wells, direction of groundwater flow, and the highly elevated level of fecal coliform detections in MW-5. It is unlikely that the fecal coliform detections are associated with landfill activities since fecal coliform bacteria could not survive in the subsurface for the 40+ years that have elapsed since the landfill was closed.

6.3.3 DOWNGRADIENT PERIMETER GROUNDWATER QUALITY

Groundwater quality near the point of groundwater discharge to surface water was evaluated based on seep and monitoring well data collected during several Site investigations. Section 6.3.3.1 (Downgradient Perimeter Groundwater Seep Quality) provides a summary of previous groundwater seep characterization results. Groundwater seep characterization data were collected during a number of Site investigations, but only the data collected during the 2002 Supplemental RI are discussed because these samples are considered the least affected by particulates (turbidity), and as a result the most representative. Section 6.3.3.2 (Downgradient Perimeter Groundwater Quality) provides a summary of groundwater quality as evaluated during the 2012 supplemental groundwater investigation. This investigation provides the most comprehensive characterization of groundwater at the Site and based on the close proximity to the discharge to surface water (point of compliance), provides the most relevant data for assessing the Site's impact on human health and the environment.

Because the seep sampling data were collected more than 10 years ago and were not collected from conventional monitoring devices, the 2012 groundwater monitoring well data are considered more representative of Site groundwater quality conditions, and are the primary data relied upon for evaluation of Site groundwater quality near its point of discharge to surface water. However, the monitoring wells installed for the 2012 groundwater investigation were installed at least 20 ft from the shoreline, and water level and specific conductance data from these wells indicate very limited interaction between the monitoring wells and marine surface water. Because hydrodynamic dispersion in close proximity to a tidally influenced shoreline tends to influence the concentration of constituents dissolved in groundwater prior to entry into the surface water body, the groundwater data from the 2012 monitoring wells represents a conservatively high estimate of COPC concentrations at the point of entry to surface water.

6.3.3.1 Downgradient Perimeter Groundwater Seep Quality

Groundwater seep quality was evaluated during Ecology's initial Site investigation in 1992, the expanded Site investigation in 1996, the focused RI in 1998, and the supplemental RI in 2002. Sample results from each of the seep sampling events are presented in Table 6-2. Samples collected from groundwater seeping from the uplands into the marine waters at the shoreline provide an opportunity to characterize groundwater at the location where groundwater discharges to Bellingham Bay. However, flow conditions and contaminant concentrations from groundwater seeps likely vary with time, season, and the complex interaction between the tide and groundwater. Based on these interactions, the analytical data from seep samples may not represent best-case or worst-case conditions, but some intermediate point in the range of concentrations. Seep sampling was conducted during low tide, in order to increase the probability that samples represent worst-case conditions, and dilution from marine water is limited.

Seep sampling methods were improved during each successive investigation to reduce the level of turbidity in the seep samples; high turbidity generally results in analytical results that are biased high for those constituents that tend to partition to soil, which is apparent in the data collected in Ecology's initial 1992 investigation (seep samples E-1 through E-4), the 1996 expanded Site investigation (seep samples S-1 through S-3), and the focused RI (seep samples S-1 through S-3). As a result, the evaluation of groundwater seep quality from the two rounds of sampling conducted during the 2002 supplemental RI (seep samples RIS-1 through RIS-3), the most recent seep sampling events, are assumed to best represent groundwater seep quality and form the basis of the discussion below.

Groundwater seep samples were analyzed for total and dissolved metals, petroleum hydrocarbons, PCBs, cyanide, fecal coliform, ammonia, and additional conventional and field parameters.

During the 2002 supplemental RI, total copper exceeded the SL in one of two samples collected from each of the three sampling locations (RIS-1, RIS-2, and RIS-3), with a maximum concentration of 7 μg/L compared to the SL of 2.4 μg/L. The copper SL was only exceeded in one of the two dissolved copper samples collected from RIS-2 during the Supplemental RI, and the detected concentration of 5 μg/L was only slightly greater than the copper SL.

No SVOCs (including PAHs) were detected above the site SLs during early investigation phases, and as a result, SVOCs were not tested for during the supplemental RI. Similarly, most conventional parameters were not tested for following the early Site investigation phases, except as discussed below for cyanide, fecal coliform, and nonionic ammonia (NH_3-ammonia).

Groundwater seep sample RIS-3 obtained during the first monitoring event of the supplemental RI (July 17, 2002) was the only sample from either sampling event in which total cyanide was detected at a concentration above the laboratory reporting limit. The detected concentration was 0.008 mg/L, which is significantly below the SL of 16 mg/L.

Fecal coliform was not detected in any of the seep water samples collected during the supplemental RI, but was detected in concentrations up to 300 CFU/100 mL in a number of samples collected during previous investigations. The variability in fecal coliform concentrations suggests that there is not a continuous source, which supports the conclusion that the presence of fecal coliform in seep samples is related to the presence of bird droppings or marine mammals along the shoreline, which are transitory in nature.

NH_3-ammonia was detected in all groundwater seep water samples collected during both monitoring events of the supplemental RI at concentrations ranging from 0.036 to 0.060 mg NH_3/L, which exceed the SL of 0.035 mg NH_3/L. However, these concentrations are significantly lower than the NH_3-ammonia concentrations up to 0.636 mg NH_3/L detected in the 2012 groundwater monitoring event, which supports the conclusion that hydrodynamic dispersion is reducing the concentrations of COPCs as groundwater migrates towards its point of discharge to surface water.

PCB Aroclor 1242 was detected in the groundwater seep samples collected from RIS-1 and RIS-2 in the second supplemental RI monitoring event at concentrations of 0.14 and 0.16 μg/L, respectively. There is no Site SL for Aroclor 1242, but both concentrations slightly exceed the total PCB site SL of 0.1 μg/L.

The absence of Aroclor 1242 detections in any of the groundwater monitoring well samples tested for PCB and the trace detections in two of six groundwater seep samples collected during the supplemental RI suggest that the detected Aroclor 1242 concentrations in sediment samples are not the result of groundwater discharge from the Site. Aroclor 1242 was previously detected in a sediment sample collected from the RIS-2 vicinity during the expanded Site investigation. PCB detections in groundwater seep samples may be the result of particulates entrained in the samples. Even though suspended solids concentrations were relatively low at 6.6 mg/L and 6.3 mg/L for RIS-1 and RIS-2, respectively, a minor amount of suspended solids would cause a significant increase in the detected Aroclor 1242 concentrations in a water sample.

Diesel- and oil-range petroleum hydrocarbons were tested for in groundwater samples collected from groundwater seep sample location RIS-1 and RIS-2 during the supplemental RI due to their location downgradient from the upland petroleum hydrocarbon contamination in the northeastern area of the Site, but petroleum hydrocarbons were not detected in these samples. These results indicate that the petroleum hydrocarbon-contaminated soil in the northeastern portion of the Site does not appear to be affecting groundwater quality at the point of discharge to surface water.

Both field and laboratory turbidity measurements were obtained for the seep samples collected during the supplemental RI (RIS-1, RIS-2, and RIS-3 locations). The laboratory turbidity values were significantly higher than the not detected field measurements for these samples. The reason for this discrepancy is not known, but likely results from a calibration or sensor failure of the field equipment. As a result, the laboratory turbidity measurements should be relied on for evaluating turbidity of the seep samples collected during the supplemental RI.

Based on the results of groundwater seep sampling, only ammonia, manganese, copper, and perhaps PCBs were considered to be present at elevated concentrations. Previous rounds suggested that other analytes might also be present at elevated concentrations, including gross beta radioactivity, phenols, and phthalates. Gross beta radioactivity appears to result from the presence of naturally occurring radioactive potassium present in marine surface water, and analytes such as phenols and phthalates appear to result from elevated turbidity present in the earlier seep sampling rounds.

6.3.3.2 Downgradient Perimeter Groundwater Quality

During a supplemental RI investigation conducted in 2012, two rounds of groundwater sampling were conducted for six shallow and deep monitoring well pairs (MW-11S, D through MW-16S, D). The locations of these monitoring wells are shown on Figure 2-1. Groundwater samples collected during these sampling events were analyzed for dissolved metals, VOCs, SVOCs, herbicides, pesticides, tannins and lignins, TPH-HCID with follow up analyses for detected hydrocarbon ranges, conventional parameters, and typical field parameters.

This supplemental investigation was the most complete groundwater quality monitoring conducted at the Site based on the comprehensive list of analyses, and the number and location of the wells. As such, data collected during these two sampling events represent the best characterization of groundwater near the point of discharge to Bellingham Bay. Because these wells are all located at least 25 ft from the shoreline, the concentrations detected in groundwater samples collected from these wells provide a conservatively high estimate of COPC concentrations that discharge to surface water. Groundwater data from other wells near the shoreline (MW-2, MW-3, and MW-8) also provide additional characterization of downgradient groundwater quality at greater distance from the shoreline. The analytical results for these wells are presented in Table 6-2.

The results of the two sampling events in 2012 were similar. Also, the water quality is fairly uniform across the length of the landfill perimeter and at the two sampled depth intervals (shallow and deep). The sampling events indicate only two constituents, manganese and NH_3-ammonia, are consistently above SLs. One additional exceedance was observed in the groundwater sample from MW-11S during the July 2012 event. The concentration of dissolved copper at this location was

2.6 µg/L, which is just above the SL of 2.4 µg/L. During the subsequent sampling event in September 2012, the detected concentration of dissolved copper was 0.9 µg/L, which is below the SL.

Herbicides and pesticides were not detected during either of the two sampling events. Except for the copper detection discussed above, the detected concentrations of dissolved metals were below SLs.

Gasoline-, diesel-, and oil-range petroleum hydrocarbons, and VOCs were below SLs. A single detection of gasoline-range petroleum hydrocarbons (330 µg/L) at MW-13D and a single detection of diesel-range petroleum hydrocarbons (200 µg/L) at MW-15S were the only petroleum hydrocarbon detections in the shoreline monitoring wells. Both of these detections occurred in the first round of monitoring and concentrations were below reporting limits in the second round of monitoring. Based on these results, and the lack of petroleum hydrocarbon detections in any of the seep samples, the petroleum hydrocarbon SLs based on the Method A groundwater cleanup level are considered protective for both human health and aquatic organisms.

The detected concentrations of ammonia ranged from 0.001 to 0.636 mg NH_3/L. The SL for ammonia is 0.035 mg NH_3/L, based on chronic aquatic water quality criteria. Ammonia was detected in samples from each location at concentrations above the SL except MW-11D, MW-15S, and MW-15D, where it was detected, but below the SL. Ammonia is a common constituent associated with landfill leachate and with sewage or septage. Both of these potential sources are present at, or in the immediate vicinity of, the Site.

The detected concentrations of manganese ranged from 0.072 to 1.430 mg/L. Detections were above the SL of 0.1 mg/L at each well during both events, with the exception of MW-11D. As mentioned previously in this report, manganese is naturally occurring in soils in this area and becomes mobile in the dissolved phase under reducing conditions, such as those associated with wood waste or landfill refuse. Because of the distance of the wells from the shoreline and the increase in the oxidation state of groundwater that generally occurs in closer proximity to the shoreline due to hydrodynamic dispersion, the manganese concentration is anticipated to be significantly lower than measured in the monitoring wells at the point of groundwater discharge to surface water.

Based on the analytical results from both seep sampling devices and monitoring wells, groundwater near the point of discharge to surface water can be summarized with the following characteristics:

- Conductivity between 2,000 and 3,000 µS/cm (likely elevated by the adjacent marine water)
- Dissolved oxygen typically less than 1 mg/L (likely increases in close proximity to shoreline)
- TOC between 10 and 25 mg/L
- Biological oxygen demand between 10 and 100 mg/L
- Tannins and lignins ranging from 1 to 40 mg/L (likely due to the wood waste)

- Sulfur species dominated by sulfate, with lesser sulfide
- Ammonia between 0.005 to 0.29 mg NH_3/L
- Manganese between 0.1 and 1.5 mg/L, and other dissolved metals (iron, copper, lead, zinc)
- Low-level non-carcinogenic PAHs
- BEP
- Low-level VOCs (including benzene, chlorobenzene, styrene, 4-isopropyltoluene, etc.)
- Low level gasoline-range petroleum hydrocarbons
- Fecal coliform (not detected in the last two rounds of seep sampling)
- PCBs (likely the result of entrained particulates).

6.4 SEDIMENT QUALITY

Sediment quality was evaluated based on chemical data and the surficial extent of landfill refuse and wood debris. The chemical assessment focused on surface sediment, although limited subsurface sediment core data were also evaluated. The assessment of the surficial extent of refuse and wood debris was based on surface and shallow subsurface observations.

6.4.1 EXTENT OF REFUSE AND WOOD DEBRIS

The extent of refuse and wood debris in Site surface and subsurface sediment was delineated based on observations from the following explorations:

- Two offshore borings (Dames & Moore borings 2 and 3)
- Four test pits excavated along the shoreline during the expanded Site investigation
- Two subtidal SCUBA reconnaissance surveys conducted during the expanded Site investigation and the supplemental RI
- Subtidal SPI and cores collected during the 2008 Ecology sediment investigation.

The locations of each of these explorations are shown on Figure 6-6. The data collected by divers during the supplemental RI are presented in Table 6-3. Results for the SPI and core sampling conducted in the 2008 sediment investigation are provided in Appendix E. The 2008 sediment investigation was relied on to a greater extent than previous investigations because it was the most recent and the most comprehensive evaluation conducted to evaluate the extent of refuse and wood debris in Site sediment.

The extent of refuse and wood debris based on the above investigations is shown on Figure 6-6. Note that the line delineating the extent of refuse and wood debris excludes location RGH-07 (at the northern end of the Site) from the affected area. This location is excluded because the identification of refuse at this location is based on the presence of a single piece of black plastic and refuse was not encountered at any nearby locations. Additionally, black plastic was not a common component of refuse in the 1950s and 1960s when the landfill was active.

As previously mentioned in Section 5.3 (Sediment Site Screening Levels), Ecology also established the following Site-specific criteria for refuse and wood debris in the aquatic environment that it considers a potential threat to benthic organisms (Kovacs 2008):

- Greater than 1-ft accumulated thickness of sediment where wood debris (sawdust or wood chips) constitutes greater than 50 percent of the sediment by volume
- Any detectable refuse
- Less than 1 ft clean sediment cover over sediment that exceeds the above criteria for wood debris and refuse.

Locations where these criteria were exceeded are shown on Figure 6-7. A comparison of the extent of refuse and wood debris on Figure 6-6 with the area over which the criteria for protection of benthic organisms is exceeded on Figure 6-7 indicates that the criteria for protection of benthic organisms is exceeded over a much smaller area. This difference in area is the result of significant deposition of recent sediment over the refuse and wood debris, such that most of the deep subtidal affected area is covered by at least 1 ft of clean sediment, which is indicative of natural recovery processes.

6.4.2 CHEMICAL ASSESSMENT

The chemical assessment of surface sediment quality was based on the analytical results for the following 25 sediment samples:

- Two sediment samples (E-2 and E-4) collected during the initial Site investigation (Ecology 1992a)
- Three sediment samples (S-1, S-2, and S-3) collected during the expanded Site investigation (Landau Associates 1997)
- Four sediment samples (HC-SS-19, HC-SS-20, HC-SS-21, HC-SS-28) from the Site vicinity collected during the Whatcom Waterway RI/FS (Anchor Environmental and Hart Crowser 1999)
- Six sediment samples collected during the supplemental RI (SRI-SED-1, SRI-SED-2, SRI-SED-3, SRI-SED-4, SRI-SED-5, and SRI-SED-6)
- Three sediment samples (SRI-2, SRI-2, and SRI-3) collected as part of the R.G. Haley site RI (GeoEngineers 2007).
- One surface sediment sample (BLVD-SS-09) and six subsurface samples (BLVD-SC-09-0-2’, BLVD-SC-09-2-3’, BLVD-SC-09-3-4’, BLVD-SC-09-4-6’, BLVD-SC-09-6-8’, and BLVD-SC-09-8.5-9.7’) collected as part of the City’s investigation for the proposed overwater walkway that would link the Site to Boulevard Park to the southwest.

The locations of the above-referenced surface sediment samples are shown on Figure 6-6. Analytical results for the detected constituents are summarized in Table 6-4. Applicable data have been organic carbon normalized (OC) for comparison to the Site SLs in Table 6-5. TOC was not analyzed during Ecology's initial Site investigation, so these data were carbon normalized using TOC concentrations measured during the expanded Site investigation for samples collected in the proximity of the original Ecology sampling locations. The PCB results for the subsurface sediment samples were carbon normalized using the TOC concentration measured from the surface sediment sample (BLVD-22-09) at that location.

A quantitative evaluation of sediment quality was conducted by comparing the analytical results for the sediment samples to the SLs developed in Section 5.3 (Sediment Site Screening Levels). As described in that section, the sediment SLs are based on SMS SQS criteria, except for PCBs, which is based on the PQL to be adequately protective of human health. Samples that exceeded the SMS CSL or AET criteria are indicated in Table 6-4 and Table 6-5 and on Figure 6-8.

For PCBs, the SL is based on the PQL of 0.006 mg/kg, which, based on the average organic carbon content of sediment samples collected at the Site, is equivalent to a value of 0.21 mg/kg OC. The sediment PCB results are presented in Tables 6-4 and 6-5 and compared to SLs based on dry weight and carbon normalized values. Because the PCB SL is based on the PQL, the PCB SL is essentially exceeded at any location where PCBs are detected.

The SLs were exceeded for one or more constituents in 20 of the 25 samples. The constituents that were detected at concentrations exceeding the SQS criteria include copper, lead, mercury, silver, zinc, PCBs, BEP, and butylbenzylphthalate (BBP). The lead, zinc, and BBP SLs were exceeded once, and in different samples; BEP and copper SL exceedances occurred in two samples; and the mercury SL was exceeded in five surface sediment samples and five core samples. The presence of mercury at concentrations exceeding the SQS is likely associated with the Whatcom Waterway site and not a release from the Site. PCBs were detected, and exceeded the SL, in 11 of the 12 surface sediment samples and all three of the core samples tested for PCBs. Analytical results for the seven constituents detected above their site SLs are presented on Figure 6-8. Detections of other constituents including cadmium, chromium, phenols, 4,4-DDD and -DDT, low molecular weight polycyclic aromatic hydrocarbons (LPAHs), high molecular weight polycyclic aromatic hydrocarbons (HPAHs), phthalates, cyanide, ammonia, and sulfide were below Site SLs.

While the Cornwall Avenue Landfill may be a source of some contaminants to sediment associated with the wave-reworked material along the landfill shore face, the landfill does not appear to be a significant source of contaminants to Bellingham Bay sediments beyond the immediate vicinity of the Site boundary. This conclusion is supported by the following information:

- With the exception of PCBs, the constituents that exceeded the Site SLs in landfill-associated surface sediment samples (copper, lead, zinc, silver, mercury, BEP, and BBP) did not exceed the SLs at the supplemental RI locations located beyond the extent of refuse in sediment.

- None of the constituents tested in the surface sediment, except PCBs, exceed the Site SLs by a factor of 2 or greater at more than one location. The zinc concentration exceeded its SL by a factor of 5.2 at sampling location E-2 and the BBP concentration at sampling location SRI-1 exceeded the SQS by a factor of 2.4.
- With the exception of PCBs, all of the sediment samples that exhibited more than one SL exceedance were collected from the intertidal zone or close proximity to the uplands.

Although the PCB SL was exceeded at numerous locations due to the use of the PQL as the SL, the concentrations are generally low, with only two samples exceeding the current SMS SQS or CSL criteria. Additionally, the distribution of PCB concentrations does not indicate a significant source of PCBs in the landfill. For example, the second highest sediment PCB concentration detected in Site sediment (16.2 mg/kg OC at S-3) was collected in the immediate vicinity of a location where PCBs were below reporting limits (E-4). Similarly, the highest PCB concentration detected in sediment (24.6 mg/kg OC at E-2) was collected adjacent to a location with a much lower concentration (5.8 mg/kg OC at S-2). Other concentrations generally ranged from about 1 mg/kg OC to about 4.5 mg/kg OC, which translates to a PCB dry weight range of about 0.03 mg/kg to about 0.14 mg/kg based on an organic carbon concentration of 3 percent.

Although not generally considered a contaminant in sediment, sulfide was observed to be significantly elevated in sample S-3. The specific cause of the high sulfide concentration is unknown. Elevated levels of sulfide in surface sediment commonly occur in an anaerobic environment and may originate from the anaerobic activity associated with wood debris present in the vicinity of sampling location S-3.

Sediment core data from location BLVD-SC-09 provides a basis for assessing the extent to which natural recovery processes are occurring in the Site vicinity. Seven core samples were collected at this location, extending in approximately 2 ft increments from the surface to a depth of 9.7 ft below mud line. Mercury was the only constituent tested for in every core sample. The mercury concentration was highest in the 3 to 4 ft core sample (3.8 mg/kg) and showed a consistently decreasing concentration in shallower core samples, with a concentration of 0.8 mg/kg in the 0 to 2 ft core. PCBs were only tested for in the upper three cores, but also showed a consistently decreasing concentration in shallower sediment, with PCB concentrations decreasing from 21.47 mg/kg OC in the 3 to 4 ft sample to 3.2 mg/kg OC in the 0 to 2 ft sample. The significant and consistent decrease in COPC sediment concentration from depth to the surface clearly demonstrates that natural recovery processes are occurring and that significant sediment accumulation is occurring at the Site.

Based on the analytical results from marine sediment characterization, marine sediment quality can be summarized with the following characteristics:

- Heavy metals generally above sediment SLs in near-shore surface sediment

- Mercury above sediment SLs in most surface sediment samples (likely originating from the Whatcom Waterway site)
- BEP above the sediment SL and low level concentrations of other phthalates in near-shore surface sediment
- PCBs above the sediment SL through marine sediment (based on PQL as SL)
- Low level pesticide detections (4,4-DDD and -DDT) in near-shore surface sediment
- Low level PAH detections
- Cyanide, sulfide, ammonia, and phenols (consistent with presence of refuse and wood waste).

6.5 SURFACE WATER AND AIR QUALITY

The surface water and air quality were not evaluated as potentially affected environmental media for the Site RI. The absence of surface water bodies within the upland portion of the Site deemed it unnecessary to perform a surface water assessment. Air quality was not assessed because it is not considered a significant concern under the present ground cover at the Site.

The only potential air quality issue associated with the Site that has been identified is landfill gas emissions resulting from the decomposition of refuse and wood debris. The age of the landfill and high permeability of the existing landfill cover would indicate that the current air emissions are likely minimal and diffuse. During the interim action conducted in 2011 and 2012, a significant portion of the Site was covered with a low-permeability material and a flexible membrane liner (20 mil scrim reinforced polyethylene) as described in Section 3.7 (Interim Action). Based on the potential for landfill gas production, although it is expected to be minimal, a passive landfill gas ventilation system was installed beneath the low permeability material. For the purposes of this RI/ FS, it is assumed that the existence of degrading landfill refuse and wood waste at the Site is sufficient to require landfill gas control as part of any cleanup alternative implemented at the Site that includes a low permeability cap installed over significant portions of the Site. An assessment of landfill gas generation and gas quality will be conducted at the Site in order to design the landfill gas control system and to evaluate the potential emissions. This evaluation will be conducted as part of the remedial design process and presented in the Engineering Design Report in accordance with requirements under a Consent Decree.

7.0 CONCEPTUAL SITE MODEL

The conceptual Site model (CSM) was developed based on historical land use, environmental data, and the contaminant fate and transport processes that control the migration of contaminants in the natural environment. A schematic representation of the Site CSM is presented on Figure 7-1, and the following sections discuss the factors affecting the CSM, including contaminants and sources present at the Site, the nature and extent of contamination, fate and transport processes, exposure pathways and receptors, and source control efforts.

The RI conclusions are also presented at the end of this section.

7.1 CONTAMINANTS AND SOURCES

The chemical contaminants detected in groundwater at the Site at concentrations exceeding SLs are primarily metals (copper, nickel, lead, and manganese), fecal coliform, ammonia, petroleum hydrocarbons, SVOCs (including PCP and PAHs), and PCBs. In addition, refuse and wood debris present at the Site could generate methane gas. The source of these contaminants is the Cornwall Avenue Landfill and the historical wood product industrial activities that preceded the landfill, with the following exceptions or clarifications:

- PCP contamination, petroleum hydrocarbon contamination, and related contamination (i.e., SVOCs and cPAHs) primarily originate from wood treating activities that occurred on the R.G. Haley site and which have migrated onto the Cornwall Site.
- Fecal coliform contamination in groundwater beneath the upland portion of the Site appears to be associated with releases of raw sewage or septage from damaged sanitary sewer lines or septic tanks that are no longer in service. Bird droppings associated with the roof of the former GP warehouse are also possible historical sources of fecal coliform.
- Fecal coliform detected in groundwater seep samples collected at the shoreline may be attributable to birds or other marine mammals that frequent the shoreline. Fecal coliform was not detected in samples collected during the supplemental RI from the two most recent rounds of seep sampling, so previous fecal coliform SL exceedances likely resulted from particulates entrained in the seep samples.
- Ammonia is likely a secondary contaminant associated with refuse and wood waste decomposition and not a direct release of ammonia at the Site.
- Manganese in groundwater is likely a secondary contaminant associated with reduced groundwater conditions typically associated with refuse and wood debris.
- Copper concentrations in upgradient groundwater (MW-1) appear to be at least partially the result of elevated particulates entrained during sampling, and may also result from natural background conditions or minor, unidentified sources. Only one of 24 downgradient groundwater samples exceeded the SL for copper (MW-11S). During the second round of sampling from this well, the concentration was below the SL.

- Lead in groundwater seep samples and surface sediment likely originates from refuse, although the limited extent of lead contamination in both media suggests that only a limited source is present. Additionally, dissolved lead was not detected above the SLs in the samples collected during the two rounds of supplemental RI seep sampling or the two rounds of 2012 supplemental RI groundwater sampling, indicating that lead in groundwater likely results from particulates entrained in the earlier seep samples.

The results of soil, groundwater, and sediment investigations are discussed in detail in Section 6.0 (Nature and Extent of Contamination). A summary of the distribution of constituents detected above SLs is discussed below and shown on Figure 7-2. The extent of contamination in the upland portion of the Site primarily includes the area upgradient of the landfill where soil and groundwater have been impacted by petroleum hydrocarbon contamination (and related compounds) from the R.G. Haley site, and areas of buried refuse and wood debris. The extent of the petroleum hydrocarbon contamination and refuse/wood waste are shown on Figure 7-2. The extent of petroleum hydrocarbon contamination, primarily in the diesel range, is defined by the area over which groundwater or soil exceed applicable Site SLs, which is essentially equal to the area where visible sheen was observed during Site investigation activities. As previously discussed, the R.G. Haley site is the primary source of petroleum hydrocarbon, PCP, and PAH contamination at the Site.

The extent of landfill refuse present in the upland portion of the Site is depicted on Figure 7-2. Due to its heterogeneous nature, specific contaminant sources within the refuse have not been identified. However, PCB, metals, and ammonia contamination observed in Site groundwater and sediment is assumed to originate from refuse present in the landfill, and it is possible that dioxins/furans could be present in the refuse. Fecal coliform contamination in the uplands portion of the Site appears to be related to sanitary sewer or septage releases, and possibly bird droppings, and not releases specific to historical Site activities. The fine-grained, stabilized sediment placed at the Site during the Interim Action contains dioxins/furans at concentrations above the SL, and low concentrations of some heavy metals and cPAHs that exceed the SLs based on protection of groundwater, as discussed in Section 6.2.4 (Interim Action Low Permeability Material). The extent of contamination associated with hazardous substances contained in the stabilized sediment is limited to the IPAs where the material is stored. As shown on Figure 6-1, wood waste is present throughout most of the upland portion of the Site. Although explorations have not been advanced in the southeast portion of the Site, it is anticipated that wood waste is also present in this area due to the extensive wood products industrial history of the Site.

The constituents detected in sediment at concentrations exceeding the Site SLs consist of metals (copper, silver, zinc, lead, and mercury), PCBs, BEP, and BBP. As shown on Figure 7-2, landfill refuse and wood debris are present at distances of up to about 350 ft from the shoreline. As discussed in Section 6.4.1 (Extent of Refuse and Wood Debris), the extent of wood debris and landfill refuse in sediment that represents a potential threat to benthic organisms based on Site-specific criteria established by Ecology is more limited due to the deposition of clean sediment over most subtidal areas of the Site, as is shown on Figure 7-2. Concentrations of most constituents above the Site SLs in sediments are sporadic and no constituent exceeded its Site SL at more than two locations except PCBs. With the exception of a single exceedance of BBP, PCBs, and possibly cPAHs, the extent of surface sediment containing constituent concentrations above the Site SLs does not extend beyond the area that represents a potential threat to benthic organisms based on the presence of wood debris and landfill refuse. Because the PCBs SL is based on the PQL, and PCBs were detected in all but one sediment sample tested for PCBs, the in-water Site boundary is considered an estimate. Because of its low concentrations relative to the SQS criteria, HPAHs (including cPAHs) were not tested for extensively in sediment. As discussed in Section 5.3 (Sediment Site Screening Levels), the cPAHs concentrations are generally low relative to PCBs and achievement of the PCB SL is assumed to also address potential human exposure to cPAHs. So the Site boundary, as determined by PCBs, is assumed to also bound the extent of Site cPAHs contamination in the aquatic portion of the Site.

7.2 FATE, TRANSPORT, AND ATTENUATION PROCESSES

This section provides an overview of the fate, transport, and attenuation processes that likely affect the migration of contaminants in the various media present at the Site. As discussed in the following sections, the primary fate and transport processes include:

- Leaching of contaminants from refuse by infiltrating precipitation
- Leaching of contaminants by groundwater in direct contact with refuse
- Migration of affected groundwater to potential receptors
- Migration of soil gas (methane and petroleum hydrocarbon vapors)
- Wave erosion and redistribution of refuse, wood debris, and associated chemical contaminants in the aquatic environment
- Erosion and transport of refuse/wood waste in stormwater runoff.

In addition to the naturally occurring processes described below, anthropogenic processes could affect the fate and transport of the contaminants at the Site in the future. These processes could include earthwork related to construction activities where contaminated soil is redistributed vertically or laterally during excavation of the subsurface, installation of future subsurface utilities that could act as a preferential transport pathway for contaminated groundwater and landfill gas migration, or recontamination from non-point sources (stormwater and atmospheric deposition). Propeller wash and anchor drag are also anthropogenic processes that may cause the redistribution of contaminated sediment or refuse in the aquatic portion of the Site, although these processes are unlikely to be significant under currently anticipated future land use scenarios.

7.2.1 UPLAND SOIL

The transport of contaminants in soil generally occurs through two primary mechanisms at the Site. Contaminants that partition to soil can be transported by erosion, either via stormwater runoff or by wave erosion along the shoreline. In the case of petroleum hydrocarbon contamination, transport in soil can also occur through the migration of LNAPL downward through the unsaturated zone and laterally on top of the water table surface in the downgradient direction of groundwater flow, or laterally along a low permeability contact (e.g., the Nooksack Deposits) under unsaturated or intermittently saturated conditions. Intermittent groundwater fluctuations in areas with LNAPL may result in the development of a smear zone where LNAPL becomes sorbed onto soil particles over the depth range that groundwater fluctuates. Soil petroleum hydrocarbon concentrations generally exceed cleanup levels wherever residual or free-phase LNAPL is present.

Attenuation processes in soil vary by the chemical characteristics of the contaminant. Many contaminants partition to soil and attenuate with distance from the source. Other contaminants undergo biological degradation. Petroleum hydrocarbon soil contamination typically attenuates rapidly with distance from the source due to both partitioning and biological degradation (i.e., natural attenuation). The transport of heavy metals in soil is limited for most metals due to their affinity for adhering to soil. However, some metals convert to more soluble forms under reducing conditions and migrate with groundwater, as discussed below. Fecal coliform attenuates rapidly from its source because fecal coliform require a nearby source of fecal matter to remain viable. Additional contaminant transport can occur through anthropogenic activities, such as excavation or grading, which have the potential to relocate contamination to greater depths, unaffected areas, or to offsite locations.

The migration of petroleum hydrocarbons in LNAPL form requires an ongoing LNAPL source as a driving force, which appears to be lacking for the portion of the R.G. Haley release located on the Site based on no observations of LNAPL in the groundwater monitoring wells constructed in 2012 along the shoreline at the Site. As a result, migration of petroleum hydrocarbon LNAPL appears to be limited, which is consistent with observations in 2007 at the R.G. Haley site (GeoEngineers 2007). The degradation of petroleum hydrocarbon LNAPL is quite slow, even at sites with ideal, high redox potential. Given the low redox potential due to refuse and wood debris decomposition, the degradation of petroleum hydrocarbon LNAPL is anticipated to be quite slow.

The mobility of dioxins/furans in the stabilized sediment was evaluated in the Interim Action Work Plan (Landau Associates 2011). The evaluation considered two mechanisms for migration of dioxin/furans contained in the fine-grained sediments stored on the property associated with the Site: 1) mobilization caused by infiltration of precipitation through the material and 2) a rise in sea level causing groundwater to rise and inundate the material. Each of these mechanisms involve water coming into contact with and leaching dioxins/furans from the material, entering the groundwater flow system, and discharging to surface water. The potential impacts of this migration pathway to groundwater were evaluated using the MTCA three phase partitioning model [WAC 173-340-747(5)]. Based on the high affinity of dioxins/furans to partition to soil particles and the low hydraulic conductivity of the fine-grained sediments, it was estimated that groundwater impacts from infiltration through the material would be less than that from the infiltration of precipitation through soil containing natural background concentrations of dioxins/furans for soil in Washington State. It was also estimated that the concentration of dioxins/furans would need to be about twice the maximum concentration measured in the fine-grained sediments to adversely affect surface water quality, even in the event that the material was inundated continuously by rising groundwater (Landau Associates 2011).

7.2.2 GROUNDWATER

Other than shoreline erosion, groundwater is the primary transport media for upland contaminant migration at the Site. Because the upland portion of the Site is not completely capped with a low permeability material, and refuse and wood debris are in direct contact with groundwater, leaching of contaminants to groundwater is ongoing. In particular, contaminants that are mobilized, or created, by the decomposition of refuse and wood debris (such as manganese and ammonia) will continue to be generated for many years. However, the average concentrations of these compounds measured upgradient of the point of discharge to surface water exceed the Site SL by much less than an order of magnitude in almost all instances, which suggests that the groundwater SLs can likely be achieved at the shoreline through actions that significantly decrease groundwater flow rates.

The transport of heavy metals in groundwater typically occurs in a dissolved form, although metals can also migrate in colloidal (particulate) form. Most metals transported in groundwater attenuate rapidly with distance from the source primarily through absorption. However, certain metals, such as iron and manganese, transform to soluble ionic forms under low oxidation reduction potential conditions, such as those present at landfill sites.

The attenuation of heavy metals and petroleum hydrocarbons is heavily influenced by hydrodynamic dispersion in a tidally-influenced groundwater regime such as that present near the Site shoreline. Hydrodynamic dispersion in groundwater subjected to tidal fluctuations is greatly increased due to the mixing of surface water and groundwater in the vicinity of the shoreline; the fluctuation in groundwater elevation also causes “tidal pumping” of soil gas in the unsaturated zone. Tidal pumping results in greater air/soil gas exchange and a more oxygen-rich subsurface environment, which in turn supports greater absorption or precipitation for most metals and greater aerobic decomposition of petroleum hydrocarbons.

The transport of petroleum hydrocarbons in groundwater occurs in the aqueous phase. Transport is affected by various processes, including absorption, dispersion, and biological decomposition. These attenuation factors are collectively referred to as natural attenuation, and tend to be most effective in an aerobic (oxygen-rich) environment. Refuse and wood debris landfills are generally depleted of oxygen, and as a result, it would be expected that natural attenuation would be relatively limited at this Site. However, microbial populations that are well adapted to anoxic environments are generally present in landfill refuse and will provide some attenuation via biological decomposition, although at a slower rate.

7.2.3 SOIL VAPORS

The migration of petroleum hydrocarbon vapors and methane gas produced by the decomposition of the refuse and wood debris represents a migration pathway of potential concern. Petroleum hydrocarbon LNAPL that contains VOCs, such as gasoline and diesel, also release contaminants to soil vapor. Vapor phase migration can be exacerbated at sites containing refuse or wood debris due to the generation of methane gas, which acts as a driving force for vapor-phase migration and can cause soil gas to migrate significant distances. Under the current permeable soil cover and land use conditions, vapors can migrate vertically upward and diffuse to the atmosphere. This condition was maintained after implementing the 2011/2012 sediment beneficial reuse interim action by installing a passive landfill gas control ventilation as part of that action. However, the management of soil vapors will be additionally considered for future development and remedial scenarios.

7.2.4 SEDIMENT

Primary fate and transport mechanisms in the aquatic environment include shoreline erosion due to wave action, bioturbation, and deposition of clean sediment. Bioturbation is the mixing (or displacement) of sediment caused by the natural activities of aquatic organisms (e.g., benthos). Past studies in Puget Sound have demonstrated benthic organisms are generally found within the uppermost 10 cm of the sediments (Ecology 2008). Studies for the Whatcom Waterway site show the depth of bioturbation for much of Bellingham Bay ranges from 10 to 15 cm (RETEC 2006), and the predominantly biologically active zone is assumed to be 12 cm. The burrowing activity of the benthic organisms may cause mixing of underlying contaminated sediments with clean surface sediments, or vice-versa. Bioturbation can act as either a contaminant transport or attenuation mechanism, depending on a number of factors, such as the rate of clean sediment deposition, the level of biological activity, and the nature and extent of contamination. Some organisms may burrow deeper than 10 or 15 cm, such as ghost shrimp

(*Neotrypaea californiensis*), which are commonly noted as one of the deepest burrowers. Ghost shrimp typically burrow to depths of approximately 40 cm. These organisms are present at the Whatcom Waterway site area and occur throughout Pacific coastal waters (RETEC 2006); therefore, there is potential for their presence in intertidal areas at the Site.

As described in Section 4.1.3 (Shoreline Features and Erosion), substantial shoreline erosion has occurred since closure of the landfill. This erosion has caused transport of landfill refuse, and likely wood debris, to the intertidal and subtidal portions of the Site. Bioturbation has caused intermixing of recently deposited clean sediment with underlying contaminated sediment, reducing the concentration of contaminants in surface sediment.

The primary transport mechanism for contaminated sediment at this Site is wave erosion. The amount of erosion due to waves varies with water depth. In relatively shallow water depths (e.g., less than 10 to 15 ft), wind-driven waves can produce increases in bottom velocities that can resuspend settled sediment, and thus cause sediment transport and redistribution. The Site is located in an unprotected area and, therefore, is exposed to prevailing offshore winds, increasing the likelihood of storm waves that may result in resuspension of settled sediment. The impact of Site wave erosion is evidenced by the significant amount of shoreline retreat that has occurred since the landfill was closed and the presence of refuse in surface sediment. However, wave erosion has decreased significantly in recent years, as discussed in Section 4.1.3 (Shoreline Features and Erosion).

The most effective process for attenuation in sediment is sediment deposition. This process involves burial of the contaminated surface sediment over time by natural deposition of clean sediment such that the depth of the contaminated sediment is below the biologically active zone, thereby reducing risk to benthic organisms. As discussed in Section 4.1.4 (Sediment Deposition), the results of the 2008 Ecology sediment investigation indicate that significant sediment accumulation has occurred throughout much of the subtidal portion of the Site. This was further evidenced in the sediment core data from location BLVD-SC-09, discussed in Section 6.4.2 (Chemical Assessment). The data from this location indicate a significant and consistent decrease in COPC sediment concentration from depth to the surface, and clearly demonstrate the natural recovery occurring through sediment accumulation at the Site. The deposition of recent, clean sediment has occurred in sufficient quantities to establish a clean surface sediment layer over most of the affected subtidal area, consistent with natural recovery processes.

Other attenuation processes in sediment include long-term weathering and transformation processes. However, weathering tends to be relatively slow compared to deposition and contaminant burial. Contaminant weathering in sediments consists of dilution, volatilization, chemical transformation, biotransformation and biodegradation, and sorption. Although slow, these processes contribute to the permanent reduction of contaminant concentrations and bioavailability. Shoreline erosion in the intertidal zone remains a transport mechanism of concern for the aquatic portion of the Site and will be considered for all remedial scenarios in the FS.

7.3 REMEDIAL ACTIONS COMPLETED TO DATE

Source control activities address the elimination of releases from historical property usage or activities at adjacent properties that resulted in contamination of affected media. The potential sources of contamination identified at the Site include refuse placed in the former municipal landfill, wood debris in upland or marine portions of the Site, and releases associated with historical wood treating operations on the R.G. Haley site. Actions taken to control these sources are described below.

7.3.1 LANDFILL REFUSE AND WOOD DEBRIS

Following closure, the landfill was covered with a soil layer of variable thickness, and the shoreline was protected by various phases of informal slope armoring consisting of a variety of rock boulders and broken concrete. In addition to the soil layer covering the surface of the landfill, an additional approximately 47,500 yd^3 of fine-grained sediment was brought to the property during 2011/2012 interim action, as described in Section 3.7 (Interim Action). Despite the shoreline armoring, significant shoreline erosion occurred, which resulted in exposure of landfill refuse at the surface and redistribution of landfill refuse in the intertidal and subtidal areas throughout the Site. Some shoreline armoring remains in place and thereby may reduce the amount of landfill refuse actively eroding into the aquatic environment. Natural deposition of sediment is also occurring in the subtidal portion of the Site, as discussed in Section 4.1.4 (Sediment Deposition), thereby capping the refuse and wood debris in this area with clean sediment such that the depth of the refuse and wood debris is below the biologically active zone.

7.3.2 R.G. HALEY SITE

The R.G. Haley site was a former wood treatment plant that used large quantities of P-9 carrier oil with and without PCP additive. P-9 carrier oil was reportedly released to several portions of the R.G. Haley site, including sediment. Additionally, contamination in the form of LNAPL has migrated to the south onto the Cornwall Avenue Landfill Site.

Process wastewater, including PCP-contaminated drainage fluid, was reportedly discharged to the former seepage pit. The former seepage pit was located in the southwestern corner of the R.G. Haley site, in close proximity to the Cornwall Avenue Landfill Site's northeastern property line. In July 1985, approximately 80 tons of contaminated material from the seepage pit and adjacent area was removed and disposed off site, and the excavation was backfilled with granular fill and paved with asphalt (GeoEngineers 2007).

Oil recovery from the subsurface at the R.G. Haley site has been implemented since 2000. Between 2000 and 2007, approximately 270 gallons of oil was recovered from the subsurface. Additionally, a steel sheetpile wall was constructed along the shoreline on the R.G. Haley site in 2002 to minimize shoreline erosion and further releases of LNAPL to the marine environment. About 100 yd^3 of petroleum-contaminated sediment was excavated in conjunction with installation of the sheetpile wall. The R.G. Haley RI/FS report (GeoEngineers 2007) provides additional information regarding source control activities for the R.G. Haley site, and source control efforts after 2007 will be described in an upcoming draft of the RI/FS report for that site.

7.4 REMEDIAL INVESTIGATION CONCLUSIONS

The RI has identified contaminants present at the Site, affected media, potential receptors and exposure pathways, and the fate and transport of the contaminants at the Site, and a comprehensive CSM has been developed based on this information. This CSM (summarized on Figure 7-1) allows for the development of cleanup levels that will be protective of human health and the environment. Although additional studies may be required as part of remedial design, sufficient information has been obtained to develop and evaluate remedial alternatives, and select a final cleanup action. The following contaminants and sources are addressed in the FS:

- Refuse and wood debris in upland and aquatic portions of the Site
- Metals, PCBs, and ammonia in Site groundwater
- Methane, petroleum hydrocarbons, and possibly VOCs in soil gas
- Metals, PCBs, cPAHs, BEP, and BBP in sediment.

Petroleum hydrocarbons and the associated PAHs and SVOCs resulting from releases from the R.G. Haley site are not specifically addressed in the FS. However, the selection of the preferred remedial alternative for this Site will consider the coordination of the cleanup activities for the two sites in order to prevent impacting cleanup activities related to the R.G. Haley site releases.

8.0 DISCUSSION OF CLEANUP STANDARDS

This section identifies regulatory cleanup requirements through the development of Site-specific cleanup levels based on remedial action objectives (RAOs) and consideration of potentially applicable laws and regulations. Screening criteria for detected groundwater constituents is presented in Table 8-1, preliminary cleanup levels (PCLs) for groundwater and sediment are shown in Table 8-2, and screening criteria for detected sediment constituents is presented in Table 8-3.

8.1 SITE CLEANUP STANDARDS

Affected Site media include soil, groundwater, and sediment. Cleanup standards consist of cleanup levels and the point(s) of compliance where the cleanup level will be achieved for each affected media. The following sections present PCLs and points of compliance for affected Site media. PCLs were set for groundwater and sediment, but not soil, as described below and summarized in Table 8-2. Final cleanup levels will be developed for the Site by Ecology in the cleanup action plan (CAP).

8.1.1 SOIL CLEANUP STANDARDS

Due to its nature as a waste material and inherent heterogeneity, the refuse was not characterized for soil quality during the RI. Rather, the refuse is assumed to be contaminated for the purposes of the RI/FS and constituent-specific soil PCLs were not developed. Because of the potential for intermixing, or impacts from previous Site industrial activities and activities on the adjacent R.G. Haley site, existing Site cover soil is also considered potentially contaminated and will be addressed in the same manner as refuse and wood waste in the FS. This is also true for the interim action sediment brought to the property; it too is contaminated. All of the cleanup alternatives developed in the following section [Section 9.0 (Feasibility Study)] address the contaminated soil/refuse/wood waste either by completely removing it or by isolating it from the environment. As a result, cleanup levels protective of direct contact, leaching, and erosion are not necessary, and have not been established.

The development of soil cleanup standards typically includes consideration of the vapor migration pathway if VOCs are present in soil. However, because the Site contains refuse and wood debris that will continue to generate low levels of methane for many years, landfill gas (LFG) control will be an element of any Site cleanup action that includes containment. As a result, any VOCs present in Site soil will be addressed by the methane gas control system, which will eliminate the soil vapor as a potential exposure pathway for the Site. Consequently, soil cleanup levels protective of the vapor migration pathway were not developed for the Site.

The point of compliance for soil in WAC 173-340-740(6) is throughout the Site. MTCA recognizes that for those cleanup actions that involve containment of hazardous substances, the soil cleanup levels will typically not be met throughout the Site [WAC 173-340-740(6)(f)]. However, MTCA also recognizes that such cleanup actions may still comply with cleanup standards. The determination of the adequacy of soil cleanup will be based on the remedial action alternative's ability to comply with groundwater cleanup standards for the Site, to meet performance standards designed to minimize human or environmental exposure to affected soil, and to provide practicable treatment of affected soil. Performance standards to minimize human and environmental exposure to affected soil may include institutional controls that limit activities that interfere with the protectiveness of the remedial action. Specific actions are described in subsequent sections of this report.

8.1.2 GROUNDWATER CLEANUP STANDARDS

Site groundwater PCLs are based on groundwater discharge to surface water (Bellingham Bay). MTCA allows for the application of groundwater cleanup criteria based on the protection of adjacent surface water if releases of hazardous substances occur to groundwater that has an extremely low probability for use as a future drinking water source [WAC 173-340-720(1)(c)]. As discussed in Section 4.3.1.5 (Groundwater Use), Ecology has determined that Site groundwater is non-potable in accordance with WAC 173-340-720(2). As a result, the use of PCLs protective of marine surface water is appropriate for the Site.

The groundwater PCLs are based on the same criteria used for the development of the SLs in Section 5.4 (Groundwater Screening Levels). As such, the groundwater PCLs are the most stringent of the following criteria adjusted to the PQL or background concentration (as appropriate): 1) federal (40 CFR 131.36) and state (MTCA) surface water criteria based on human consumption of fish, and 2) federal (40 CFR 131.36) and state (Chapter 173-201A WAC) acute and chronic water quality criteria. Since surface water criteria have not been established for total petroleum hydrocarbons, MTCA Method A cleanup levels for groundwater were used for these constituents for evaluation of risk to human health, as provided for in WAC 173-340-730(3)(b)(iii)(C). The Method A groundwater cleanup levels for petroleum hydrocarbons are not specifically referenced as applicable to surface water for protection of aquatic life. As such, Method A groundwater PCLs may not be appropriate screening criteria for demonstrating protection of aquatic organisms if petroleum hydrocarbons are broadly distributed near the point of groundwater discharge to surface water. As discussed in Section 6.3.3 (Downgradient Perimeter Groundwater Quality), petroleum hydrocarbons were not found to be present in most wells near the shoreline at this Site.

The point of compliance for groundwater is typically throughout the Site when groundwater is considered a potential source of potable drinking water. If groundwater discharge to surface water represents the highest beneficial use, MTCA provides for a conditional point of compliance at the point of discharge of groundwater to the surface water receiving body. The conditional point of compliance is acceptable under MTCA for properties abutting surface water with the following conditions [WAC 173-340-720(7)(d)(i)]:

A. Contaminated groundwater is entering, and will continue to enter, surface water even after implementation of the selected cleanup action
B. If it is not practicable to meet the cleanup level at a point within the groundwater before entering the surface water within a reasonable restoration timeframe
C. A mixing zone is not used to demonstrate compliance
D. Groundwater discharges are provided with all known available and reasonable methods for treatment before being released to surface waters
E. Groundwater discharges shall not result in violations of the sediment quality values published in Chapter 173-204 WAC
F. Groundwater and surface water monitoring shall be conducted to assess the long-term performance of the selected cleanup action
G. Notice of proposal of the conditional point of compliance shall be mailed to DNR and the USACE inviting comments on the proposal.

Conditions A and B are currently met based on the information provided in the RI. A mixing zone will not be proposed to achieve compliance with groundwater cleanup standards, addressing condition C. The FS will evaluate, and integrate as applicable, all known available and reasonable methods of groundwater treatment into the remedial alternatives to address condition D. The groundwater cleanup levels will consider protection of marine sediment quality to address condition E. Groundwater and surface water quality compliance monitoring will be included in all remedial alternatives developed in the FS to address condition F. Required notice will be provided to the USACE and DNR once a final cleanup action is selected for the Site, if the selected remedy requires a conditional point of compliance, to address condition G.

Based on these considerations, it is anticipated that the downgradient edge of the Site, as close as technically possible to the point of entry of groundwater to Bellingham Bay, will be established as the conditional point of compliance for Site groundwater. The achievement of groundwater cleanup levels will be measured at the conditional point of compliance using a network of groundwater monitoring wells located at the downgradient edge of the Site.

The data collected in 2012 from the groundwater monitoring wells located near the downgradient edge of the Site were used to develop the screening criteria summary presented in Table 8-1. As indicated in Table 8-1, there were exceedances of one or more of the water quality criteria for copper, manganese, and NH_3-ammonia. Each of these is identified as a Site indicator hazardous substance (IHS) based on exceedance of the SL with the exception of copper, as discussed below. The most stringent of the applicable criteria is identified as the PCL for groundwater at the Site and is summarized in Table 8-2.

Fecal coliform was detected in groundwater seep samples, but was not carried forward as an IHS because it appears to be unrelated to the Site and appears to originate from non-landfill sources, as discussed in Section 6.3.1 (Overlap Area Groundwater Quality). In addition, fecal coliform bacteria were not detected in any of the seep groundwater samples collected during the supplemental RI.

The maximum detected groundwater concentration of copper in the downgradient perimeter wells was 2.6 μg/L. This value only slightly exceeds the PCL for dissolved copper of 2.4 μg/L and is below the concentration of 7.2 μg/L detected in an upgradient well. Based on the low frequency of exceedance (1 of 24, or 4 percent) and considering the maximum detection only slightly exceeds the SL, copper was not carried forward as an IHS.

A number of VOCs and SVOCs that do not have promulgated cleanup criteria were detected in Site groundwater at low concentrations, primarily during the 2012 supplemental groundwater sampling activities. As discussed in Section 5.4 (Groundwater Screening Levels), the concentrations of these constituents are near the method reporting limits and are orders of magnitude lower that the concentrations of groundwater IHS such as manganese and ammonia. As a result, any cleanup actions that adequately address established groundwater IHS will result in concentrations below the PQL for these hazardous substances that lack applicable cleanup criteria. As a result, groundwater PCLs were not developed for these COPCs and they are not carried forward as Site IHS.

It is important to note that petroleum hydrocarbons and specific compounds associated with petroleum hydrocarbon contamination are not identified as IHS for groundwater (or soil) even though extensive petroleum hydrocarbon sheen was observed within and upgradient of the Site. Petroleum hydrocarbon detections in groundwater upgradient of the Site have exceeded MTCA groundwater Method A cleanup levels for diesel- and oil-range petroleum hydrocarbons. As discussed in Section 6.3.1 (Overlap Area Groundwater Quality), the petroleum hydrocarbon contamination appears to originate from the R.G. Haley site. Although the petroleum hydrocarbon sheen appears to originate from an offsite source, its presence should not compromise the effectiveness of any of the alternatives evaluated for cleanup of the Site.

Petroleum hydrocarbon constituents were not detected above SLs in groundwater monitoring wells located along the downgradient perimeter of the upland portion of the Site. Gasoline-range petroleum hydrocarbons were detected at a concentration of 330 μg/L in one groundwater sample collected from MW-13D, which is below the SL of 800 μg/L based on protection of human health. Regulatory criteria for gasoline-range petroleum hydrocarbons protective of marine organisms are not available, so it is not known whether the groundwater SL is adequately protective of marine organisms. However, gasoline-range petroleum hydrocarbons were not detected in the 28 other groundwater and seep samples tested for this analyte, including the other sample collected from MW-13D, for a frequency of detection of about 3.5 percent. Based on a frequency of detection of less than 5 percent, and a detected concentration less than the SL, gasoline-range petroleum hydrocarbons was not carried forward as a Site IHS for groundwater.

8.1.3 SEDIMENT CLEANUP STANDARDS

The sediment PCLs are based on the chemical criteria identified for the sediment SLs discussed in Section 5.3 (Sediment Site Screening Levels) and the Site-specific physical criteria for refuse and wood debris coverage considered protective of benthic organisms presented in Section 6.4.1 (Extent of Refuse and Wood Debris). The SQS and bioaccumulative SLs are the primary chemical criteria for the sediment PCLs. The physical criteria for the sediment PCLs consist of the following Site-specific criteria for refuse and wood debris in the aquatic environment that Ecology considers adequately protective of benthic organisms (Kovacs 2008):

- No less than 1 ft of accumulated thickness of sediment where wood debris (sawdust or wood chips) constitutes greater than 50 percent of the sediment by volume
- No detectable refuse
- No less than 1 ft of clean sediment cover over sediment that exceeds the above criteria for wood debris and refuse.

The sediment analytical data were compared to SQS values to identify sediment IHS and PCLs, except that PCB analytical data were also compared to the sediment PQL as a conservative approach to addressing the bioaccumulative characteristics of this IHS, as previously discussed in Section 5.4 (Groundwater Screening Levels). The constituents detected in sediment at the Site are compared to applicable levels in Table 8-3.

The IHS identified for marine sediment at the Site are copper, cadmium, lead, silver, zinc, BEP, cPAHs, and PCBs since these constituents were detected at least once in sediment samples at concentrations exceeding the Sediment PCLs, or in the case of cadmium, lead, and cPAHs, are carried forward as IHS based on their bioaccumulative affects although the PCB PCL is being used as a surrogate to address all bioaccumulative compounds for the purposes of the RI/FS. As stated in Section 5.3 (Sediment Site Screening Levels), all bioaccumulatives will need to be considered during development of the CAP, and cleanup levels based on bioaccumulative affects may be developed for cadmium, lead, and cPAHs at that time. A complete list of IHS and PCLs identified for sediment at the Site are summarized in Table 8-2.

The point of compliance for sediment chemical criteria is the predominantly biologically active zone, which is considered the upper 12 cm of sediment, as discussed in Section 7.2.4 (Sediment). The point of compliance for the physical criteria is the upper 1 ft (30.5 cm), as identified in the third bullet above.

9.0 FEASIBILITY STUDY

The purpose of this section is to develop and evaluate a range of cleanup action alternatives and identify the preferred alternative for Site cleanup. MTCA has established requirements for selecting a cleanup action and the expectations for cleanup action alternatives in WAC 173-340-360 and 173-340-370. This section begins with a discussion of the interdependent relationship between the Site Units requiring cleanup, then establishes RAOs and potentially applicable laws relevant to the cleanup of this Site, and develops cleanup alternatives to meet the RAOs.

9.1 SITE UNITS

The Site contains two separate and distinct affected areas that warrant designation and evaluation as independent Site Units. The Site Units are the Upland Site Unit and the Marine Site Unit, as identified on Figure 9-1. Alternatives are presented to clean up each Site Unit and a preferred alternative is developed as a Site-wide cleanup alternative which achieves RAOs for both Site Units.

Although the environmental settings of the two Site Units are separate and distinct, the primary sources of contamination, refuse and wood waste, are contiguous between the two Site Units. As a result, the cleanup actions selected for each Site Unit are interdependent and must be integrated for an effective Site-wide cleanup action. Additionally, implementation of some cleanup action elements may need to be sequenced in a specific manner to be effective. The interrelationship between, and coordination of, the Upland and Marine Site Unit cleanup alternatives are discussed as appropriate in the applicable sections of the FS. The physical factors, land and navigation use, and natural resource value for each Site Unit is described below.

9.1.1 UPLAND SITE UNIT

The Upland Site Unit is the approximately 12 acres of upland generally bounded by Bellingham Bay, the property boundary to the north (except where refuse extends beyond the northern property boundary as shown on Figure 9-1), and the landward limit of refuse and wood debris as shown on Figure 9-1. The Site is currently zoned light industrial. However, the Port and the City have developed a draft subarea plan for the Waterfront District redevelopment area that includes the property associated with the Site and other areas along the waterfront (Port of Bellingham, City of Bellingham 2010). The zoning within the vicinity of the Site will be updated to a “commercial mixed use” designation, contingent on final development of the subarea plan. The draft subarea plan anticipates that the majority of the Site (and surrounding properties) will be converted to a large park with pedestrian trails, open space, and ancillary structures such as restrooms as well as parking and vehicle access. Although not currently planned, the commercial mix-use zoning could allow for a combination of parkland and mixed use (residential condominiums, retail stores, and office parks) for the City-owned portion of the Site and the adjacent property to the southeast. Under the final 2013 Shoreline Master Program (Bellingham, City of nd.), the designated use of the Cornwall Avenue Landfill Site includes recreational parks and open spaces. The cleanup action alternatives developed herein are based on future property use as recreational parkland and open space. However, each of the alternatives presented are compatible with the various potential land uses mentioned above without significant modifications to the conceptual details.

The upland habitat of the Site is sparse, as discussed in Section 4.4.1.4 (Upland Habitat). The Site consists of a soil cover over the former landfill area and adjacent Site upland area containing wood debris. The cover soil consists primarily of granular material (sand and gravel), wood debris, and occasional areas of cobble ballast. A stormwater detention basin is located in the southeastern corner of the Site. Several catch basins remain at the Site as shown on Figure 4-4, although the system is in disrepair. These remaining features of the older surface water management system will be abandoned during cleanup of the Site. Little vegetation is present on the upland portion of the Site that would impact selection or implementation of cleanup at the Site. Section 3.7 (Interim Action) provides details concerning the low permeability material that is being temporarily stored at the Site. The 2011/2012 interim action included the placement of low-permeability material at the Site which will be evaluated in this FS as a potential media to use as capping and grading material for cleanup of the Site. As discussed in Section 4.1.3 (Shoreline Features and Erosion), the shoreline has changed significantly over the years, based on changes in the approximate location of the top of slope above the beach area.

It is likely that without additional shoreline stabilization, erosion forces would continue to rework the shoreline area, exposing and causing the migration of buried refuse. Shoreline stabilization is discussed as part of the Marine Site Unit, but stabilization features will be extended above mean higher high water (MHHW) along the shoreline, so it will extend into the Upland Site Unit.

9.1.2 MARINE SITE UNIT

The Marine Site Unit is the approximately 11.6 acre area of intertidal and subtidal aquatic lands where landfill refuse and wood debris have come to be located. Sediment within this area exceeds either surficial marine sediment physical criteria based on the protection of benthic organisms, or the sediment PCLs (chemical criteria). As shown on Figure 9-1, the estimated boundary of the Marine Site Unit extends in some locations greater than 300 ft from the shoreline. The actual distance from the shoreline may be greater than shown, when exceedances of the cleanup levels for PCBs and other bioaccumulatives are considered. Further evaluation will be completed during the design phase to define the in-water boundary of this unit.

Current and anticipated future use and navigation in the Marine Site Unit includes private and commercial maritime activities associated with the Whatcom Waterway and recreational maritime uses along the Bellingham Bay waterfront. Navigation use offshore of the property is characterized primarily by transitory vessels traveling the Whatcom Waterway. Vessels are generally not anchored offshore of the property and there are no permanent dock structures or mooring dolphins.

As described in Section 4.4.1.1 (Intertidal Habitat), the intertidal zone is composed primarily of riprap, concrete debris, and other informal shoreline stabilization materials, which provides minimal habitat for marine species other than rock crabs. The shallow subtidal portion of the Marine Site Unit contains a significant area of native eelgrass at the southern end of the Site, and a limited amount of eelgrass near the northern Site boundary, as described in Section 4.4.1.2 (Shallow Subtidal Habitat) and shown on Figure 9-1. Mudflats within the shallow subtidal zone may support epibenthic prey that is consumed by juvenile salmon migrating through the area and may provide potentially suitable habitat for Dungeness crab mating and egg brooding (RETEC 2006). Some varieties of clams and shrimp may be present in the shallow subtidal zone. The subtidal substrate and water column are also used for feeding by a variety of fish, including sub-adult and adult juvenile salmon. More detailed natural resource information can be found in Section 4.4 (Natural Resources).

9.2 REMEDIAL ACTION OBJECTIVES AND POTENTIALLY APPLICABLE LAWS

The RAOs identify the goals that must be achieved by a cleanup alternative in order to achieve cleanup standards and provide adequate protection of human health and the environment. The RAOs must address all affected media and a cleanup alternative must achieve all RAOs to be considered a viable cleanup action. The characterization of Site conditions presented in Section 6.0 (Nature and Extent of Contamination), the preliminary cleanup standards developed in Section 8.1 (Site Cleanup Standards), and the review of applicable or relevant and appropriate requirements (ARARs) have culminated in the development of RAOs for the Site.

9.2.1 REMEDIAL ACTION OBJECTIVES

RAOs can be either action-specific or media-specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on the PCLs developed in Section 8.1 (Site Cleanup Standards).

The action-specific and media-specific RAOs identified for the Site are as follows:

> ***RAO-1: Prevent erosion of refuse along shoreline:*** Previous investigations confirmed the presence of exposed landfill materials on the Site shoreline and within the intertidal and subtidal zones. A primary goal of the Site cleanup is to prevent further erosion of landfill refuse along the

shoreline. The containment alternatives must effectively prevent continued erosion of the landfill slope along the Bellingham Bay shoreline.

RAO-2: Prevent direct contact with refuse and contaminated soil: If refuse or contaminated soil (including existing cover soil and stockpiled sediment) remains on Site, direct contact with humans and terrestrial species or erosion and transport in stormwater runoff must be prevented.

RAO-3: Prevent use of shallow Site groundwater for potable purposes: Shallow Site groundwater that comes into contact with, or is affected by, refuse is not appropriate for use as potable water, and its use for such purposes must be prevented.

RAO-4: Control LFG/VOCs: Methane generated by the degradation of landfill materials may accumulate under a landfill cap designed to prevent the infiltration of water; this gas must be managed by a LFG control system. The age of the Site (no waste has been placed in the landfill for over 40 years) is such that gas generation is expected to be minimal. This RAO will also address potential human exposure to VOCs in soil gas associated with petroleum hydrocarbons released from the R.G. Haley site, or any other sources of VOCs that may be present in Site soil vapor.

RAO-5: Prevent exposure of marine biota to sediment that exceeds the sediment PCLs: Marine biota in the predominantly biologically-active zone must be protected from sediment that exceeds the preliminary sediment cleanup standards to protect marine biota, and in the case of PCBs, protect human health for individuals that consume affected marine biota.

RAO-6: Prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs: Aquatic organisms must be protected from groundwater that discharges to surface water with concentrations of contaminants that exceed the groundwater PCLs.

Additional considerations that will be evaluated when selecting a remedy for the Site include:

- Compatibility with anticipated future Site uses, including public park and/or commercial/residential development.
- Restoration of public access and marine habitat function to the shoreline, to the extent practicable.
- Retain and enhance existing eelgrass beds, to the extent practicable.
- Compatibility with planned or potential cleanup actions for the R.G. Haley and Whatcom Waterway sites.

The RAOs for the Upland Site Unit are to mitigate risks associated with Site contaminants for the potential exposure pathways and migration routes. Specifically, the RAOs that are applicable to the Upland Site Unit include the following:

- RAO-2: Prevent direct contact with refuse
- RAO-3: Prevent use of shallow Site groundwater for potable purposes
- RAO-4: Control LFG/VOCs
- RAO-6: Prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs.

The RAOs that are applicable to the Marine Site Unit include the following:

- RAO-1: Prevent erosion of refuse along shoreline

- RAO-2: Prevent direct contact with refuse
- RAO-5: Prevent exposure of marine biota to sediment that exceeds the sediment PCLs
- RAO-6: Prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs.

9.2.2 POTENTIALLY APPLICABLE STATE AND FEDERAL LAWS

The extent to which each alternative meets these objectives will be determined by applying the specific evaluation criteria identified in MTCA and SMS. In accordance with MTCA, all cleanup actions conducted under MTCA must comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate (collectively referred to as the ARARs). This section provides a brief overview of potential ARARs for Site cleanup.

The primary ARARs are cleanup standards under the SMS and MTCA cleanup levels and procedures for implementation of a cleanup under MTCA. Other potential ARARs include the following:

- Washington Chemical Contaminants and Water Quality Act and Washington Water Pollution Control Act and the following implementing regulations: Water Quality for Surface Waters (Chapter 173-201A WAC) and SMS (Chapter 173-204 WAC).
- Minimum Functional Standards for Solid Waste Handling (MFS; Chapter 173-304 WAC): these regulations contain typical closure requirements that are relevant based on the waste disposal history of the Site.
- Resource Conservation and Recovery Act (RCRA) and Subtitle C regulations, to the extent that any hazardous wastes are discovered during the cleanup action. RCRA regulations may be applied in the overlap area with the R.G. Haley cleanup site for any listed wastes that are present related to R.G. Haley operations.
- Washington Hazardous Waste Management Act and Dangerous Waste Regulations, to the extent that any dangerous wastes are discovered during the cleanup action.
- Clean Water Act, with respect to water quality criteria for surface water (Bellingham Bay) and in-water work associated with dredging or sediment capping.
- Shoreline Management Act, with respect to construction activities during the cleanup action.
- Dredge and fill requirements under CFR 320-330 and Hydraulic Code Rules under Chapter 220-110 WAC.
- ESA, due to listing of Puget Sound Chinook and the potential listing of Coastal/Puget Sound bull trout.

The current refuse regulations, Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC), are not an ARAR for the Site because the current solid waste regulations specifically reference the MFS as the applicable regulations for landfills that did not accept waste after October 9, 1991 [WAC 173-351-010(2)(b)].

MTCA, Water Quality Standards for Surface Waters, SMS, and the Clean Water Act were considered in the development of cleanup standards [Section 8.1 (Site Cleanup Standards)]. RCRA Subtitle C and Dangerous Waste Regulations are not expected to apply unless dangerous wastes are discovered or generated during the cleanup action. Dangerous wastes are not known to be present at the Site. The Shoreline Management Act, dredge and fill requirements, and Hydraulic Code Rules may apply during the implementation of a particular cleanup action but do not directly influence the evaluation of the cleanup alternatives.

The MFS landfill closure requirements (Chapter 173-304 WAC) were considered during development and evaluation of the cleanup alternatives. WAC 173-304-407 identifies closure and post-closure requirements for landfills. These requirements include the following:

- The facility shall be closed in a manner that minimizes the need for further maintenance, and controls, minimizes, or eliminates threats to human health and the environment from post-closure escape of solid waste constituents, leachate, landfill gases, contaminated rainfall, or waste decomposition products to the ground, groundwater, surface water, and the atmosphere.
- Post-closure activities include groundwater monitoring; surface water monitoring; gas monitoring; and maintenance of the facility, facility structures, and monitoring systems for their intended use for a period of 20 years or as long as necessary for the facility to stabilize (i.e., little or no settlement, gas production, or leachate generation) and to protect human health and the environment; and until monitoring of groundwater, surface water, and gases can be safely discontinued.

A draft biological evaluation will be prepared for USACE review and approval as part of the permitting process for the selected cleanup remedy. The USACE-approved draft biological evaluation will be submitted to NOAA Fisheries and USFWS concurrently to address ESA requirements.

9.3 SCREENING OF REMEDIAL TECHNOLOGIES

The purpose of the FS is to develop and evaluate cleanup action alternatives to enable an appropriate cleanup action to be selected for the Site. This FS complies with the requirements under MTCA for performance of an FS (WAC 173-340-350) and selection of a cleanup action (WAC 173-340-360). Additionally, it is consistent with the Bellingham Bay Comprehensive Strategy and meets the Bellingham Bay Action Team's objectives for contaminated Site cleanup, habitat restoration, and integrated land use.

Under MTCA, the development of a cleanup action alternative requires that technologies capable of meeting cleanup requirements are screened, and then assembled into remedial alternatives that achieve all of the RAOs. These are then evaluated and compared and a preferred alternative is identified. Section 8.0 (Discussion of Cleanup Standards) presents the cleanup requirements for the Site and Section 9.1 (Site Units) identifies the site units for which cleanup alternatives will be developed. This section describes pertinent considerations for the development of cleanup alternatives for the Site, reviews a range of potentially applicable cleanup technologies, and selects various technologies to be retained for development of cleanup alternatives in Section 9.4 (Description of Remedial Alternatives).

In this section, the range of potential technologies available for remediation of Site contaminants is reviewed and screened to identify a short-list of potentially applicable technologies for further evaluation. MTCA regulations place a preference on the use of permanent cleanup methods such as removal, disposal, or treatment, relative to those that manage contaminants in-place using institutional controls and/or containment. This preference is reflected in the MTCA and SMS evaluation criteria, and the comparative analysis of remedial alternatives. Retained technologies to be carried forward in development of remedial alternatives are summarized in Section 9.4 (Description of Remedial Alternatives).

Ecology will ultimately select a cleanup action alternative that complies with MTCA and SMS, and the PLPs will implement that cleanup action through a consent decree or agreed order. Subsequent redevelopment activities will be required to maintain the integrity of the cleanup action and comply with institutional controls, as applicable. The identified potentially applicable technologies screened are summarized in the following sections.

9.3.1 INTEGRATION OF REMEDIAL ALTERNATIVES WITH FUTURE DEVELOPMENT

One of the key screening considerations for selecting potential remedial technologies for the Site is the ability to integrate the cleanup with future development options, as previously identified in Section 9.2.1 (Remedial Action Objectives). This section is presented to provide a point of reference for the screening of technologies.

The property associated with the Site is located at the southern boundary of the Waterfront District redevelopment area, as shown on Figure 4-18. As shown on the figure, the property associated with the Site is planned for development as a public park and open space area. Development as a park could include restrooms and possibly small businesses such as food service or recreational equipment, so indoor air quality is a consideration. Property redevelopment would also include paved roadway and parking areas that would need to be integrated with capping of park vegetated areas. However, redevelopment is still in the planning stages and could conceivably change to include other uses such as mixed use, commercial, or industrial. As a result, the technologies and resulting remedial alternatives must be sufficiently flexible to apply to a number of potential future property uses.

All cleanup alternatives must be compatible with redevelopment plans for the Site property. This requires that applicable cleanup elements, such as capping and LFG control, be considered and are integrated into the development design once a development plan is selected. Detailed design and construction of the upland portions of the selected cleanup action may or may not be performed concurrently with the design and construction of redevelopment components. Therefore, institutional controls and restrictive covenants may be required to ensure that future redevelopment activities are properly integrated with capping and LFG control systems.

9.3.2 SCREENING OF UPLAND REMEDIAL TECHNOLOGIES

The RAOs applicable to the Upland Site Unit are RAO-2 (prevent direct contact with refuse where it is potentially exposed along the shoreline), RAO-3 (prevent use of shallow Site groundwater for potable purposes), RAO-4 (control LFG/VOCs), and RAO-6 (prevent exposure of aquatic organisms to groundwater that exceeds the groundwater PCLs). The remedial technologies or response actions screened for consideration in development of cleanup action alternatives for the Upland Site Unit are presented in the following sections.

9.3.2.1 Capping

Capping would be achieved by placing a low permeability cap over the upland portion of the Site to limit potential future human exposure to refuse and contaminated soil and groundwater, and to minimize surface water infiltration and groundwater recharge at the Site. The cap could be constructed of a low-permeability soil cap, a flexible membrane liner (FML) system, pavement, and/or buildings. The cap would be designed to provide surface water drainage and erosion control by sloping final ground surfaces toward drainage features that would provide conveyance and discharge to Bellingham Bay. The capping and stormwater controls would extend throughout the upland Site Unit to mitigate exposure routes and to minimize surface water recharge to groundwater.

A soil cap would consist of low permeability soil cover system placed throughout the Site to provide a physical barrier to direct contact with refuse and contaminated soil (RAO-1). The use of a fine-grained soil or sediment to construct the soil cap would significantly reduce stormwater infiltration and reduce groundwater flow and associated discharge of contaminated groundwater to surface water (RAO-6).

Similarly, a low permeability cap consisting of asphalt, an FML system, or buildings, would provide a physical barrier to prevent direct contact with refuse and contaminated soil (RAO-1), and significantly reduce stormwater infiltration and associated discharge of contaminated groundwater to surface water (RAO-6).

These approaches to upland capping (low permeability soil, FML system, pavement and buildings) are carried forward as remedial technologies for further evaluation. Any capping system implemented at the Site would also include the abandonment of the surface water control system components near the former GP Warehouse building. This includes the catch basins, tight-line conveyance system, and potential outfall shown on Figure 4-4. For each capping system discussed herein, it is assumed that 15 percent of the Site upland area will be covered with pavement or buildings, and the remaining 85 percent (455,520 ft^2) will be covered with the capping system.

9.3.2.2 Landfill Gas Management

If areas of refuse or wood debris are capped with low permeability materials, a LFG management system will be needed to ensure methane gas and potentially VOCs present in soil vapor do not pose a risk of accumulation or migration (RAO-4). LFG management typically consists of horizontal collection piping embedded in high permeability backfill and located below the low permeability cap section. Active gas management systems that generate a vacuum to remove subsurface gasses are typically reserved for sites that generate significant amounts of LFG, and passive (self-venting) systems are typically used at sites that do not generate large amounts of gas. Because landfilling has not occurred for over 40 years, and the current redevelopment plans are for primarily parks and open space, it is anticipated that a passive gas control system will be adequate for the Site. The final selection of passive gas control or active gas control will be made during the system design based on the selected cleanup action, the final development plan selected for the Site, and on field data obtained during the final design. LFG management is carried forward as a remedial technology for further evaluation.

9.3.2.3 Groundwater Extraction and Treatment

Groundwater treatment technologies that require groundwater extraction would be located along the shoreline to extract groundwater impacted by the refuse and wood waste. Extraction of groundwater near the shoreline would necessitate the installation of a barrier wall along the shoreline to prevent marine water intrusion. The installation of a barrier wall along the shoreline is considered infeasible because of the presence of large obstructions such as concrete debris within the refuse that would likely preclude the installation of a continuous barrier. Without a barrier wall, extracted groundwater would be composed primarily of marine water drawn from the bay rather than contaminated groundwater. Both the quantity and quality of marine water would result in treatment of extracted groundwater being impracticable.

The installation of a barrier wall at the current shoreline would not address impacts on surface water quality from refuse and wood waste waterward of the shoreline, so a barrier wall would not be fully effective unless it was installed beyond the limits of Site refuse and wood waste in the marine portion of the Site. Installation of a barrier wall at the limits of refuse and wood waste in the aquatic portion of the Site would require converting a large aquatic area to uplands, which is not considered protective of marine habitat.

Based on these considerations, groundwater extraction and treatment is not carried forward as a potential remedial technology for further evaluation.

9.3.2.4 Groundwater Shoreline Filter Treatment

Groundwater treatment through filtration by porous media (i.e., a sand filter) near the groundwater/surface water interface would provide treatment by removing particulates entrained in groundwater. Additionally, a porous filter zone at the groundwater/surface water interface would increase hydrodynamic dispersion induced by tidal fluctuation, thus decreasing the concentration of groundwater IHS prior to discharge to surface water. A properly designed granular filter layer would provide filtration treatment for metals and organic compounds such as PCBs, which tend to partition heavily to particulates. Additionally, IHS that are mobilized by reducing (low oxygen) conditions, such as manganese, would transition to the solid phase due to the presence of highly oxygenated marine surface water within the filtration zone. The highly oxygenated marine surface water is also anticipated to provide a reduction in ammonia concentrations. Thus, shoreline filtration would assist in meeting RAO-6.

The granular filter layer would be designed based on Site specific conditions with a higher hydraulic conductivity and more homogeneous composition than the adjacent refuse to increase the hydrodynamic dispersion that naturally occurs in the pore water of near-shore soil and sediment near the groundwater/surface water interface. Depending on the characteristics of the local aquifer and receiving water, tidally-averaged dispersion ratios at the sediment/water interface in Puget Sound can range from a low of 3:1 (surface water:groundwater) to more than 10:1 (e.g., refer to D-Street, Great Western Chemical, and Southwest Harbor RI reports on file at Ecology). The construction of a highly permeable, homogeneous filter layer would significantly improve the mixing of marine water and groundwater.

The average concentrations of ammonia and manganese in seep samples are about 50 percent of concentrations measured in the shoreline wells, indicating about a 2:1 (surface water:groundwater) dispersion factor without the benefit of a shoreline filter layer. An additional reduction ratio of between about 2:1 to 3:1 will be required at the shoreline to achieve the groundwater PCLs. The combination of reduced contaminant flux and improved hydrodynamic dispersion near the surface water/groundwater interface through use of a granular filter layer are established engineering concepts for improving groundwater quality prior to discharge to surface water, and are considered capable of achieving the additional concentration reduction required to achieve the groundwater PCLs. As a result, groundwater treatment through sand filtration is carried forward as a remedial technology for further evaluation.

9.3.2.5 Groundwater Permeable Reactive Barrier

Permeable reactive barriers (PRBs) can be used as an *in situ* groundwater treatment technology. PRBs are design to intercept the flow of contaminated groundwater and are filled with media which reacts with dissolved contamination, allowing treated groundwater to flow freely downgradient. A PRB installed along the shoreline could potentially treat groundwater flowing from the upland Site Unit toward Bellingham Bay, prior to its discharge to surface water. PRBs are typically filled with a reactive media such as zero-valent iron, with a relatively high hydraulic conductivity and reaction kinetics that can quickly react with the contacting water as it passes through. PRBs are typically installed into a trench elongated in the direction perpendicular to groundwater flow, often in conjunction with an impermeable barrier system to direct groundwater flow to the PRB zone in what is referred to as a "funnel and gate" system.

Construction of such a system would be subject to the same constructability issues as the continuous barrier discussed in the previous section. Additional concerns include the lack of appropriate reactive media for treatment of groundwater IHS (manganese and ammonia), that the barrier cannot be placed completely downgradient of the refuse, and the effective useful life of reactive media submerged in a marine environment is expected to be short. Based on these concerns, a PRB is not considered feasible for groundwater treatment and is not carried forward as a remedial technology for further evaluation.

9.3.2.6 Offsite Surface Water Interception and Diversion

Surface water ponding and flow was observed upgradient of the northeast corner of the Site through most of the year, as discussed in Section 4.1.2.1 (General Site Drainage). Based on groundwater elevations in the northeast portion of the Site, it appears that surface water infiltration upgradient of this area is recharging Site groundwater. Intercepting and diverting surface water in this area would reduce the amount of surface water infiltrating into the Site and would in turn reduce the amount of contaminated groundwater discharging to surface water (RAO-6). Intercepting and diverting surface water in this area is technically implementable but may be subject to administrative complications because the property is offsite and owned by BNSF. However, offsite surface water interception and diversion is carried forward for further evaluation because the administrative implementability issues are not considered insurmountable.

9.3.2.7 Groundwater Diversion Barrier

Installation of an upgradient groundwater diversion barrier system would reduce the amount of groundwater flowing into the Site and would in turn reduce the amount of contaminated groundwater discharging to surface water (RAO-6). A groundwater diversion barrier system would intercept shallow groundwater at the eastern upgradient boundary of the property along the BNSF railway alignment and divert the water to a surface water discharge point before it would be affected by contact with Site soil and refuse. Because the Chuckanut Formation bedrock is present at shallow depth in this location, a groundwater diversion barrier would not extend to a significant depth below ground surface, and would not eliminate groundwater recharge originating from the Chuckanut Formation. The groundwater diversion barrier technology is carried forward as a remedial technology for further evaluation. However, it should be noted that the interception and diversion of offsite surface water discussed in the previous section could reduce the need for, and effectiveness of, a groundwater diversion barrier.

9.3.2.8 Soil Treatment

Treatment of Site soil is not considered as a viable cleanup technology because the heterogeneous nature of refuse and wood debris at the Site precludes the effective treatment of such a large volume. As a result, soil treatment is not carried forward for further evaluation.

9.3.2.9 Removal and Offsite Disposal

Physical removal (excavation) and offsite disposal of the upland refuse and any associated contaminated soil would achieve all Site RAOs by removing the primary contaminant sources and the secondary contaminated media (i.e., groundwater). Standard excavation techniques would be used for removal, although the physical setting and large volume of material requiring removal would result in significant implementability issues. Because refuse is present as a continuum extending into the Marine Site Unit, upland removal would need to be implemented in conjunction with a sediment removal action. Removed refuse, wood debris, and contaminated soil would be disposed of at a licensed solid waste disposal facility. Removal and offsite disposal of upland refuse and contaminated soil is carried forward as a remedial technology for further evaluation.

9.3.2.10 Institutional Controls

This technology would utilize restrictive covenants to achieve RAO-2 and RAO-3, by preventing Site activities that could lead to direct human contact with contaminated soil or groundwater, or the ingestion of contaminated groundwater. Institutional controls are not considered a stand-alone remedial alternative, but would be an integral part of any containment alternatives. As a result, institutional controls are carried forward as a remedial technology for further evaluation.

9.3.2.11 Compliance Monitoring

Compliance monitoring is not considered a stand-alone remedial alternative, but is a required element of any cleanup action conducted under MTCA. Compliance monitoring would be conducted to verify that cleanup standards for affected media are achieved, and once achieved, are maintained. Compliance monitoring could be applied to all affected upland media (soil, groundwater, soil vapor), and could also be applied to the performance of certain cleanup technologies (e.g., physically monitoring the integrity of a low permeability cap). Compliance monitoring is carried forward as a remedial technology for further evaluation.

9.3.3 SCREENING OF MARINE SITE UNIT (SEDIMENT) REMEDIAL TECHNOLOGIES

The RAOs applicable to the Marine Site Unit are RAO-1 (prevent erosion of refuse along the shoreline), RAO-2 (prevent direct contact with refuse where it is potentially exposed along the shoreline), RAO-5 (prevent exposure of marine biota to sediment that exceeds the sediment PCLs), and RAO-6 (prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs). The remedial technologies or response actions screened for consideration in development of cleanup action alternatives for the Marine Site Unit are presented in the following sections.

9.3.3.1 Shoreline Stabilization

Shoreline stabilization is incorporated as an integral part of the overall strategy for each of the remedial alternatives that include containment as part of the alternative. Stabilization of the shoreline is necessary to permanently contain the landfill refuse, protect the landfill against further wave erosion, and provide an environmental cap over contaminated sediment in the intertidal and shallow subtidal zones. Stabilization technologies include stabilization with granular rock materials or soft bank technologies. Shoreline stabilization would prevent erosion of refuse and wood debris along the shoreline (RAO-1), prevent direct contact with refuse within the intertidal zone (RAO-2), and prevent exposure of marine biota to contaminated sediment within the intertidal and shallow subtidal area (RAO-5).

The wind wave analysis conducted for the design of the Coast Guard improvements on the I&J Waterway (Baker 1997) indicated that peak waves entering the Site from the south/southwest can achieve heights of about 7 ft under 100-year storm conditions. The Site is relatively protected from waves originating from the south/southwest but there is direct exposure to waves originating from the northwest, which is the direction from which many severe storms and associated wind waves originate. As a result, any erosion control system for the Site will need to be designed to withstand high energy wave action.

Although shoreline stabilization using typical materials such as large rock (riprap) is effective in preventing erosion and can be designed to provide public water access, the resulting surface contacting the open water has limited habitat value. Shoreline stabilization using soft bank technologies may not provide as much protection from erosion as typical stabilization technologies and is known to be unstable in high energy environments, but is considered potentially applicable for the Site due primarily to the greater habitat value and improved shoreline esthetics. Soft bank technologies are typically considered for aquatic environments where erosion can be controlled with less protective measures than a fully armored face. Some long-term regular maintenance and replenishment of beach materials is typically necessary to address the ongoing erosion that would be expected. Soft bank technologies are usually designed to respond dynamically to storm waves and do not generally provide the same degree of design certainty as conventional shoreline stabilization (i.e., riprap and seawalls). Permanent containment of refuse is a fundamental requirement at the Site, so soft bank technologies must be applied with caution. It may be necessary to incorporate additional engineering controls into the design that otherwise would not be required under less critical applications. Shoreline stabilization technologies are carried forward as remedial technologies for further evaluation.

9.3.3.2 Sediment Capping

Placement of a layer of clean soil or sediment over contaminated sediment creates a predominantly biologically active zone unaffected by Site contamination. The cap material would provide a clean stratum for colonization by benthic organisms, thus preventing exposure of marine biota to contaminated sediment (RAO-5). Sediment capping can consist of a thin layer cap (typically less than 1 ft thick) or an engineered cap of greater thickness. A thin layer cap is primarily intended to expedite natural recovery processes while an engineered cap is intended to maintain a thicker, stable layer of clean material over contaminated sediment. Both thin layer and engineered capping are widely accepted technologies for addressing sediment contamination and are carried forward as remedial technologies for further evaluation.

9.3.3.3 Monitored Natural Recovery

Sediment natural recovery is the remedial technology through which sediment quality improves though a number of natural processes. For example, data for the Whatcom Waterway MTCA site indicate that the combination of source removal, sedimentation, and bioturbation in the upper 12 cm (5 inches) of sediment have resulted in natural recovery of mercury-contaminated sediment associated with former releases from the GP chlor/alkali facility to Bellingham Bay (Patmont et al. 2004). Monitoring of natural recovery processes through physical and/or chemical monitoring is a necessary component of natural recovery when it is used as a remedial technology to ensure that cleanup standards are achieved and maintained.

As discussed in Section 4.1.4 (Sediment Deposition), the results of the 2008 Ecology sediment investigation indicate that sediment accumulation, which is the most significant component of natural recovery, is occurring at the Site at an average rate of 1.4 cm/yr throughout much of the subtidal portion of the Marine Site Unit. This accumulation rate is generally consistent with the sedimentation rates that have been measured in inner Bellingham Bay (RETEC 2006). Thus, available data support the conclusion that sediment accumulation is occurring within Bellingham Bay, including the vicinity of the Site, and that natural recovery is a viable remedial technology to achieve RAO-5 for the portion of the Marine Site Unit that is not addressed through shoreline stabilization or sediment capping. As a result, monitored natural recovery (MNR) is carried forward as a remedial technology for further evaluation. The outer boundary of where MNR will be applied will at a minimum extend to the limits of refuse or wood waste, but will extend farther, as necessary, to encompass surface sediment where PCB concentrations exceed the sediment cleanup level established for the Site.

9.3.3.4 Removal and Offsite Disposal

Physical removal (dredging) and offsite, upland disposal of the contaminated sediment and associated landfilled materials from the Marine Site Unit would achieve all RAOs applicable to the Marine Site Unit. Standard dredging techniques would be used and dredged affected media would be disposed of at a licensed solid waste facility. As previously indicated in Section 9.3.2.9 (Removal and Offsite Disposal), refuse and wood debris are contiguous between the Upland and Marine Site Units, and complete removal for both Site Units would be required for effective implementation. Although subject to a number of implementability issues, removal and offsite disposal of contaminated sediment is carried forward as a remedial technology for further evaluation.

9.4 DESCRIPTION OF REMEDIAL ALTERNATIVES

The remedial alternatives evaluated in this FS utilize cleanup response actions specified in MTCA as appropriate for addressing hazardous substances [WAC 173-340-350(8)(c)(i)(C)] and which were chosen to be carried forward after initial screening [Section 9.3 (Screening of Remedial Technologies)]. This section describes these remedial alternatives with sufficient detail to provide the reader with a conceptual understanding of the design intent for comparing the various alternatives, and to provide an adequate basis for developing the cost estimates for each alternative. The alternatives were developed based on professional judgment and experience, cleanup actions implemented for similar sites, and applicable scientific and engineering principles and practices. The basic design assumptions used in developing these alternatives are for the purposes of cost and feature comparison for the FS, and may vary from the final design. Additional design-phase data collection, detailed engineering, design, and permitting will be required once a remedial alternative is selected by Ecology, and these activities may significantly affect the final design for the selected remedy.

For each alternative, this section provides the following information:

- A description of the cleanup actions, including habitat and land use and navigation considerations relevant to the cleanup action
- A discussion of how each alternative would meet the RAOs for the Site.

As indicated in Section 9.3.1 (Integration of Remedial Alternatives and Future Development), it is anticipated that future Site use will be primarily as a public park, with potential ancillary uses such as public restrooms, food services and/or park-related commercial services. However, future property use is still in the planning stages, so other potential future uses are possible. Because the remedial alternatives evaluated must be compatible with the final selected property use, alternatives will be kept sufficiently general such that they could be implemented for a wide variety of future uses. However, for cost estimating purposes, future use is assumed to be as a public park to allow development of remedial alternative costs for FS evaluation purposes.

The development of alternatives presented herein considers the potential impact on the R.G. Haley site, and the potential impact of the R.G. Haley site on the Site remedial alternatives with the recognition that close coordination will be required between the two sites during cleanup implementation. The Site alternatives are developed to be compatible with a wide range of potential remedies for the R.G. Haley site, although the range of alternatives ultimately evaluated were not limited by the proximity of the R.G. Haley site. Additionally, the Marine Site Unit overlaps with the Whatcom Waterway cleanup site in an area of that site designated for MNR under a MTCA consent decree. Each of the alternatives presented herein for cleanup of the Marine Site Unit will be at least as protective as this measure, and would be implemented carefully to not disturb the natural recovery process occurring at the Whatcom Waterway site. Additionally, long-term compliance monitoring for the Site will be coordinated with the Whatcom Waterway and R.G. Haley sites in order to provide for efficient data collection.

The following sections provide a more detailed description of the cleanup alternatives developed for the Site, including the assumptions and rationale used for developing these cleanup alternatives. Four remedial alternatives were developed for the Site using a combination of the remedial technologies discussed in Section 9.3 (Screening of Remedial Technologies). The alternatives are summarized in Tables 9-1, the evaluation of the reasonable restoration time frame for the Upland and Marine Unit alternatives are presented in Tables 9-2 and 9-3, respectively, and a summary of costs are provided in Table 9-4. Detailed cost estimates costs for each alternative are included in Appendix F. There are several technologies that would be implemented at the Site under each of the containment Alternatives 1, 2, and 3. These technologies would not be required if Alternative 4 is implemented because Alternative 4 includes the excavation and removal of all refuse and wood debris from the Upland and Marine Site Units. The costs for operation and maintenance of the capping systems have not been estimated for this evaluation. Periodic inspections would be a necessary component of each of the containment alternatives, as well as repairs to the cap if damage is observed. These costs would be essentially equivalent for each of the containment alternatives, would be small in comparison to the cost of Alternative 4, and therefore, would not impact the selection of the preferred alternative. The four cleanup alternatives and the technologies that are common to each of the containment alternatives are summarized in the list below and discussed in the following sections:

- **Technologies that would be included as a part of cleanup Alternatives 1, 2, or 3:**
  - Upland Site Unit (protection for direct contact, soil vapor, erosion)
    - Low permeability upland cap (to reduce stormwater infiltration)
    - Upland stormwater and erosion control (reduce infiltration and prevent erosion)
    - Passive LFG control (to mitigate accumulation of LFG)
    - Institutional controls (to prevent Site usage or activities that could lead to direct contact with contaminated soil or groundwater, or the ingestion of contaminated groundwater).
    - Actions to improve the BNSF property drainage (reduce infiltration).
    - Proper abandonment of the former stormwater system in the northeast portion of the Site, including catch basins and the subsurface tight-line conveyance system.
  - Marine Site Unit (intertidal and subtidal sediment areas and surface water)
    - Shoreline stabilization (prevent erosion and sediment toxicity).
    - Capping of intertidal and shallow subtidal beach area (limit human and benthic contact, bioaccumulation risks).
- **Alternative 1: Containment with Low Permeability Cap, Shoreline Stabilization, and Subtidal Sediment Monitored Natural Recovery**
  - Implement technologies listed above that are common to each alternative
  - Upland cap: Low permeability soil cap plus buildings, and/or pavement
  - Subtidal sediment remediation: MNR.
- **Alternative 2: Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and Monitored Natural Recovery**
  - Implement technologies listed above that are common to each alternative
  - Upland cap: Low permeability soil cap with scrim reinforced liner plus buildings, and/or pavement
  - Surface water protection: Shoreline sand filter treatment layer

  - Subtidal sediment remediation: Thin layer sand cap and MNR.

- **Alternative 3: Two-Layer Upland Cap, Upgradient Groundwater Interception, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap, and Monitored Natural Recovery**
  - Implement technologies listed above that are common to each alternative
  - Upland cap: Two layer cap (FML and low permeability soil cap), buildings, and/or pavement
  - Surface water protection: Shoreline sand filter treatment layer, upgradient groundwater diversion barrier system
  - Subtidal sediment remediation: Engineered sediment cap, with MNR beyond limits of cap.
- **Alternative 4: Waste Removal**
  - Landfill and wood waste excavation and removal
  - Shoreline armoring or stabilization.

9.4.1 ALTERNATIVE 1: CONTAINMENT WITH LOW PERMEABILITY CAP, SHORELINE STABILIZATION, AND SUBTIDAL SEDIMENT MONITORED NATURAL RECOVERY

The primary components of this cleanup alternative include covering the Upland Site Unit with a low permeability cap, stabilizing the shoreline in the intertidal zone, and implementing MNR for sediment remediation in the subtidal zone. Figure 9-2 shows a plan view of the Site and indicates where each of these technologies would be implemented at the Site. Figure 9-3 provides a conceptual cross section through both upland and marine Alternative 1 primary elements. The figures also illustrate other features of this alternative, including surface water management to reduce infiltration and LFG control to prevent the accumulation and mitigate migration of gas. Compliance monitoring would be conducted to evaluate the long-term integrity of the cleanup action and institutional controls would be implemented to restrict property usage and prevent human contact with contaminants in the subsurface.

Alternative 1 achieves all applicable RAOs through a combination of containment, institutional controls, and compliance monitoring.

- *RAO-1 (Prevent erosion of refuse along shoreline)* is achieved by installing a shoreline stabilization system.
- *RAO-2 (Prevent direct contact with refuse)* is achieved by constructing a cap over the Upland Site Unit consisting of low-permeability soil with the inclusion of a non-woven geotextile separation layer to prevent contact with plants, soil biota, or burrowing wildlife at the surface, pavement, or buildings; installing a shoreline stabilization system that will act as a cap over the intertidal and shallow subtidal portions of the Marine Site Unit; and implementing institutional controls.
- *RAO-3 (Prevent use of shallow Site groundwater for potable purposes*) is achieved by implementing institutional controls.

- *RAO-4 (Control LFG/VOCs*) is achieved by installing a passive LFG control system beneath the low permeability upland cap.
- *RAO-5 (Prevent exposure of marine biota to sediment that exceeds the sediment PCLs)* is achieved in the intertidal zone shallow subtidal zones by the installation of a shoreline stabilization system that will provide containment of wood debris and refuse, and in the deeper subtidal zone by implementing MNR.
- *RAO-6 (Prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs)* is achieved through a combination of components of the cleanup action alternative. Groundwater recharge will be reduced by installing an upland low permeability cap with surface grading, and onsite and offsite surface water control measures. This reduction in groundwater recharge will result in a decrease in the flux of groundwater discharge to surface water and the associated exposure of aquatic organisms to affected groundwater.

The following sections provide additional details of the cleanup action elements associated with Alternative 1.

9.4.1.1 Upland Site Unit

The elements of Alternative 1 associated with the Upland Site Unit consist of installation of a low permeability soil cap, stormwater control both on the Site and on BNSF property upgradient of the northeast corner of the Site, and LFG control throughout the Site. These remedial action elements are discussed in the following sections.

Low Permeability Cap and Stormwater Control

A low permeability cap would be installed throughout the Upland Site Unit as part of Alternative 1, as shown on Figure 9-2. For the purposes of estimating cost for the cap system, we assume that 15 percent of the total area of the Upland Site Unit will be covered by buildings or pavement. Conceptual design details of the cap are presented on Figure 9-3. The thickness of the various layers making up the capping system and the materials of construction presented in this FS are provided in general terms consistent with a conceptual design to provide an understanding of the system functionality and cost. The actual details of the cap, including layer thicknesses and materials of construction would be developed during the design process if this alternative is selected for implementation. Under Alternative 1, the containment capping system would include the following elements from ground surface to the depth of buried refuse and wood debris:

- **Surface cover**: The surface of the Upland Site Unit would consist of a layer of topsoil approximately 1 ft thick, asphaltic pavement with a base course material, or buildings. A surface cover thickness of 1 ft is a typical minimum thickness for landfill covers and will be used in the FS for cost estimating purposes. We note that vegetative plantings at this Site may be quite different than for other landfill cover systems. As a result, the actual thickness of this layer (and others) will be determined during the design phase and may need to be thicker than 1 ft. It is likely, under the current redevelopment plans, that the majority of the Site uplands surface cover would be topsoil vegetated to support property usage as an open park. Paved areas would be limited and may include surface parking or paved sidewalks. Buildings would also be limited and may include small structures located at the Site to support park functions such as facilities maintenance or public restrooms.

- **Drainage layer:** A drainage layer would be located beneath the surface cover to provide drainage for water that infiltrates through topsoil or pavement to prevent saturation of the low permeability soil layer. The drainage layer could be constructed from geocomposite materials or granular fill, as determined during the remedial design. For the purposes of this FS conceptual design and for cost estimating purposes, we assume the drainage layer would be approximately 1 ft thick and consist of granular fill material.
- **Separation Layer:** A separation layer would be placed between the drainage layer and the underlying low permeability soil layer, if the low permeability layer is constructed using the stabilized fine-grained sediments placed at the Site during the 2011/2012 interim action. The layer would serve to provide physical separation between the drainage layer and the underlying low permeability soil layer. Because the fine grained sediment contains low concentrations of dioxins and furans, the separation layer is included to prevent direct contact with the underlying low permeability soil during any post-construction intrusive activities by alerting would-be excavators in the future that they are encountering the low permeability layer and so they could implement procedures to minimize direct contact with, or unintentional disturbance of, the material. For the purposes of cost estimating, we assume the separation layer will be constructed of a non-woven geotextile.
- **Low permeability layer**: In areas not covered with buildings or pavement, a layer of low permeability soil would be installed beneath the drainage and separation layers which would largely prevent stormwater infiltration into the underlying refuse and wood debris. The soil would need to demonstrate permeability characteristics equivalent to a 2-ft-thick layer of soil with a hydraulic conductivity of $1\text{x}10^{-6}$ cm/s to meet the requirements for landfill closure under the MFS for solid waste handling (Chapter 173-304 WAC), which is considered an ARAR for the Site due to its historical use as a solid waste landfill. The fine-grained sediment stored at the Site as part of the 2011/2012 interim action meet this criteria, exhibiting a hydraulic conductivity of $4\text{x}10^{-7}$ cm/s for cement stabilized sediment tested during design of the interim action (Landau Associates 2011).
- Because of the relatively flat Site grades, granular soil would be imported and placed to create adequate grades for stormwater drainage. The amount of soil required to establish drainage would be reduced through the use of the interim action sediment discussed in the previous bullet.
- **Gas control layer:** A gas control layer would be placed just below the low permeability layer in order to provide a ventilation pathway for LFG or VOCs rising from the subsurface. This layer could be constructed from geocomposite materials or granular fill, as determined during the remedial design. For the purposes of this FS conceptual design and for cost estimating purposes, we assume the gas control layer would be approximately ½ ft thick and consist of granular fill material, and that perforated 2-inch SDR-11 high density polyethylene (HDPE) would convey gases collected from this layer to the atmosphere via LFG vents.

The existing soil cover, low permeability layer, and import fill would be graded to provide adequate drainage and prevent stormwater ponding, and the surface cover of topsoil would support re-vegetation. In order to provide adequate drainage, a 1.5 percent slope toward drainage features would be established. Drainage would be partially provided using the low-permeability layer while maintaining a minimum thickness in that layer of 2 ft to minimize infiltration. It is estimated that approximately 27,000 yd^3 of additional soil would be need to be imported to establish adequate drainage. These actions would significantly reduce surface water infiltration through improved stormwater interception and increased evapotranspiration from the vegetative cover. Stormwater management would consist of stormwater interception, treatment (as applicable), and conveyance to surface water discharge to Bellingham Bay. Stormwater actions such as regrading, lining of ditches, and tight line conveyance of stormwater would be made to the BNSF property stormwater drainage system to intercept, convey, and discharge surface water that currently accumulates in ponds and ditches near the railroad tracks, discussed in Section 4.1.2.1 (General Site Drainage) and shown on Figure 4-4. The existing Site stormwater system would be decommissioned as part of the redevelopment activities.

The surface grading, placement of topsoil, and stormwater management system associated with construction of the low permeability cap and ancillary buildings and paved surfaces would significantly reduce stormwater infiltration. Based on the low hydraulic conductivity of the stabilized sediment (4×10^{-7} cm/s), the material would provide an excellent low permeability layer for the cover system, and would be located below a separation layer and at least 2 ft of clean cover soil which will limit future potential for direct contact. For the purposes of this FS, we have conservatively assumed that surface water infiltration within the Upland Site Unit would be reduced by approximately 90 percent by the Alternative 1 soil capping system described above.

Based on the average groundwater recharge rate of 15.7 gpm resulting from infiltration of precipitation at the Site estimated in Section 4.3.1.4 (Groundwater Recharge and Water Balance), the estimated reduction in groundwater recharge expected after installing a low-permeable soil cover that reduces infiltration by 90 percent would be 14.1 gpm (15.7 gpm X 0.90). Based on the average groundwater discharge rate for the entire Site drainage basin of 21 gpm estimated in Section 4.3.1.3 (Groundwater Flow), this low permeability cap would reduce groundwater recharge through the landfill by about 67 percent. Recharge would be further reduced by the stormwater actions on the BNSF property, although the amount by which these actions would reduce groundwater recharge is difficult to quantify. These reductions of groundwater recharge would improve groundwater quality near the point of discharge to Bellingham Bay by reducing the rate of Site contaminated groundwater discharge to Bellingham Bay.

While the reduction in groundwater flow alone may not be sufficient to achieve groundwater PCLs at the point of discharge to surface water, the reduction in groundwater discharge rate will also increase hydrodynamic dispersion near the shoreline, particularly with the installation of the shoreline stabilization system. So while it is likely that implementing Alternative 1 would achieve the PCLs for groundwater at the point of compliance, a level of uncertainty exists regarding the degree of hydrodynamic dispersion that could be expected and the reduction in concentrations of ammonia and manganese that it would provide.

LFG Control

Because it has been more than 40 years since landfill closure, it is expected that current LFG generation rates are minimal. However, the low permeability cap could result in the accumulation and possible migration of LFG. As a result, a LFG management system would be installed throughout the Site which provides for the collection of and passive ventilation of LFG and potentially other VOCs that may be in the soil gas.

During the remedial design phase, LFG monitoring and LFG generation potential modeling would be conducted to evaluate whether active or passive gas control is needed and whether air emissions would meet Northwest Air Pollution Control Authority guidelines and MTCA air quality standards. For the purposes of estimating costs, it was assumed that a passive gas collection and atmospheric venting system would be constructed as part of this cleanup alternative.

9.4.1.2 Marine Site Unit

The elements of Alternative 1 associated with the Marine Site Unit consist of installation of a shoreline stabilization system and MNR beyond the limits of the shoreline stabilization system. These remedial action elements are discussed in the following sections.

Shoreline Stabilization

Alternative 1 would include shoreline stabilization in the intertidal and shallow subtidal zone as shown on Figures 9-2 and 9-3. Portions of Alternative 1 overlap with portions of the R.G. Haley cleanup. Because sediment dredging may be conducted as part of the R.G. Haley cleanup in areas that would be subject to shoreline stabilization as part of Alternative 1, the R.G. Haley sediment dredging activities would need to be implemented in advance of Alternative 1 at the northern end of the Site. The manner in which cleanup for the two sites will be coordinated is discussed further in Section 10.2 (Compatibility with R.G. Haley and Whatcom Waterway Remedial Activities).

The shoreline stabilization system would be designed to prevent shoreline erosion, which could cause exposure to, or possibly the migration of, refuse buried beneath the shoreline. The system would be constructed throughout the intertidal and shallow subtidal zones to an elevation of -10 ft MLLW to ensure that the stabilization system would remain stable under high wave action during extreme low tides. The stabilization system would also serve as a cap and biotic barrier over the sediment that is most impacted by Site releases due to shoreline erosion resulting from wave action.

Detailed engineering, design, and permitting of the shoreline stabilization system will be required to ensure that the system can provide adequate protection from significant wave action during winter storms to effectively contain the buried refuse and wood debris. The stabilization system would be developed to balance the need for the rock size to be large enough to resist detachment from wave action while also meeting federal in-water permitting requirements. The use of soft bank technologies would be considered during remedial design, particularly at the southern end of the Site where the shoreline is partially protected from winter storms. The use of soft bank technologies in this area could minimize the loss of eelgrass habitat and better support its re-establishment following construction.

For the purposes of FS cost estimating purposes, it is assumed that the shoreline stabilization system would consist of gravel and riprap and be approximately 3 ft thick. We assume a nominal 6-inch layer of gravel would be placed over the revetment rock to fill the rock interstices and enhance the habitat value of the shoreline stabilization system. The shoreline stabilization layer would extend from above the extreme high water elevation (about 13 ft MLLW) to the approximate boundary between deep and shallow subtidal habitat zones (-10 ft MLLW), although the thickness would be decreased from the extreme low water elevation (about -4 ft MLLW) to the -10 ft MLLW elevation.

The existing landfill slope above the shoreline would be re-graded, as necessary, to ensure slope stability and facilitate construction of the shoreline stabilization system. The shoreline stabilization system would be constructed during low tides using conventional upland construction equipment in conjunction with marine-based equipment for the lower intertidal and subtidal portions. A slope stability analysis was not conducted, but the relatively flat slope (5H:1V) used for the FS, and the course nature of the existing riprap and landfill materials, suggest that slope stability under static or dynamic conditions, including liquefaction, would not be an issue. Additional slope stability analyses would be performed during the remedial design phase.

The construction of the shoreline stabilization system would move the landfill slope farther seaward so that the intertidal and shallow subtidal zones would be resituated accordingly. This would result in a loss of up to about 0.14 acre of deep subtidal habitat, although the area of intertidal and shallow subtidal habitat would remain relatively unchanged. Some of this potential aquatic habitat loss could be avoided by reshaping and grading of the shoreline prior to installation of the shoreline stabilization system, although it would be undesirable to significantly disturb the relatively stable zone of reworked refuse and soil currently exposed in the intertidal zone. The sediment habitat would be significantly enhanced through the intertidal capping and containment of exposed refuse and contaminated sediment, and through the placement of the gravel over the riprap. Habitat components of the cleanup action, including any required mitigation resulting from loss of aquatic habitat, would be addressed during the design and permitting phase of the cleanup.

The relatively low concentrations of groundwater IHS, and the low organic content and permeable nature of the shoreline stabilization system, support the conclusion that recontamination of the intertidal and shallow subtidal sediment cap materials by groundwater would not occur. In addition to promoting hydrodynamic dispersion, containing refuse and wood debris, and providing erosion protection, the shoreline stabilization layer would provide a 3-ft cap over contaminated sediment in the intertidal and shallow subtidal zone between about elevations +13 ft and -4 ft MLLW, and a stabilization layer of decreasing thickness between about elevations -4 ft and -10 ft MLLW. The rock would also provide a barrier to deep burrowing benthic biota commonly found in the intertidal zone.

Monitored Natural Recovery

Alternative 1 would include MNR in the deep subtidal zone as shown on Figure 9-2. Because sediment dredging may be conducted as part of the R.G. Haley cleanup in areas that would be subject to MNR as part of Alternative 1, the R.G. Haley sediment dredging activities would need to be implemented in advance of Alternative 1 at the northern end of the Site. The manner in which cleanup for the two sites will be coordinated is discussed further in Section 10.2 (Compatibility with R.G. Haley Preferred Remedial Action).

Natural sediment deposition is expected to eventually create a cap over the entire deep subtidal area that currently exceeds the PCLs or Site-specific physical criteria for protection of benthic organisms. The subtidal area outside the limits of the shoreline stabilization system that requires additional natural recovery to achieve the sediment chemical or physical criteria is shown on Figure 9-2 and represents approximately 229,000 ft^2 (5.3 acres), although the exact limits would be defined during remedial design. As discussed in Section 4.1.4 (Sediment Deposition), sufficient sediment deposition to achieve the sediment physical criteria has already occurred over a significant portion of the deep subtidal area, and sediment accumulation at other locations in Bellingham Bay support the conclusion that natural recovery is a viable technology for sediment cleanup. As shown on Figure 9-2, the shoreline stabilization system will extend over almost the entire area where the extent of refuse and wood debris are not protective of aquatic organisms. With the exception of PCBs, the shoreline stabilization system will cover and contain all sediment IHS concentrations exceeding the sediment PCLs. As a result, MNR would be focused on demonstrating natural recovery for PCBs.

MNR would consist of conducting periodic sediment monitoring to confirm that natural recovery is occurring and that the sediment physical criteria and the Site sediment PCLs are achieved throughout the Marine Site Unit. Sediment compliance monitoring would consist of sediment coring or similar techniques to determine the thickness of clean sediment cover over refuse and wood debris to evaluate whether a minimum 1-ft cover thickness has been achieved, and to monitor the recovery of sediment quality with respect to PCB concentrations. For FS cost estimating purposes, it is assumed that 10 shallow core samples would be collected to monitor the accumulation of clean sediment thickness and 12 surface sediment samples would be collected to monitor surface sediment quality. It is assumed for cost estimating purposes that only PCBs would be tested for in surface sediment samples.

Sediment compliance monitoring would be conducted immediately following construction of the shoreline stabilization system, and at 5-year intervals thereafter, until the sediment physical and chemical criteria are achieved throughout the Marine Site Unit. The length of time required to achieve the sediment physical criteria is not known, but is estimated to be about 15 to 20 years, based on the extent to which natural recovery has already occurred at the Site. As a result, up to five sediment compliance monitoring events are assumed for FS cost-estimating purposes.

Contingent remedial measures, such as additional capping, would be evaluated if natural recovery monitoring does not demonstrate that sufficient sediment deposition would occur within a reasonable time frame to achieve physical and chemical MNR goals, or if natural recovery was not occurring in portions of the Marine Site Unit.

9.4.1.3 Compliance Monitoring and Institutional Controls

Compliance monitoring would be conducted to evaluate compliance with MTCA requirements WAC 173-340-440 (4)(B) and WAC 173-340-410, which require compliance monitoring for all cleanup actions for the following three purposes:

- **Protection monitoring** to confirm that human health and the environment are adequately protected during construction, operation, and maintenance associated with the cleanup action.
- **Performance monitoring** to confirm that the cleanup action has attained cleanup standards and any other performance standards.
- **Confirmational monitoring** to confirm the long-term effectiveness of the cleanup action once the cleanup standards and other performance standards have been attained.

Compliance monitoring and institutional controls would apply to both Upland and Marine Site Units. Compliance monitoring would include chemical monitoring of groundwater, LFG, and sediment, and physical monitoring of the Site cap and shoreline stabilization system, as described below.

Groundwater and surface water quality would be evaluated at the point of compliance for long-term groundwater compliance performance and confirmational monitoring. Specific details of the sampling and analysis program, including number and location of monitoring stations, frequency of sampling, quality assurance objectives, and complete list of analytes, would be documented in a compliance monitoring plan that would be developed during the remedial design phase. For FS cost estimates, it is assumed that eight new groundwater monitoring wells would be installed at the shoreline, the wells would be installed at an angle to allow monitoring as close as practicable the groundwater/surface water interface.

Monitoring of the LFG control system may be required, depending on the results of LFG emissions survey conducted during remedial design. The level of effort required for LFG monitoring, if required, is anticipated to be of limited scope and duration due to the low LFG generation potential of the Site.

For the purposes of the FS, it is assumed that both groundwater and LFG would be monitored on a quarterly basis for 2 years, followed by 3 years of semiannual monitoring following construction of the upland cap. Groundwater samples would be tested for all groundwater IHS and LFG would be tested for VOCs and methane. The need for groundwater or LFG compliance monitoring would be evaluated by Ecology at the conclusion of the 5-year monitoring period.

It is assumed for FS cost-estimating purposes that physical monitoring of the upland landfill cap and the shoreline stabilization system would be performed annually. Compliance monitoring is an integral part of MNR, as described above. For the purposes of FS cost estimating, we assume that bathymetric surveys of the Marine Site Unit would be conducted in conjunction with natural recovery monitoring activities on 5-year intervals. Through continued maintenance and repair as necessary, the design life for Alternatives 1 through 3 is expected to be extended to perpetuity. For the purposes of conducting a comparison between the Alternatives, we estimate the cost for maintenance and repair based on a project life of 20 years, although these activities will likely be required for a longer period.

Institutional controls for the upland portion of the Site would include a restrictive covenant for the Site to prevent activities that could compromise the integrity of the cleanup action or otherwise result in unacceptable risks to human health or the environment. The restrictive covenant would prevent the use of groundwater for potable purposes and would place restrictions on intrusive activities that could result in releases of hazardous substances or exposure of workers to contaminated media. The low permeability cover and LFG management systems are integral to the effectiveness of the cleanup action, so the restrictive covenant would also be written to provide that the low permeability cover and the LFG management system are properly protected and maintained. The restrictive covenant would be filed as a deed restriction with Whatcom County, would be binding on the owner's successors and assignees, and would impose limits on property conveyance.

Institutional controls for the Marine Site Unit would be required to prevent damage to the shoreline stabilization system and the clean sediment cover created through natural recovery. Institutional controls would include prohibitions on activities that could breach the shoreline stabilization system within any soft bank portion of the system. Additionally, vessel activity within the Marine Site Unit would likely need to be managed to prevent damage by boat prop wash, anchoring, or similar activities to the shoreline stabilization system and clean sediment cover achieved through natural recovery.

Specific monitoring requirements, contingency response actions, and required institutional controls would be prepared as part of the remedial design activities.

9.4.2 ALTERNATIVE TWO: CONTAINMENT WITH LOW PERMEABILITY CAP AND LINER, SHORELINE STABILIZATION WITH SAND FILTER, SEDIMENT CAP, AND MONITORED NATURAL RECOVERY

Alternative 2 increases the level of protection over Alternative 1 through the inclusion of a scrim-reinforced liner above the low permeability soil layer, the placement of a thin layer sediment cap in the area shown on Figure 9-4, and a shoreline sand filter treatment layer in the shoreline stabilization system. As with Alternative 1, portions of Alternative 2 overlap with portions of the R.G. Haley cleanup, and because sediment dredging may be conducted as part of the R.G. Haley cleanup in these areas of overlap, the R.G. Haley sediment dredging activities would need to be implemented in advance of Alternative 2 at the northern end of the Site. The manner in which cleanup for the two sites will be coordinated is discussed further in Section 10.2 (Compatibility with R.G. Haley and Whatcom Waterway Remedial Activities).

Alternative 2 achieves all applicable RAOs through a combination of containment, enhanced hydrodynamic dispersion, institutional controls, and compliance monitoring. Alternative 2 achieves applicable RAOs in a manner similar to Alternative 1, but includes additional measures presented in bold text below:

- *RAO-1 (Prevent erosion of refuse along shoreline)* is achieved by installing a shoreline stabilization system.
- *RAO-2 (Prevent direct contact with refuse)* is achieved by constructing a cap that includes soil and a scrim-reinforced polyethylene layer over the Upland Site Unit, installing a shoreline stabilization system that will act as a cap within the intertidal and shallow subtidal areas, and implementing institutional controls.
- *RAO-3 (Prevent use of shallow Site groundwater for potable purposes*) is achieved by implementing institutional controls.
- *RAO-4 (Control LFG/VOCs*) is achieved by installing a passive LFG control system beneath the low permeability layer of the soil cap.
- *RAO-5 (Prevent exposure of marine biota to sediment that exceeds the sediment PCLs)* is achieved **by constructing a sediment thin layer cap that would extend to the limits of refuse and wood debris,** and by implementing a MNR program in the area outside the limits of this cap.
- *RAO-6 (Prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs)* is achieved through a combination of components of the cleanup action alternative. Groundwater recharge will be

> reduced by installing an **upland low permeability cap with scrim-reinforced liner,** surface grading, surface water control measures, **and by constructing a sand filter treatment layer along the shoreline of the Site designed to increase hydrodynamic dispersion and aeration in the intertidal and shallow subtidal zones.**

The following sections provide additional details of the cleanup actions associated with Alternative 2.

9.4.2.1 Upland Site Unit

A low permeability soil cap would be installed throughout the Upland Site Unit as part of this cleanup action Alternative. The area of coverage shown on Figure 9-4, and the conceptual design details of the cap presented on Figure 9-5 are the same as those described for Alternative 1, except that the geotextile separation layer would be replaced with scrim-reinforced polyethylene layer to further reduce infiltration and provide a more durable physical separation layer. As discussed in Section 9.4.1 (Alternative 1: Containment with Low Permeability Cap, Shoreline Stabilization, and Subtidal Sediment Monitored Natural Recovery), the low permeability soil cap is anticipated to provide adequate containment of the buried refuse and wood debris, and reduce groundwater recharge from stormwater at the Site.

As with the other alternatives, the thickness of the various layers making up the system and the materials of construction presented in this FS are provided in general terms consistent with a conceptual design to provide an understanding of the system functionality and a basis for cost estimating. The actual details of the cap, including layer thicknesses and materials, would be developed during the design process if Alternative 2 is selected for implementation. For the purposes of the FS, we assume the liner placed above the low-permeability soil will be a scrim-reinforced polyethylene liner with a thickness of 20 mils. A conceptual cross section of the two-layer capping system is provided on Figure 9-5.

It is anticipated that the use of a scrim-reinforced polyethylene layer would result in the cover system reducing infiltration at least 95 percent, thereby reducing infiltration by 14.9 gpm (15.7 gpm x 0.95). Based on the average groundwater discharge rate for the entire Site drainage basin of 21 gpm estimated in Section 4.3.1.3 (Groundwater Flow), this low permeability cap would reduce groundwater recharge through the landfill by about 71 percent.

Sand Filter Treatment Layer

As part of Alternative 2, a sand filter treatment layer would be installed along the shoreline to provide filtration for groundwater discharging to Bellingham Bay. For the purposes of the FS, it is assumed that the sand filter treatment layer would include approximately 1 ft of clean sand placed on the intertidal slope as a filtration layer beneath the shoreline stabilization system. A nonwoven geotextile layer would be placed above the sand filter layer to provide separation between the sand filter and the overlying shoreline stabilization material to ensure that the filter media is not eroded through the large stabilization media pore spaces. It is anticipated that well-graded sand from an upland borrow source would be used for the filter material. The appropriate material gradation and thickness for the granular filter layer requires a detailed analysis that will be performed during the remedial design phase. The gradation and thicknesses for the intertidal granular filter layer identified in this FS are preliminary conceptual designs that were developed for estimating cleanup costs.

The sand filter treatment layer would provide filtering of the groundwater prior to entering Bellingham Bay to reduce suspended particles, increase hydrodynamic dispersion near the groundwater/surface water interface by providing a higher permeability and more heterogeneous media for mixing of groundwater and surface water, and enhanced aeration (oxidation) of groundwater prior to entry of surface water by increasing the intermixing of oxygen-rich surface water with groundwater. Based on the groundwater quality data and the anticipated effectiveness of the upland cap, a relatively thin and highly permeable granular filter layer should be adequate to achieve cleanup standards. However, the composition and thickness of the sand filter layer would be evaluated during remedial design. Additionally, the groundwater compliance monitoring system would be integrated into the sand filter treatment layer to provide more representative samples of groundwater at the groundwater/surface water interface.

In combination with the approximately 71 percent reduction in groundwater discharge caused by the low permeability soil cap, a shoreline filter appears likely to reduce NH_3-ammonia and dissolved manganese concentrations to below PCLs. In addition to the reduction in contaminant concentration due to hydrodynamic dispersion, the filter would enhance groundwater treatment by increasing the residence time at the intertidal zone interface where dissolved oxygen levels are higher due to aeration caused by wave or tidal action. Aeration is a common method of reducing both ammonia (Patoczka and Wilson 1984; Jamieson et al 2003) and dissolved manganese (Raveendran 2001) concentrations in water by promoting nitrification of NH_3-ammonia to nitrate or nitrite and oxidizing manganese to an insoluble form. Anticipated loading would be calculated during the final design to further refine the layer thickness required.

9.4.2.2 Marine Site Unit

Alternative 2 would include the basic shoreline stabilization system and MNR components of Alternative 1, plus a thin layer sediment cap beyond the shoreline stabilization system.

Thin Layer Cap

To meet the chemical PCLs and sediment physical criteria in the subtidal zone, Alternative 2 would include constructing a thin layer sand cap over the area shown on Figure 9-4, and implementing MNR. The thin layer sand cap would extend from the boundary of the shoreline stabilization system at about elevation -10 ft MLLW to the outer limit of the extent of refuse and wood debris.

The purpose of a thin layer cap is primarily to accelerate and enhance natural recovery rather than to provide a stable, engineered cap that would isolate contaminated sediment from overlying biological activity and other natural or anthropogenic activities that could expose contaminated sediment to the predominantly biologically active zone. For FS cost estimating purposes, a minimum thickness of 6 inches is assumed for the thin layer cap. Because we anticipate difficulty in spreading a uniform layer of sand beneath the water, our cost estimate includes an additional volume of sand equivalent to 20 percent of the total volume necessary to achieve a minimum thickness of 6 inches. Construction of such a cap would immediately increase the quality of deep subtidal aquatic habitat and provide a clean sediment stratum appropriate for colonization by marine benthic organisms throughout the area affected by Site refuse and wood debris. In combination with the shoreline stabilization system, which would effectively provide a cap over the intertidal and shallow subtidal zone, a thin layer cap in the deep subtidal zone would bring the total sediment capping area to about 11.6 acres.

The target area for the thin layer cap is shown on Figure 9-4. For the purposes of the FS and cost estimating, we assume the cap will generally consist of sand. During the remedial design phase, specific gradation requirements for the thin layer cap material would be developed.

The shoreline stabilization system would cover most of the eelgrass beds shown on Figure 9-4, and the thin layer cap would cover the remainder of the eelgrass beds at the northern end of the Site. The thin layer capping material would provide a cleaner, more receptive substrate for eelgrass colonization than the existing surface sediment containing refuse or wood debris near the surface, so the eelgrass beds covered by the thin layer cap should be quickly recolonized.

Similar to shoreline stabilization, subtidal capping will need to be coordinated with implementation of the R.G. Haley cleanup. Sediment dredging associated with the R.G. Haley cleanup would need to be implemented in advance of Site subtidal capping.

Monitored Natural Recovery

MNR would be implemented similar to Alternative 1. Because a thin layer cap would be installed rather than an engineered containment cap, there is some potential that erosion, bioturbation, or anthropogenic activities could expose underlying contaminated sediment. As a result, MNR would be implemented throughout the thin layer cap area, and extending farther offshore to evaluate MNR effectiveness in reducing PCB concentrations.

9.4.2.3 Compliance Monitoring and Institutional Controls

The compliance monitoring conducted as part of Alternative 2 would be the similar to that for Alternative 1 in Section 9.4.1.3 (Compliance Monitoring and Institutional Controls), including the scope for both physical and chemical monitoring. Specific monitoring requirements, contingency response actions, and required institutional controls would be prepared as part of the remedial design activities.

9.4.3 ALTERNATIVE 3: TWO-LAYER UPLAND CAP, SHORELINE STABILIZATION WITH SAND FILTER, ENGINEERED SEDIMENT CAP, AND UPGRADIENT GROUNDWATER INTERCEPTION

Alternative 3 is similar to the first two alternatives, but uses a two-layer upland cap (addition of a FML), provides a thicker, engineered containment sediment cap in the subtidal area, and includes the addition of a groundwater diversion barrier at the upgradient boundary of the Site to further reduce groundwater flow through the landfill and contaminated groundwater discharge to Bellingham Bay. The primary components of Alternative 3 are shown in plan view on Figure 9-6, and a conceptual cross section for the Site is provided on Figure 9-7.

Alternative 3 achieves all applicable RAOs through a combination of containment, enhanced hydrodynamic dispersion, groundwater diversion, institutional controls, and monitoring. Alternative 3 achieves applicable RAOs in a manner similar to Alternative 2, and additional measures that are not a part of Alternative 2 are presented in bold in the text below:

- *RAO-1 (Prevent erosion of refuse along shoreline)* is achieved by installing a shoreline stabilization system.
- *RAO-2 (Prevent direct contact with refuse)* is achieved by constructing a cap over the Upland Site Unit, installing a shoreline stabilization system that will act as a cap within the intertidal and shallow subtidal areas, and implementing institutional controls.
- *RAO-3 (Prevent use of shallow Site groundwater for potable purposes*) is achieved by implementing institutional controls.
- *RAO-4 (Control LFG/VOCs*) is achieved by installing a passive LFG control system beneath the low permeability layer of the soil cap.
- *RAO-5 (Prevent exposure of marine biota to sediment that exceeds the sediment PCLs)* is achieved by **constructing an engineered sediment containment cap that would extend to the limits of the extent of refuse and wood debris,** and by implementing a MNR program in the area outside the limits of this cap.
- *RAO-6 (Prevent exposure of aquatic organisms to contamination originating from groundwater or surface water that exceeds the groundwater PCLs)* is achieved through a combination of components of the cleanup action alternative. Groundwater recharge will be

reduced by installing an upland two-layer low permeability cap with surface grading and surface water control measures, **by constructing an upgradient groundwater diversion barrier,** and by constructing a sand filter along the shoreline of the Site.

The following sections provide additional details of the cleanup actions associated with Alternative 3.

9.4.3.1 Upland Site Unit

The components of the Upland Site Unit for Alternative 3 are the same as for Alternative 2, except for the addition of the upgradient groundwater diversion barrier. A two-layer low permeability cap would be installed throughout the Upland Site Unit as part of this cleanup action Alternative as shown on Figure 9-6. Conceptual design details of the cap are the same as would be implemented under Alternative 2. As discussed for Alternative 2, we have conservatively assumed that surface water infiltration within the Upland Site Unit would be reduced by approximately 98 percent by the two-layer low permeability cap, and it would reduce groundwater recharge through the landfill by about 73 percent. Additional components of Alternative 3 that are equivalent to Alternative 2 include grading the Site to promote drainage, actions to the BNSF property stormwater drainage system to prevent accumulation of surface water ponds observed near the railroad tracks, installation of a sand filter along the shoreline, and LFG control.

Alternative 3 includes the addition of an upgradient groundwater diversion barrier system to further reduce groundwater recharge through the landfill. The groundwater interception and diversion system would be constructed along the alignment shown on Figure 9-6. Conceptual details of the system are provided on Figure 9-7. The groundwater interception and diversion system could only be installed to a maximum depth of the contact with the Chuckanut Formation and would not be effective in intercepting any groundwater recharge originating from this unit.

The upgradient diversion barrier would consist of a groundwater interception trench backfilled with coarse soil such as pea gravel, with a low permeability cutoff wall on the downgradient side of the trench, as shown on Figure 9-7. Intercepted groundwater would be discharged to surface water near the southern end of the Site. Because the diversion barrier would extend into the petroleum hydrocarbon-affected area associated with the R.G. Haley site to the north, LNAPL recovery and/or groundwater treatment may be needed prior to discharging intercepted groundwater to Bellingham Bay, although the trench should be isolated from the petroleum hydrocarbon contamination following completion of the trench. For cost estimating purposes, it is assumed that treatment of groundwater from the trench will not be required.

As discussed in Section 4.3.1.4 (Groundwater Recharge and Water Balance), approximately 5.8 gpm of recharge through the landfill originates from rainfall in the portion of the drainage basin located upgradient of the Site. Assuming an upgradient groundwater interception system could capture and divert approximately 80 percent of this flow, the potential reduction in Site groundwater recharge that can be achieved by the system is about 4.6 gpm, representing approximately 22 percent of the estimated 21 gpm of Site groundwater discharge. However, a portion of this groundwater recharge would likely be eliminated by the stormwater actions identified for the BNSF property. The combination of the upgradient groundwater diversion barrier and the low permeability cap is estimated to reduce the amount of groundwater discharge by 20 gpm for Alternative 3, or about 95 percent of the currently estimate rate of groundwater discharge.

9.4.3.2 Marine Site Unit

The primary difference between Alternatives 2 and 3 for the Marine Sediment Unit is the installation of an engineered containment cap in the deep subtidal area rather than a thin layer cap. Additionally, the scope of MNR would be reduced because the cap would provide greater physical separation between contaminated sediment and the predominantly biologically active zone. Alternative 3 is discussed in the following sections.

Shoreline Stabilization and Sediment Engineered Cap

Alternative 3 would include constructing the same shoreline stabilization system (with sand filter) that would be included in Alternative 2, as shown on Figures 9-6 and 9-7. Alternative 3 differs from Alternative 2 in the type of cap constructed outboard of the shoreline stabilization system. Instead of a 6-inch-thick thin layer cap intended to enhance and accelerate natural recovery, Alternative 3 would include a thicker, engineered cap to provide a higher degree of assurance that contaminated sediment would be contained below the predominantly biologically active zone.

As with Alternative 2, the sediment cap placement would occur below elevation -10 ft MLLW, which is the elevation separating the shallow and deep subtidal zones. As a result, capping in the subtidal area would slightly increase the amount of shallow subtidal habitat by raising the mudline elevation. Because shallow subtidal habitat is considered to have greater value than deep subtidal habitat, sediment capping represents an improvement in aquatic habitat. Because the cap is located in the deep subtidal zone, it would not likely be affected by wave action or vessel prop wash, so it could be constructed from materials ranging in gradation from clay to coarser sand and gravel. Specific borrow sources and gradation requirements would be evaluated during remedial design. Sources of clean sediment could be either clean dredge material from periodic maintenance dredging of locations such as the Squalicum Channel or the Snohomish River, or from an upland borrow source. For the FS conceptual design, it was assumed that the cap would be constructed of sand with an average thickness of 18 inches, although cap thickness would be further evaluated during remedial design.

Monitored Natural Recovery

The scope of MNR would be reduced because MNR monitoring within the sediment capping zone would not be required. But, monitoring beyond the sediment cap would be required for PCBs to evaluate the effectiveness of natural recovery in achieving the PCB cleanup level. For FS cost estimating purposes, it was assumed that monitoring for natural recovery would include six monitoring stations monitored on the same frequency as Alternatives 1 and 2.

9.4.3.3 Compliance Monitoring and Institutional Controls

The compliance monitoring and institutional controls implemented as part of Alternative 3 would be similar to the compliance monitoring described for Alternatives 1 and 2 described above. The only difference would be that physical monitoring of the cap thickness could require slightly longer cores to evaluate cap thickness. Specific monitoring requirements, contingency response actions, and required institutional controls would be prepared as part of the remedial design activities.

9.4.4 ALTERNATIVE 4: WASTE REMOVAL

In this cleanup alternative, the refuse, wood debris, and contaminated soil present at the Site would be removed from the Upland and Marine Site Units, and transported off site to a licensed solid waste disposal facility. The approximate limits of excavation are shown on Figure 9-8 and the conceptual details of the remedial alternative are presented on Figure 9-9. Alternative 4 achieves all RAOs by removing all contaminated media from the Site, thereby eliminating the source. Because all refuse would be removed from the Site under this cleanup alternative, institutional controls and compliance monitoring would not be necessary.

The excavation volume is estimated based on complete removal of the refuse, wood debris, and associated contaminated soil or sediment, as discussed in Section 6.2.1 (Extent of Refuse and Wood Waste). We estimate the upland excavation will remove approximately 430,000 yd^3 of refuse, wood debris, and soil. The excavation would extend throughout the Upland Site Unit where refuse and wood debris is present, wherever practicable. Excavation boundaries may require modification in areas such as the eastern boundary of the Site near the BNSF railroad alignment. The estimated volume of excavation is based on the total depth of observed refuse and wood debris, and includes a significant portion of intermixed and cover soil. We assume all soil excavated would be considered contaminated. The estimated volume of required excavation does not include the approximately 47,500 yd^3 fine-grained sediments that are stored at the Site. Including this volume would increase the estimated cost for Alternative 4 by about 10 percent, and this additional volume was not included in the estimated costs for the alternative to avoid influencing the cost considerations for this alternative in the disproportionate cost analysis (DCA) process.

The depth of refuse and wood debris in the Marine Site Unit is highly variable and not well documented except near the shoreline, where it is estimated to extend to an average depth of approximately 30 ft. Although the actual volume of sediment dredging would be evaluated during the remedial design process, for the purposes of the FS, it is estimated that approximately 150,000 yd^3 of material would be dredged to completely remove the refuse and wood waste from the Marine Site Unit. Dredge sediments would be stockpiled on a barge to allow dewatering prior to transport and disposal.

It is possible that some of the excavated waste would require pretreatment before it could be accepted at a solid waste facility. For the purposes of cost estimation, it is assumed that 90 percent of the waste excavated would be accepted without treatment, 10 percent of the waste would require onsite stabilization prior to disposal at a solid waste facility, and that none of the waste would require disposal at a hazardous waste landfill. Preliminary estimates of the waste used in this Section are based on available data and would be further evaluated during the remedial design.

The excavation and dredging would significantly modify the location of the shoreline. The shoreline would be reconstructed using clean sand fill and the shoreline stabilized within the intertidal and shallow subtidal zones. For the purpose of cost estimating, the conceptual design includes reconstructing the shoreline slopes to establish a 10H:1V grade within the intertidal zone, and 5H:1V below MLLW. It is additionally assumed for FS cost estimating purposes that the shoreline would be stabilized using traditional materials such as gravel and riprap, although soft bank technologies would be evaluated during remedial design. Alternative 4 has the potential for significant short-term water quality and sediment impacts resulting from the release of contaminants during removal, which may affect its ability to achieve RAO-5 and RAO-6 during construction. This issue is further discussed in Section 9.6 (Evaluation of Alternatives).

Alternative 4 would result in an increase of approximately 7 acres of marine habitat, primarily in the subtidal zone. Because all refuse would be removed from the Site under this cleanup alternative, institutional controls and long-term compliance monitoring would not be necessary following construction. As discussed for the other Marine Site Unit alternatives, Site sediment excavation/dredging would need to be conducted in coordination with cleanup of the R.G. Haley site.

9.5 FEASIBILITY STUDY EVALUATION CRITERIA

This section presents a description of the evaluation criteria against which the alternatives are evaluated. As previously discussed in Section 9.4 (Description of Remedial Alternatives), all cleanup action alternatives for each Site Unit achieve the applicable RAOs presented in Section 9.2 (Remedial Action Objectives and Potentially Applicable Laws). MTCA specifies the evaluation criteria against which cleanup action alternatives are compared. However, additional evaluation criteria specified in SMS are applicable to sediment cleanup sites. As a result, the alternatives developed for the Upland Site Unit will be evaluated against MTCA criteria, and the alternatives developed for the Marine Site Unit will be evaluated against both MTCA and SMS criteria. Both MTCA and SMS require that cleanup alternatives be compared to a number of criteria to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as a basis for comparing the relative merits of the developed cleanup alternatives. Most of the evaluation criteria are identical between MTCA and SMS, although SMS identifies two evaluation criteria not specified in MTCA.

9.5.1 THRESHOLD REQUIREMENTS

As specified in WAC 173-340-360(2)(a), all cleanup actions are required to meet the following threshold requirements:

- Protection of human health and the environment
- Compliance with cleanup standards specified under MTCA
- Compliance with applicable state and federal laws
- Provisions for compliance monitoring.

9.5.2 REQUIREMENT FOR PERMANENT SOLUTION TO THE MAXIMUM EXTENT PRACTICABLE

WAC 173-340-200 defines a permanent solution as one in which cleanup standards can be met without further action being required at the Site or at any other site involved with the cleanup action, other than the approved disposal site of any residue from the treatment of hazardous substances. Ecology recognizes that permanent solutions may not be practicable for all sites and provides criteria for determining whether a cleanup action is permanent to the "maximum extent practicable" in WAC 173-340-360(3)(f). These criteria include:

- ***Overall protectiveness*** of human health and the environment, including the degree to which Site risks are reduced, the risks during implementation, and the improvement of overall environmental quality
- ***Permanent reduction in toxicity, mobility, and volume of hazardous substances***, including the reduction or elimination of hazardous substance releases and sources of releases
- ***Cleanup costs,*** including capital costs and operation and maintenance costs

- ***Long-term effectiveness***, including the degree of certainty that the alternative will be successful, the long-term reliability, the magnitude of residual risk, and the effectiveness of controls required to manage treatment residues and remaining waste
- ***Management of short-term risks***, including the protection of human health and the environment during construction and implementation
- ***Implementability***, including consideration of whether the alternative is technically possible; the availability of necessary offsite facilities, services, and materials; administrative and regulatory requirements; scheduling, size, and complexity of construction; monitoring requirements; access for construction, operations, and monitoring; and integration with existing facility operations
- ***Consideration of public concerns,*** which will be addressed through public comment on this RI/FS report and the CAP that will be subsequently developed by Ecology.

Ecology provides guidance for a DCA procedure [WAC 173-340-360(3)(e)] to determine whether a cleanup action is permanent to the maximum extent practicable. The purpose of the DCA is to determine if the incremental increase in cost of a cleanup alternative over that of a lower cost alternative is justified by the incremental increase in benefits to human health and the environment. If the incremental increase in costs is determined to be disproportionate to the benefits, the more expensive alternative is considered impracticable and the lower cost alternative is determined to be permanent to the maximum extent practicable. This process provides a mechanism for balancing the permanence of the cleanup action with its costs, while ensuring that human health and the environment are adequately protected.

9.5.3 REQUIREMENT FOR A REASONABLE RESTORATION TIME FRAME

WAC 173-340-360(4)(b) specifies that the following factors be considered in establishing a reasonable time frame:

- Potential risks to human health and the environment
- Practicability of achieving a shorter restoration time frame
- Current use of the Site, surrounding areas, and associated resources that are, or may be, affected by releases from the Site
- Potential future use of the Site, surrounding areas, and associated resources that are, or may be, affected by releases from the Site
- Availability of alternate water supplies
- Likely effectiveness and reliability of institutional controls
- Ability to control and monitor migration of hazardous substances from the Site
- Toxicity of the hazardous substances at the Site
- Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar Site conditions.

9.5.4 REQUIREMENT FOR CONSIDERATION OF PUBLIC CONCERNS

Consideration of public concerns is an inherent part of the Site cleanup process under MTCA (refer to WAC 173-340-600). This RI/FS report will be issued for public review and comment, and Ecology will determine whether changes to the RI/FS report are needed in response to public comment. A similar process will occur for the CAP, prior to implementation of the final cleanup action, as specified in WAC 173-340-380.

9.5.5 SEDIMENT MANAGEMENT STANDARDS EVALUATION CRITERIA

In addition to the MTCA evaluation criteria described above, SMS requires that sediment cleanup alternatives be evaluated for the improvement in overall environmental quality or net environmental benefit, and for environmental impacts. Net environmental benefit includes benefits to the environment such as restoration of water and sediment quality, habitat and fisheries, and public benefits such as public access, recreation, aesthetics, and future land use. Environmental impacts include such factors as construction-related water and sediment quality impacts, loss of habitat value or acreage, and restrictions to land use or access. Net environmental benefit will be addressed by a separate evaluation criterion for the Marine Site Unit in Section 9.7.1.2 (Marine Site Unit).

9.6 EVALUATION OF ALTERNATIVES

This section provides an evaluation of the cleanup alternatives with respect to the MTCA and SMS criteria discussed in Section 9.5 (Feasibility Study Evaluation Criteria). A DCA of the alternatives is presented in Section 9.7 (Disproportionate Cost Analysis).

9.6.1 THRESHOLD REQUIREMENTS

In order for a cleanup alternative to meet the threshold requirements, it must adequately protect human health and the environment, comply with cleanup standards, comply with state and federal laws, and provide for compliance monitoring. Compliance with the threshold requirements for a cleanup action under MTCA is presumed by definition to be protective of human health and the environment once the cleanup action meets the cleanup standards for all affected media. Also, any cleanup action performed in accordance with the requirements of MTCA (and SMS) is assumed to be in compliance with cleanup standards and applicable state and federal laws. The following sections identify how the cleanup alternatives for each Site Unit comply with the threshold requirements.

9.6.1.1 Upland Site Unit

The potential exists for human health to be impacted under current Site conditions through direct contact with subsurface refuse during intrusive activities, or along the shoreline as additional shoreline erosion occurs. The primary potential impacts to the environment associated with the Upland Site Unit are continued release of refuse and wood debris to the aquatic environment from shoreline erosion and the discharge of contaminated groundwater (impacted through contact with the refuse) to Bellingham Bay. The current impacts will be addressed by the cleanup alternatives carried forward for evaluation.

The four Upland Site Unit alternatives comply with the threshold requirements as follows:

- ***Protection of human health and the environment*** – Alternatives 1, 2, and 3 protect human health and the environment through 1) physical containment of refuse, 2) reduction of contaminant concentrations in groundwater at the proposed conditional point of compliance by a reduction in groundwater discharge, and 3) institutional controls, and groundwater compliance monitoring. Alternatives 2 and 3 also reduce groundwater contaminant concentrations at the preliminary conditional point of compliance through groundwater treatment (filtration) and enhanced hydrodynamic dispersion provided by the sand filter layer. Alternative 3 further reduces contaminated groundwater discharge through installation of an upgradient groundwater diversion barrier. Alternative 4 provides protection of human health and the environment through complete soil, refuse, and wood waste removal and disposal at an offsite licensed solid waste facility.
- ***Compliance with cleanup standards*** – Through the various cleanup technologies and administrative controls employed, and achievement of the applicable RAOs, it is anticipated that Alternatives 1 through 4 would all comply with MTCA soil and groundwater cleanup standards. Alternatives 1, 2, and 3 would comply with cleanup standards through containment and the use of a conditional point of compliance for groundwater, and Alternative 4 would achieve cleanup standards through removal and offsite disposal.
- ***Compliance with applicable state and federal laws*** – Through identification of ARARs in Section 9.2 (Remedial Action Objectives and Potentially Applicable Laws) and compliance with MTCA and SMS regulations, Alternatives 1 through 4 all comply with applicable state and federal laws.
- ***Provisions for compliance monitoring*** – Protection monitoring will be provided for Alternatives 1 through 4 through health and safety protocols outlined under a Site-specific health and safety plan. Groundwater quality monitoring and LFG collection system monitoring would provide both performance and confirmation monitoring for Alternatives 1 through 3. Alternative 4 would include soil quality monitoring for performance and confirmation monitoring after completion of the excavation.

9.6.1.2 Marine Site Unit

The potential exists for human health to be impacted under current Site conditions through direct contact with refuse and contaminated sediment within the intertidal zone, and through the ingestion of marine organisms affected by contaminated sediment. The primary impact to environmental receptors is contact with contaminated sediment and affected groundwater or surface water. The current impacts will be addressed by the cleanup alternatives carried forward for evaluation.

Each alternative addresses threshold requirements for the Marine Site Unit as follows:

- ***Protection of human health and the environment*** – Alternative 1 protects human health and the environment through physical containment in the intertidal and shallow subtidal zones, and through natural recovery in deep subtidal areas of the Marine Site Unit. Alternatives 2 and 3 protect human health and the environment through physical containment of refuse in the intertidal and shallow subtidal zones, and through capping of refuse and wood debris and natural recovery in the deep subtidal zone. Alternative 4 protects human health and the environment through physical removal of contaminated sediment, refuse, and wood debris, and disposal at an offsite licensed solid waste facility.
- ***Compliance with cleanup standards*** – Through the various cleanup technologies, and achievement of the applicable RAOs discussed in Section 9.2.1 (Remedial Action Objectives), Alternatives 1 through 4 would each be in compliance with MTCA and SMS cleanup standards. Alternative 1 would comply with cleanup standards through containment and natural recovery, and Alternatives 2 and 3 would comply through containment, groundwater filtration, and natural recovery. Alternative 4 would achieve cleanup standards through removal and offsite disposal.
- ***Compliance with applicable state and federal laws*** – Through identification of ARARs, as discussed in Section 9.2.2 (Potentially Applicable State and Federal Laws) and compliance with MTCA and SMS regulations, Alternatives 1 through 4 would each be in compliance with applicable state and federal laws.
- ***Provisions for compliance monitoring*** – Protection monitoring would be provided for Alternatives 1 through 4 through health and safety protocols outlined under a Site-specific health and safety plan. Sediment natural recovery monitoring and/or cap monitoring, and bathymetric surveys would provide both performance and confirmation monitoring for Alternatives 1, 2, and 3 conducted under a Site-specific compliance monitoring plan. Alternative 4 would include sediment quality monitoring for performance and confirmation monitoring after completion of the removal action.

9.6.2 REQUIREMENT FOR A REASONABLE RESTORATION TIME FRAME

MTCA identifies a number of factors to be considered when establishing a reasonable restoration time frame, as described in Section 9.5.3 (Requirement for a Reasonable Restoration Time Frame). A cleanup action is considered to have achieved restoration once cleanup standards have been met. An evaluation of the cleanup alternatives with regard to achieving a reasonable restoration time frame is presented in Tables 9-2 and 9-3, for the Upland and Marine Site Units, respectively, and restoration time frames for each of the alternatives is summarized in Table 9-5. However, the practicability of achieving a shorter restoration time frame is addressed as part of the DCA evaluation presented in Section 9.7 (Disproportionate Cost Analysis). All the cleanup alternatives achieve restoration in a reasonable time frame.

9.6.2.1 Upland Unit

It is anticipated that each of the alternatives described in Section 9.4 (Description of Remedial Alternatives) would achieve restoration within the time frame criteria listed in Section 9.5.3 (Requirement for a Reasonable Restoration Time Frame), as presented in Table 9-2 and 9-5. Alternatives 1 through 3 could be constructed in a single construction season, and would immediately achieve soil cleanup standards. It may require 1 or more years following construction for these alternatives to achieve groundwater cleanup standards, depending on the length of time required to achieve post-construction steady state groundwater conditions. Specifically, Alternatives 2 and 3 are expected to achieve groundwater cleanup standards within 1 to 2 years, and Alternative 1 within 3 to 5 years (Alternative 1 does not have the shoreline sand filter). Alternative 4 would likely require multiple years to construct because of the large excavation volume, but should achieve restoration upon completion of construction, provided the cleanup action does not cause sediment contamination through releases during the removal process. The restoration time frame for Alternative 4 is expected to be 4 to 5 years.

9.6.2.2 Marine Site Unit

It is anticipated that each of the alternatives described in Section 9.4 (Description of Remedial Alternatives) would achieve restoration within the time frame criteria listed in Section 9.5.3 (Requirement for a Reasonable Restoration Time Frame), as presented in Table 9-3 and 9-5. Alternatives 1 through 3 could each be constructed within a single construction season. Alternative 1 is anticipated to achieve sediment cleanup standards in shallow subtidal areas within 3 to 5 years, and within 10 to 20 years within the deep subtidal zone where MNR is applied. Alternative 2 would be similar to Alternative 1, but with increased protection in intertidal and shallow subtidal zones because of improved groundwater quality resulting from the installation of a sand filter layer, and increased protection in the subtidal zone where a sediment cap would be placed. It is anticipated that cleanup would be achieved within 1 to 2 years (immediately following construction) in the shallow subtidal zone and the portion of the deep subtidal zone that is capped. The remainder of the deep subtidal zone is anticipated to achieve protection within 10 to 15 years, slightly shorter than Alternative 1 because capping a portion of the deep subtidal zone should accelerate the effectiveness of MNR. The restoration timeframe is anticipated to be the same for Alternative 3 as Alternative 2. Alternative 4 is anticipated to achieve cleanup immediately following construction (4 to 5 years), which is similar to the restoration timeframe for Alternatives 1 through 3 for the intertidal and shallow subtidal zones, but 5 to 15 years shorter than Alternatives 1 through 3 in the deep subtidal zone. However, redistribution and contamination of post-construction sediment surface could extend the restoration time frame by 10 to 20 years, resulting in a similar restoration time frame as to the other alternatives.

9.6.3 PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

As described in Section 9.5.2 (Requirement for Permanent Solution to the Maximum Extent Practicable), MTCA requires that cleanup actions be permanent to the maximum extent practicable, and identifies a number of criteria to determine which remedial alternative achieves this requirement. The evaluation of whether a given remedial alternative is permanent to the maximum extent practicable is addressed through a DCA, which is presented in Section 9.7 (Disproportionate Cost Analysis).

9.7 DISPROPORTIONATE COST ANALYSIS

As discussed in Section 9.5.2 (Requirement for a Permanent Solution to the Maximum Extent Practicable), MTCA requirements for remedy selection include the requirement to use permanent solutions to the maximum extent practicable. MTCA defines permanent cleanup actions as those in which cleanup standards are met without further action being required. MTCA specifies that the evaluation of whether a cleanup action uses permanent solutions to the maximum extent practicable be based on a DCA consistent with the requirements of WAC 173-340-360(3)(e). In a DCA analysis, cleanup alternatives are arranged from most to least permanent based on the criteria specified in WAC 173-340-360(3)(f).

The DCA then compares the relative environmental benefits of each alternative against those provided by the most permanent alternative evaluated. Costs are disproportionate to benefits if the incremental cost of the more permanent alternative exceeds the incremental benefits achieved by the lower cost alternative [WAC 173-340-360(3)(e)(i)]. The costs for each cleanup alternative is summarized in Table 9-4. Alternatives that exhibit disproportionate costs are considered “impracticable.” Where the benefits of two alternatives are equivalent, MTCA specifies that Ecology select the least costly alternative [WAC 173-340-360(e)(e)(ii)(C)].

The DCA is performed in the following sections, using the information presented in Section 9.6 (Evaluation of Alternatives). The alternatives are first compared to the most permanent cleanup alternative for each Site Unit, and the benefits of each alternative are ranked under the criteria of the DCA [WAC 173-340-360(3)(f)] in Section 9.7.1 (Comparative Evaluation of Alternatives). The costs are then compared against these benefits and the relationship between the costs and benefits is determined in Section 9.7.3 (Disproportionate Cost Analysis). This analysis then determines which alternative is permanent to the maximum extent practicable for each Site Unit.

Relative rankings for the alternatives within each Site Unit were determined by assigning a value on a scale from 1 to 10, where 10 is the highest benefit/value, for each criterion, multiplying each value by a weighting factor, and summing the weighted values to determine an overall alternative benefit ranking score. Weighting factors are based on Ecology input provided for other feasibility studies conducted on Port of Bellingham sites. The six evaluation criteria and associated weighting factors are:

- Protectiveness: 30 percent
- Permanence: 20 percent
- Long-term effectiveness: 20 percent
- Short-term risk management: 10 percent
- Implementability: 10 percent
- Considerations of public concerns: 10 percent.

Additionally, net environmental benefit must be included as an evaluation criterion for the Marine Site Unit. Net environmental benefit is the environmental gains in quality attained by remediation efforts, minus the environmental injuries caused by those actions. To accommodate this additional criterion, net environmental benefit is given a weighting factor of 10 percent, and the weighting factor for long-term effectiveness is reduced to 10 percent.

9.7.1 COMPARATIVE EVALUATION OF ALTERNATIVES

The DCA is based on a comparative analysis of the alternatives for each Site Unit against the six permanence evaluation criteria plus the net environmental benefit criteria for the Marine Site Unit. For each Site Unit, relative rankings for the evaluation criteria of each alternative are discussed below and summarized in Table 9-5.

9.7.1.1 Upland Site Unit

The following provides the comparative evaluation of the alternatives for the Upland Site Unit and compares Alternatives 1 through 3 to the most permanent alternative, Alternative 4.

Protectiveness of Human Health and the Environment

All four alternatives for the Upland Site Unit are protective of human health and the environment. However, there are relative degrees of protectiveness based on the technologies used to achieve that protectiveness. Alternative 4 achieves protection through the removal of contaminated soil and refuse. Alternatives 1 through 3 achieve protection through containment, stormwater management, compliance monitoring and institutional controls, and, in the case of Alternative 3, a groundwater diversion system. Although removal and offsite disposal is not inherently more protective than the other technologies, it does provide a higher level of certainty that protectiveness will be maintained in the long term. Although it is anticipated that each Alternative would achieve groundwater cleanup standards, a slightly increased level of groundwater flow reduction and greater level of hydrodynamic dispersion is achieved by

Alternative 2 over Alternative 1, and additional groundwater flow reduction is achieved by Alternative 3 over Alternative 2. As a result, incremental increases in the level of protectiveness are achieved progressing from Alternative 1 to Alternative 3.

Based on these factors, Alternative 4 was ranked the highest for protectiveness with a ranking of 9 based on the complete removal of contaminated soil. Although placement of low permeability caps provides a high degree of certainty for protectiveness, Alternatives 1 through 3 are ranked slightly lower because they also rely on institutional controls to achieve cleanup. Alternatives 1 through 3 were given rankings of 4, 6, and 7, respectively, because of the slightly higher level of redundancy in effort achieved through addition of the shoreline sand filter layer for Alternative 2 and the upgradient groundwater diversion and two-layer low permeability cap under Alternative 3.

Permanence

Although none of the cleanup alternatives provide a permanent reduction in the toxicity or volume of hazardous substances, all alternatives provide a permanent reduction in mobility. Alternative 4 is considered the most permanent alternative because it removes the source material from the Site and contains it in an engineered landfill. Alternatives 1 through 3 each provide a permanent reduction in mobility through containment of refuse and a reduction in contaminated groundwater discharge to Bellingham Bay.

The integrity of the capping and containment systems associated with Alternatives 1 through 3 can be effectively maintained under the future land use options being considered for the Site. Regardless of future land use, the remedial actions associated with these three alternatives can be easily integrated into Site development and maintained in the long term. The permanence of Alternatives 1 through 3 will be further ensured through institutional controls that establish development and operational requirements for perpetuity. Alternative 4 was ranked highest for permanence (9) based on the waste being placed in a more secure setting, thus reducing the long-term mobility. Alternative 1 receives a ranking of 5, slightly less than the ranking of 6 for Alternatives 2 and 3 based on the greater durability of the liners used for the separation layer in the capping system. Alternatives 2 and 3 are both assigned a ranking of 6 because they will achieve approximately the same level of permanence, but significantly less than that provided by complete removal.

Effectiveness Over the Long Term

The four upland cleanup alternatives have varying degrees of certainty regarding long-term effectiveness. Alternative 4 has the highest certainty for long-term effectiveness because all refuse would be removed from the Site. Alternative 3 has the highest level of long-term effectiveness of the three containment alternatives because it provides the greatest reduction in groundwater discharge to surface water. Alternative 2 provides less of a reduction in the rate of groundwater discharge to surface water as compared to Alternative 3. Alternative 1 is similar to Alternative 2, but does not include the shoreline sand filter treatment layer that would further reduce contaminant concentrations at the point of groundwater discharge to surface water.

Alternatives 1 through 3 would prevent direct human contact with landfill refuse and would progressively increase the reduction of groundwater flow and contaminant concentrations discharging to Bellingham Bay. The concentrations of IHS in groundwater will decrease due to reduced groundwater flow and contaminant flux, increased hydrodynamic dispersion, and to some degree, geochemical reactions (primarily oxidation) near the tidal interface.

Based on these factors, Alternative 4 is ranked the highest for long-term effectiveness (10) because removal of contamination sources (refuse and soil) will eliminate any potential for a release to the environment in the future, although there is some potential that low levels of contamination would be redistributed into the aquatic environment during removal. Alternative 3 received a lower ranking of 7 for long-term effectiveness because onsite containment does not provide the same level of long-term effectiveness as removal. Alternatives 1 and 2 received lower rankings of 5 and 6, respectively, because the lower levels of groundwater recharge and hydrodynamic dispersion (as applicable) reduce the long-term effectiveness of the alternatives.

Management of Short-Term Risks

Alternatives 1 through 3 are all ranked high (9, 9, and 8, respectively) for short-term risk management because these alternatives require minimal disturbance of the landfill contents and consist primarily of placing an engineered layer of protective materials over impacted soil and refuse. Alternative 3 has slightly higher short-term risk than Alternatives 1 and 2 due to the construction of the hydraulic barrier system, which has a higher construction risk and a greater risk of releasing hazardous substances during construction.

The short-term risks for implementation of Alternative 4 are high because of the high potential for environmental releases to Bellingham Bay during implementation, and that it will likely require multiple construction seasons to implement. This will extend the duration for short-term risks and increase the potential for sediment recontamination in the Marine Site Unit from heavy stormwater runoff and wave action. While these short-term risks can be managed over the multiple construction seasons, it may not be possible to completely mitigate them. Additionally, the removal and offsite disposal of more than 500,000 yd^3 of refuse and contaminated sediment represents a significant potential for vehicle accidents or spills during transport to the waste disposal facility. Therefore, Alternative 4 is ranked low (2) for short-term risk management.

Implementability

Alternatives 1 through 3 would be implemented using common construction techniques employed for earthwork. Alternative 2 is identical to Alternative 3, except for the addition of the upgradient groundwater diversion barrier and the FML in Alternative 3. Alternative 4 would likely require extensive groundwater management and specialized equipment to reach the excavation depths required. There are a limited number of contractors capable of implementing a project of this magnitude within the physical setting present at the Site. Additionally, Alternative 4 may be subject to permitting difficulties due to the significant potential for water quality impacts, including the release of hazardous substances to the marine environment. The scope of Alternative 4 is such that it may not be possible to obtain adequate funding to implement the project, so its administrative implementability is uncertain.

Alternatives 1 and 2 are ranked 9 for implementability because they require the least amount and lowest difficulty of construction, and do not pose significant administrative implementation. Alternative 3 is given a ranking of 7 due to the additional complexity associated with implementation of the groundwater diversion system. Alternative 4 is ranked lowest (3) for implementability due to the volume and location/depth of refuse and soil that would need to be removed and managed appropriately.

Consideration of Public Concerns

Each alternative considers public concerns by responding to public comments received on the RI/FS and CAP documents as part of the cleanup process under MTCA. As a result, all alternatives are given a ranking of 10 for consideration of public concerns.

Comparison of Overall Benefits (Relative Benefit Scores)

Based on higher overall scores in the areas of protectiveness, permanence, and long-term effectiveness, Alternative 4 has the highest weighted score. The rank and relative benefit scores for each Upland Site Unit alternative under this scenario are presented in Table 9-5, and are as follows:

Alternative 1 Relative Benefit Score: 6.0
Alternative 2 Relative Benefit Score: 7.0
Alternative 3 Relative Benefit Score: 7.2
Alternative 4 Relative Benefit Score: 8.0

9.7.1.2 Marine Site Unit

The following provides the comparative evaluation of the alternatives for the Marine Site Unit and compares Alternatives 1 through 3 to the most permanent alternative, Alternative 4.

Protectiveness of Human Health and the Environment

Each of the alternatives for the Marine Site Unit are protective of human health and the environment. Alternative 1 achieves protection through MNR and shoreline stabilization. Alternatives 2 and 3 achieve protection through MNR, sediment capping, and shoreline stabilization. Alternative 4 achieves protection through the dredging and removal of contaminated sediment. Alternative 4 provides a higher level of certainty that protectiveness will be achieved, although there is some potential to redistribute contamination during dredging.

Alternative 4 was ranked the highest for protectiveness with a ranking of 9 based on the complete removal and offsite disposal of contaminated sediment, but with recognition of the potential for some contaminant redistribution and resulting surface sediment contamination. Alternatives 1 through 3 are given rankings of 5, 7, and 8 respectively for overall protectiveness. Alternative 1 is given the lowest ranking based on the additional time required to achieve sediment cleanup standards solely through natural recovery. However, natural recovery is the selected remedial action for the portion of the Whatcom Waterway site that extends onto the aquatic portion of the Site, so it has already been accepted by Ecology as effective in this area. Alternative 2 is ranked lower than Alternative 3 because a thin layer cap may not provide the same level of protectiveness as an engineered containment cap, although natural recovery processes have already been demonstrated to be occurring at the Site, so a thin layer cap is considered protective of human health and the environment and would achieve cleanup standards more rapidly than Alternative 1.

Permanence

Although none of the cleanup alternatives provide a permanent reduction in mobility, all four cleanup alternatives result in a permanent remedy provided that containment remedies (Alternatives 1 through 3) are adequately maintained over the long term. Alternative 4 is considered the most permanent alternative because it results in the complete removal and offsite disposal of refuse, wood debris, and contaminated sediment from the Marine Site Unit, and provides a reduction in contaminant mobility through placement in an engineered landfill. Alternatives 1 through 3 would provide permanent remedies, although Alternative 1 is more dependent on natural processes than and the other alternatives since it does not include placement of a cap in the subtidal zone.

Alternative 4 is given a permanence ranking of 9. It does not receive the highest benefit score because it does not permanently reduce the volume or toxicity of the hazardous substances and there is a potential for redistribution of contaminated sediment onto clean surface sediment during dredging. Although engineering controls used during dredging will minimize contaminant redistribution and associated residual sediment contamination, complete elimination of contaminant redistribution for such a large excavation/dredging project subject to high wave energy is likely infeasible. Alternatives 1 through 3 receive lower rankings of 6, 7, and 7, respectively, because they provide no reduction in volume of waste and contaminated media and minimal reduction in toxicity (through treatment of groundwater at the shoreline). Alternative 1 is given a lower ranking than Alternative 2 and 3 because of its reliance solely on natural recovery to achieve and maintain cleanup standards beyond the limits of the shoreline stabilization system.

Effectiveness Over the Long Term

Alternatives 1 through 4 are considered effective over the long term because each will achieve sediment cleanup standards in a reasonable restoration time frame and containment or removal of contamination sources (refuse and wood debris) would eliminate the potential for future release to the environment. Although Alternative 4 would achieve cleanup standards quickly, there is a significant potential for residual surface sediment contamination following implementation of Alternative 4 from suspension and redistribution of contaminants during dredging.

Alternative 4 receives the highest ranking (9) for long-term effectiveness. Alternatives 1 through 3 receive lower rankings (5, 8, and 8, respectively) for long-term effectiveness because onsite containment is not a high-preference technology; the ranking for Alternative 1 is lower than Alternatives 2 and 3 because of the time required to achieve sediment cleanup standards based solely on MNR beyond the shoreline stabilization system, and Alternatives 2 and 3 are ranked at 8 because they are expected to provide the same level of effectiveness over the long term.

Management of Short-Term Risks

The short-term risks associated with implementation of Alternatives 1 through 3 are minimal given that these alternatives will require limited disturbance of refuse, contaminated sediment, or wood debris. The most significant short-term risks for these alternatives would result from potential releases of contaminants to Bellingham Bay during installation of the shoreline stabilization system. Additionally, some short-term risk to marine biota would result from the water quality impacts, and benthic and epibenthic biota would be impacted resulting from the placement of the sediment thin layer and engineered caps associated with Alternatives 2 and 3, respectively.

There is significantly greater short-term risk associated with Alternative 4 than the other two alternatives due to the large volume of refuse, wood debris, and contaminated sediment that would be excavated/dredged from the marine environment. Alternative 4 construction activities would result in the potential exposure of workers to hazardous substances, and potential release of hazardous substances to Bellingham Bay. Additionally, transport of large volumes of dredged material on public roadways or via barge poses potential risk of spills and accidents.

Alternative 1 is ranked highest (9) for short-term risk management and Alternatives 2 and 3 are ranked slightly lower (8). Alternative 4 is given a lower score (2) because it presents significant potential short-term risks during implementation because large volumes of contaminated materials would be excavated/dredged from the intertidal and subtidal zones over multiple construction seasons.

Implementability

The cleanup technologies utilized by Alternatives 1 through 3 (shoreline stabilization and sediment capping) use common upland and marine equipment and methodologies applied to numerous environmental and marine engineering projects. As such, Alternatives 1 through 3 are considered highly implementable.

Alternative 4 would be implemented using common dredging techniques and equipment, but the magnitude and complexity of the alternative makes it subject to a number of engineering implementability issues associated with removing such a large volume of refuse, wood waste and sediment from the marine environment, including water quality issues, spreading contamination through suspension and redistribution, and conducting such a large scale dredging project in a near shore, high wave energy environment.

Administrative implementability, including permitting and cost, would also be a significant project challenge for Alternative 4. Permitting for such a large scale dredging project could be difficult because of the potential impacts to water quality and threatened or endangered species protected under the ESA. Additionally, the cost of Alternative 4 is such that it may not be possible to obtain adequate funding to implement.

Alternative 1 is ranked the highest (10) for implementability because it requires minimal construction and does not pose any significant administrative implementation issues. Alternatives 2 and 3 are ranked slightly lower (9) due to the potential difficulties in placing the sediment cap and controlling surface water quality impacts (turbidity). Alternative 4 is given a low score of 4 for the reasons discussed above.

Consideration of Public Concerns

Each alternative considers public concerns by responding to public comments received on the RI/FS and CAP documents as part of the cleanup process under MTCA. As a result, all the alternatives are given a ranking of 10 for consideration of public concerns.

Net Environmental Benefit

Each alternative would provide a net environmental benefit through achieving sediment cleanup standards. Alternative 1 achieves a net environmental benefit through containment of refuse and contaminated sediment in the intertidal and shallow subtidal zones, and natural recovery in the deep subtidal zone. About 0.8 acres of the eelgrass bed at the southern end of the Site and about 0.2 acres of the eelgrass bed at the northern end of the Site would be covered by the shoreline stabilization system associated with Alternatives 1, 2 and 3, resulting in a net loss of about 1.0 acre of eelgrass beds. The eelgrass beds in this area would not likely re-colonize unless soft bank methods are used for shoreline stabilization. Alternatives 2 and 3 achieve a net environmental benefit through containment in the intertidal zone and sediment capping in the subtidal zone. An approximate additional 0.1 acre of the eelgrass bed at the northern end of the Site would be covered by the sediment cap associated with Alternatives 2 and 3, resulting in a net loss of an additional 0.1 acre of eelgrass beds, although the eelgrass is expected to quickly repopulate the area after the cap has been applied. Additionally, the thicker engineered cap associated with Alternative 3 would provide a modest increase in shallow habitat receptive to eelgrass colonization, so Alternative 3 would provide a slightly greater net environmental benefit than Alternative 2.

Alternative 4 achieves a net environmental benefit through the removal of refuse, wood debris, and contaminated sediment from the marine environment, and by the creation of about 7 acres of new aquatic habitat. Although cleanup construction would cause significant disruption of existing marine habitat, Alternative 4 would create and improve the most marine habitat of the three alternatives developed for the Marine Site Unit.

Alternative 4 is given the highest net environmental benefit ranking (9) based on the significant amount of aquatic habitat improved and created, and in consideration of the significant disruption to existing eelgrass beds and benthic organisms. Alternative 3 is given the next highest net environmental benefit ranking (7) because it creates a modest amount of new shallow subtidal habitat, which is of greater net environmental benefit than deep subtidal habitat. Alternative 1 is given a slightly lower net environmental benefit score (5) than Alternative 2 (6) because will not achieve sediment cleanup standards as quickly without a thin-layer cap to enhance natural recovery.

Comparison of Overall Benefits (Relative Benefit Scores)

Based on higher scores in the areas of short-term risk, implementability, and net environmental benefit, Alternative 3 received the highest overall weighted score. The rank and relative benefit scores for each Marine Site Unit alternative are as follows:

Alternative 1 Relative Benefit Score: 6.6
Alternative 2 Relative Benefit Score: 7.6
Alternative 3 Relative Benefit Score: 8.0
Alternative 4 Relative Benefit Score: 7.9

9.7.2 COST

This section presents the estimated costs for each alternative, subdivided by Site Unit. Itemized costs are provided in Appendix F and the costs are summarized in Table 9-4. The following sections briefly summarize the estimated costs for use in the DCA, for the Upland and Marine Site Units, respectively.

9.7.2.1 Upland Site Unit

Estimated present worth costs related to the Upland Site Unit for each alternative are as follows:

Alternative 1: $5,100,000
Alternative 2: $5,700,000
Alternative 3: $6,900,000
Alternative 4: $53,700,000

These estimated cleanup costs are consistent with an order of magnitude cost estimate and are based on an assumed present worth factor of 3 percent.

9.7.2.2 Marine Site Unit

Estimated present worth costs related to the Marine Site Unit for each alternative are as follows:

Alternative 1: $3,100,000
Alternative 2: $3,400,000
Alternative 3: $3,800,000
Alternative 4: $24,500,000

These estimated cleanup costs are consistent with an order of magnitude cost estimate and are based on an assumed present worth factor of 3 percent.

9.7.3 DISPROPORTIONATE COST ANALYSIS

As required by MTCA for remedy selection, the costs and benefits associated with the evaluated remedial alternatives are compared using a DCA. The DCA compares the relative environmental benefits of each alternative against those provided by the most permanent alternative evaluated. Costs are disproportionate to benefits if the incremental cost of the most permanent alternative exceeds the incremental degree of benefits achieved over the lower cost alternative [WAC 173-340-360(3)(e)(i)]. Alternatives that exhibit such disproportionate costs are considered "impracticable." Where the benefits of two alternatives are equivalent, MTCA specifies that Ecology select the lower cost alternative [WAC 173-340-360(3)(e)(ii)(C)].

The estimated costs presented in Section 9.7.2 (Cost), and the benefits presented in Section 9.7.1 (Comparative Evaluation of Alternatives), are summarized for each alternative in Table 9-5. Table 9-5 also summarizes the overall benefits and costs for each alternative using the relative benefit scores developed in Section 9.7.1 (Comparative Evaluation of Alternatives). The benefit/cost ratio for each alternative, which is a relative measure of the cost effectiveness of the alternative, is also presented in Table 9-5. The cost benefit ratio is calculated by dividing the comparative overall benefit by the cost of the alternative; the alternative cost is first divided by $5,000,000 for scaling purposes. The comparative benefit, cost, and benefit/cost ratio for each alternative, grouped by Site Unit, are graphically presented on Figure 9-10.

9.7.3.1 Upland Site Unit

Consistent with MTCA requirements, the composite benefit and cost of each remedial alternative for the Upland Site Unit are compared to those for the most permanent alternative, Alternative 4. Alternative 4 makes the greatest use of high-preference technologies and represents the most permanent remedial alternative evaluated in this FS. As such, Alternative 4 represents the benchmark against which the incremental costs and benefits of the other alternatives are evaluated.

Alternative 4 receives a composite benefit ranking of 8.0 (out of 10.0). Because this remedy uses the most permanent remedial technologies of those evaluated for this FS, it receives high benefit rankings for overall protectiveness, permanence, and long-term effectiveness. However, Alternative 4 receives low benefit rankings for short-term risk management and implementability, due to the difficulty and risk associated with the removal of large volumes of refuse, contaminated soil, and wood debris from the upland portion of the Site. Alternative 4 receives a higher composite benefit ranking than Alternative 3. However, its incremental increase in benefit over Alternative 3 is about 10 percent while the increase in cost is almost 700 percent. As a result, the cost for Alternative 4 is considered substantial and disproportionate to the incremental benefit provided relative to Alternative 3, and, consistent with WAC

173-340-360(3)(e), upland Alternative 4 is considered impracticable. As a result, Alternative 4 was eliminated from further consideration for cleanup of the Upland Site Unit and the remaining upland alternatives were compared to Alternative 3.

Alternatives 2 and 3 receive similar composite benefit rankings (7.0 and 7.2, respectively). Both remedial alternatives are ranked high for overall protectiveness, short-term risk management, and implementability but are ranked slightly lower for permanence and long-term effectiveness because they primarily rely on containment to achieve and maintain cleanup standards. Alternative 3 provides a greater reduction in groundwater flow through the Site than Alternative 2, which should result in lower concentrations of groundwater constituents of concern discharging to surface water at the groundwater point of compliance. However, the estimated cost for Alternative 2 is $5,700,000, compared to an estimated cost of $6,900,000 for Alternative 3, which represents about a 21 percent increase in cost to achieve a similar score in composite environmental benefit. Additionally, the benefit/cost ratio for Alternative 2 (6.14) is higher than for Alternative 3 (5.88). As a result, the cost for Alternative 3 is considered substantial and disproportionate to the incremental benefit provided relative to Alternative 2, and, consistent with WAC 173-340-360(3)(e), upland Alternative 3 is considered impracticable.

Alternative 1 receives a composite benefit ranking of 6.0, which is about 14 percent lower than for Alternative 2 (7.0). Alternative 1 receives a lower benefit ranking for overall protectiveness and long-term effectiveness based on Alternative 2 including a sand filter treatment layer and a slightly lower permeability capping system. The estimated cost of Alternative 1 is $5,100,000, so the incremental increase in cost for Alternative 2 ($600,000) is about 12 percent, and the benefit/cost ratios are similar at 5.88 and 6.14, respectively. Although the benefit/cost ratio for Alternative 1 is only slightly lower than Alternative 2, Alternative 2 provides significant additional benefit compared to Alternative 1. Based on these considerations, the potential reduction in cost achieved by Alternative 1 is not considered proportionate to the lower environmental benefit achieved by this alternative. Alternative 2 is, therefore, considered permanent to the maximum extent practicable for the Upland Site Unit.

9.7.3.2 Marine Site Unit

Consistent with MTCA requirements, the composite benefit and cost of each remedial alternative for the Marine Site Unit are compared to those for Alternative 4, the most permanent alternative for the Marine Site Unit. Alternative 4 makes the greatest use of high-preference technologies and represents the most permanent remedial alternative evaluated in this FS. As such, Alternative 4 represents the benchmark against which the incremental costs and benefits of the other alternatives are evaluated.

Alternative 4 receives a composite benefit ranking of 7.9. Because this remedy uses the most permanent remedial technologies of those evaluated for this FS, it receives high benefit rankings for overall protectiveness, permanence, long-term effectiveness, and net environmental benefit. However, this alternative receives low benefit rankings for short-term risk management and implementability due to the difficulty and risk associated with the removal of large volumes of refuse, contaminated soil, and sediment from the marine and near-shore environments.

Although Alternative 4 is considered the most permanent, it receives a lower equivalent composite benefit ranking score than Alternative 3 because of the significant short-term risk and implementability concerns. Because the overall benefit score is lower and the cost is almost 7 times higher, the cost of Alternative 4 is clearly substantial and disproportionate to the cost of Alternative 3 given that the overall benefit score is actually lower. As a result, Alternative 4 was eliminated from further consideration.

Alternative 3 received a composite benefit ranking of 8.0, which is about 5 percent higher than Alternative 2 (7.6). The increase in benefit ranking is due to its slightly higher permanence and net environmental benefit rankings based on the use of an engineered cap rather than a thin layer cap. However, given that natural recovery is documented to be occurring at the Site, the thin layer sediment cap included in Alternative 2 is likely to be as effective as the engineered cap associated with Alternative 3. The estimated cost of Alternative 3 is approximately $3,800,000, which is about 12 percent higher than the estimated cost for Alternative 2, resulting in Alternative 3 having a lower benefit/cost ratio (2.11) than Alternative 2 (2.24), indicating that Alternative 2 is a more cost effective alternative. As a result, the incremental increase in cost ($400,000) is considered disproportionate to the incremental increase in benefit and Alternative 3 is considered impracticable and is eliminated from further consideration.

Alternative 1 has an overall benefit score of 6.9, which is about 9 percent lower than the ranking for Alternative 2 (7.6). Alternative 1 receives a higher ranking than Alternative 2 for implementability and management of short-term risk, but receives lower rankings for overall protectiveness, permanence, net environmental benefit, and long-term effectiveness. Alternative 1 has a benefit/cost ratio of 2.23 compared to 2.24 for Alternative 2, indicating Alternative 1 is more cost effective. The incremental increase in cost for Alternative 2 compared to Alternative 1 is relatively small at approximately $300,000 (10 percent) and is not considered disproportionate to the incremental increase in comparative overall benefit achieved by Alternative 2. As such, Alternative 1 is eliminated from future consideration and Alternative 2 is considered the Marine Site Unit alternative that is permanent to the maximum extent practical.

10.0 SUMMARY AND CONCLUSIONS

The Site RI defined physical characteristics, source areas, the nature and extent of impacted media, and the migration pathways for contaminants. Data from the RI and previous investigations were used in the FS process to develop and evaluate remedial alternatives for the Site.

The FS developed remedial alternatives for each of the Site Units to clean up contaminated media defined in the RI, evaluated the alternatives against criteria defined by MTCA and SMS, provided a comparative analysis of the alternatives to determine the relative benefits of each, and compared the relative benefits of each alternative against their costs to determine the most permanent solution to the maximum extent practicable. This section presents the preferred alternative based on these evaluations, discusses how the preferred alternative will be compatible with the cleanup action selected for the R.G. Haley site, provides a comparison of the preferred alternative to cleanup actions conducted at similar sites, and discusses implementation of Site cleanup.

10.1 PREFERRED ALTERNATIVE

This section presents the preferred cleanup alternative for the Site. The actual cleanup remedy will be selected in the CAP developed by Ecology, and may vary from the preferred cleanup action described herein. Alternative 2 was identified in the DCA [Section 9.7 (Disproportionate Cost Analysis)] as the alternative that is permanent to the maximum extent practicable for the Upland Site Unit and Alternative 2 is identified as the alternative that is permanent to the maximum extent practicable for the for the Marine Site Unit. As a result, the preferred alternative (Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Thin Layer Sand Cap, and Monitored Natural Recovery) consists of the following elements:

- Upland cap consisting of low permeability soil and a scrim-reinforced liner, pavement, or buildings to reduce stormwater infiltration. Cap will include surface drainage features designed to reduce stormwater infiltration and prevent erosion.
- Upgradient stormwater actions to BNSF property and decommissioning of the existing Site stormwater collection and conveyance system located to the north of the former GP warehouse.
- Passive LFG collection and control system to mitigate the accumulation of LFG.
- Shoreline stabilization system to prevent erosion and limit human and benthic contact
- A sand filter layer to treat groundwater prior to discharge to surface water.
- A thin layer sediment cap installed from the toe of the shoreline stabilization system to the outer limit of Site refuse and wood debris.
- MNR from the outer edge of the engineered containment cap to the limits of sediment IHS above the sediment cleanup levels (i.e., PCBs).

- Compliance monitoring.
- Institutional controls.

The preferred alternative is shown on Figures 10-1 and 10-2. The sand filter layer included in the Upland Site Unit will provide groundwater treatment and will also provide a location for most effectively monitoring groundwater quality at the point of discharge to surface water. It is anticipated that the preferred alternative will achieve groundwater cleanup standards within 1 to 2 years and sediment cleanup standards within 10 to 15 years following implementation of the cleanup action. The total estimated cost for the preferred alternative is $9,100,000.

10.2 COMPATIBILITY WITH R.G. HALEY AND WHATCOM WATERWAY REMEDIAL ACTIVITIES

The R.G. Haley site is located adjacent to the Site. As discussed in the RI, there is some overlap of hazardous substances in soil, groundwater, and sediment between the two sites. Because of this overlap, it is important that the remedial actions implemented at the two sites be coordinated to ensure successful remediation at both sites over the long term. It is the intent of the Port and the City to coordinate remedial activities for the Site with the actions at the R.G. Haley site. Because the City is the owner of portions of both properties, coordination and integration of the two cleanups should be easily accomplished.

Also nearby is the Whatcom Waterway cleanup site. The selected remedy for that cleanup site is MNR, and is now underway. The preferred alternative for cleanup at the Cornwall Site (and each of the alternatives considered) has some overlap with the Whatcom Waterway site in the Marine Site Unit. Because the selected remedy for the Whatcom Waterway cleanup site is MNR, the preferred alternative for cleanup of the Cornwall Site is compatible with that cleanup. Cleanup at the Cornwall Site will include capping and monitored natural recovery in the Marine Site Unit and as such, will not interfere and is likely to result in a quicker cleanup of the area where capping will be conducted. Where MNR overlaps between the sites, monitoring will be coordinated to increase the efficiency of data collection.

Although a preferred cleanup alternative has not yet been selected for the R.G. Haley site, it is anticipated that each site will utilize common remedial technologies, including upland capping and stormwater management, shoreline erosion protection, and other engineering and institutional controls. Cleanup of the R.G. Haley site could also include groundwater extraction, soil excavation, soil treatment, or soil stabilization. Some remedial technologies evaluated in this document are specific to Site issues, but all are considered compatible with the anticipated remedial actions at the R.G. Haley site. The remedial measures to be implemented at each of the sites can be designed and implemented in a coordinated and complementary manner. The spatial relationship between the preferred remedy for the

Site and potential elements of the remedy for the R.G. Haley site is shown on Figure 10-1. As shown on this figure, upland remedial actions in the northern portion of the Site are anticipated for both cleanups. Similarly, sediment remedial areas for both sites may overlap. The administrative issues associated with these areas of overlap (i.e., definition of site boundaries, points of compliance, and PLP roles and responsibilities) can be addressed as part of the CAP and consent decree.

Some sequencing of remedial activities may be required to ensure successful implementation of cleanup actions at the two sites. For example, to prevent potential sediment cap recontamination, the completion of shoreline erosion controls at both of the sites, and the completion of R.G. Haley site source control measures may need to be implemented prior to construction of the engineered containment cap proposed for the Site.

These types of coordination and sequencing issues can be addressed as part of the CAP, consent decree, and engineering design reports for the two sites, following Ecology selection of remedial alternatives for the two sites. At that time, the detailed plans and scheduling issues pertaining to engineering and institutional controls, and integration of these requirements with future land use, will be defined for the remedial alternative selected for each site. Detailed plans for implementing the cleanup in the areas overlapping the two sites will also be clarified.

The Port and the City are committed to working together, and with Ecology, to coordinate remedial actions at the two sites to ensure successful implementation and redevelopment.

11.0 USE OF THIS REPORT

This report was prepared for the exclusive use of the Port of Bellingham, the City of Bellingham, and applicable regulatory agencies, for specific application to the Cornwall Avenue Landfill Site. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of the Port, the City, and Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied. This document was prepared under the supervision and direction of the undersigned.

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JMD/LDB/kes

12.0 REFERENCES

Anchor Environmental and Hart Crowser. 1999. *Remedial Investigation/Feasibility Study, Whatcom Waterway Site*. August 4.

Aspect Consulting. 2004. *Phase II Environmental Site Assessment, GP Bellingham Operations.* September.

Baker. 1997. *United States Coast Guard Boathouse Wave Study: Final Report.* Prepared for the U.S. Coast Guard: Facilities Design and Construction Center Pacific. November.

Ballinger, D. and Vanderhorst, R. 1995. *Predation on Chinook Smolts in Georgia Strait*. Lummi Indian Business Council. Bellingham, Washington.

Bellingham, City of. nd. *Title 22, Bellingham Municipal Code, Shoreline Master Program.*

Blumen Consulting Group, Inc. 2010. *Final Environmental Impact Statement, The Waterfront District Redevelopment Project (Formerly Known as New Whatcom).* July.

Dames & Moore. 1960. *Report of Foundation Investigation, Proposed Site Development, Bloedel-Donovan Mill Site, Bellingham, Washington.* December 19.

Desert Research Institute. 2012. *Period of Record Monthly Climate Summary*. Available at: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wabell Accessed on August 27.

DMMP et al. 2009. *OSV Bold Summer 2008 Survey Data Report, Final.* Prepared by the Dredged Material Management Program; U.S. Army Corps of Engineers, Seattle District; U.S. EPA Region 10; WA State Department of Natural Resources; WA State Department of Ecology. June 25.

Driscoll, Fletecher G. 1986. *Groundwater and Wells, Second Edition.* Johnson Division. St. Paul, Minnesota.

EA Engineering. 2012. *2012 EIS Addendum, The Waterfront District Redevelopment Project.* December

Ecology. 2008. *Sediment Sampling and Analysis Plan Appendix; Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards (Chapter 173-204 WAC)*. February 1.

Ecology. 2005. *Lake Whatcom Total Maximum Daily Load Groundwater Study*. Publication No. 05-03-001. January.

Ecology. 1992a. *Sediment and Seep Sampling at Cornwall Avenue Landfill, Bellingham, Washington.* Washington State Department of Ecology. May 6.

Ecology. 1992b. *Site Hazard Assessment, Cornwall Avenue Landfill, Foot of Cornwall Avenue, Bellingham, Washington.* Washington State Department of Ecology, Northwest Regional Office. Bellevue, Washington. June.

Ecology. 1992c. *Site Hazard Assessment for the R.G. Haley Property.* Washington State Department of Ecology.

Emerson, K., et al. 1975. *Aqueous ammonia equilibrium calculations: effect of pH and temperature.* Journal of the Fisheries Research Board of Canada. 32:2379-2383.

ENSR. 2007. Letter: *Final Work Plan Addendum.* To Phil Kovacs, Ecology. July 17.

Freeze, R. Allan and John A. Cherry. 1979. *Groundwater.* Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

Ferris, J.G. 1951. "Cyclic Fluctuations of Water Level as a Basis for Determining Aquifer Transmissibility." *Intl. Assoc. Sci. Hydrology.* Publ. 33. pp. 148-155.

GeoEngineers. 2007. *Draft Final FI/FS Report, Volume I of II, R.G. Haley International Corporation Site, Bellingham, Washington, Agreed Order No. DE 2186.* September 5.

GeoEngineers. 2002. *Interim Cleanup Action Report, Former R.G. Haley International/DNR Property, Bellingham, Washington*. Prepared for Perkins Coie LLP and Douglas Management Company. May 20.

GeoEngineers. 2001. *Addendum No. 2, Interim Cleanup Action Plan, Former R.G. Haley International/DNR Property, Bellingham, Washington.* Prepared for Perkins Coie LLP and Douglas Management Company. December 17.

GeoEngineers. 2000. *Interim Cleanup Action Plan, Former R.G. Haley International/DNR Property, Bellingham, Washington*. Prepared for Perkins Coie LLP and Douglas Management Company. July 6.

Hart Crowser. 2009. *Sediment Site Characterization Evaluation of Bellingham Bay Creosote Piling and Structure Removal, Cornwall Avenue Landfill Mapping, Boulevard Park Overwater Walkway Feasibility, and Dioxin Background Sampling and Analysis, Bellingham, Washington.* Prepared for Washington State Department of Ecology. June 26.

IPCC. 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Inter Governmental Panel on Climate Change.*

Jamieson, T.S., G.W. Stratton, R. Gordon, and A. Madani. 2003. "The use of aeration to enhance ammonia nitrogen removal in constructed wetlands." *Canadian Biosystems Engineering/Le géniedes biosystèmes au Canada.* Volume 45: 1.9-1.14.

Kovacs, Phil. 2008. Email message from Phil Kovacs, Environmental Engineer, Toxics Cleanup Program, Washington State Department of Ecology, to Brian Gouran, Environmental Site Project Manager, Port of Bellingham. Re: *Cornwall Ave LF RI/FS: Wood Waste Delineation*. November 17.

Landau Associates. 2012a. *Work Plan, Cornwall Avenue Landfill Site, Supplemental RI Groundwater Investigation, Bellingham, Washington.* June 15.

Landau Associates. 2012b. *Interim Action Completion Report, Cornwall Avenue Landfill Interim Action, Bellingham, Washington.* August 22.

Landau Associates. 2011. *Cornwall Avenue Interim Action Plan, Bellingham, Washington*. August 18.

Landau Associates. 2002. *Draft Work Plan Supplemental Remedial Investigation, Cornwall Avenue Landfill, Bellingham, Washington*. May 13.

Landau Associates. 2000. *Report, Focused Remedial Investigation/Feasibility Study, Cornwall Avenue Landfill, Bellingham, Washington*. October 3.

Landau Associates. 1997. *Report, Expanded Site Investigation, Cornwall Landfill Investigation, Bellingham, Washington.*

Marine Resources Consultants. 1999. *Underwater Videographic Eelgrass Survey, Bellingham Bay Demonstration Pilot Project, August 3-5, 1999.* Prepared for Pacific International Engineering PLLC. November 4.

Newcomb et al. 1949. *Groundwater Resources of Western Whatcom County, Washington.* USGS. December

NOAA website. 2008. *Tides for Bellingham Bay, Bellingham, Washington*. National Oceanic and Atmospheric Administration. http://tidesandcurrents.noaa.gov/. Accessed December 8.

NSEA website. 2008. *Padden Creek Watershed Land Uses*. Nooksack Salmon Enhancement Association. http://www.n-sea.org/. Accessed December 8.

Patmont, et al. 2004. *Working Draft, Natural Recovery: Monitoring Declines in Sediment Chemical Concentrations and Biological Endpoints.* RTDF: Technical Documents, Sediments Remediation Action Team. June.

Patoczka, Jerzy and David J. Wilson. 1984. "Kinetics of the Desorption of Ammonia from Water by Diffused Aeration." *Separation Science and Technology*. Volume 19(1), pp. 77-93.

Port of Bellingham, City of Bellingham. 2010. *The Waterfront District, Bellingham Washington, Draft Sub-Area Plan 2010.* http://www.portofbellingham.com/index.aspx?NID=172 Prepared by Port of Bellingham and City of Bellingham. Updates proposed 2012.

Port of Bellingham website. 2012. *2012-2013 Master Planning Updates*. Accessed at: http://www.portofbellingham.com/index.aspx?nid=497. November 29.

Purnell & Associates. 1985. *Engineering Geology and Geotechnical Investigation Tissue Warehouse Additions, Bellingham, Washington.* W.D. Purnell & Associates. March 20.

Raveendran, Ravi, Brian Ashworth, and Bryan Chatelier. 2001. "Manganese Removal in Drinking Water Systems." 64th Annual Water Industry Engineers and Operators' Conference. All Seasons International Hotel – Bendigo. September 5-6.

RETEC. 2006. *Supplemental Remedial Investigation & Feasibility Study, Volume 1: RI Report, Whatcom Waterway Site, Bellingham, Washington*. Report (draft) prepared for the Washington Department of Ecology, Northwest Regional Office. October 10.

Stasney. 1997. *The Cornwall Avenue Landfill, Bellingham, Washington.* Prepared for the Port of Bellingham. Western Washington University Geology Department. April 18.

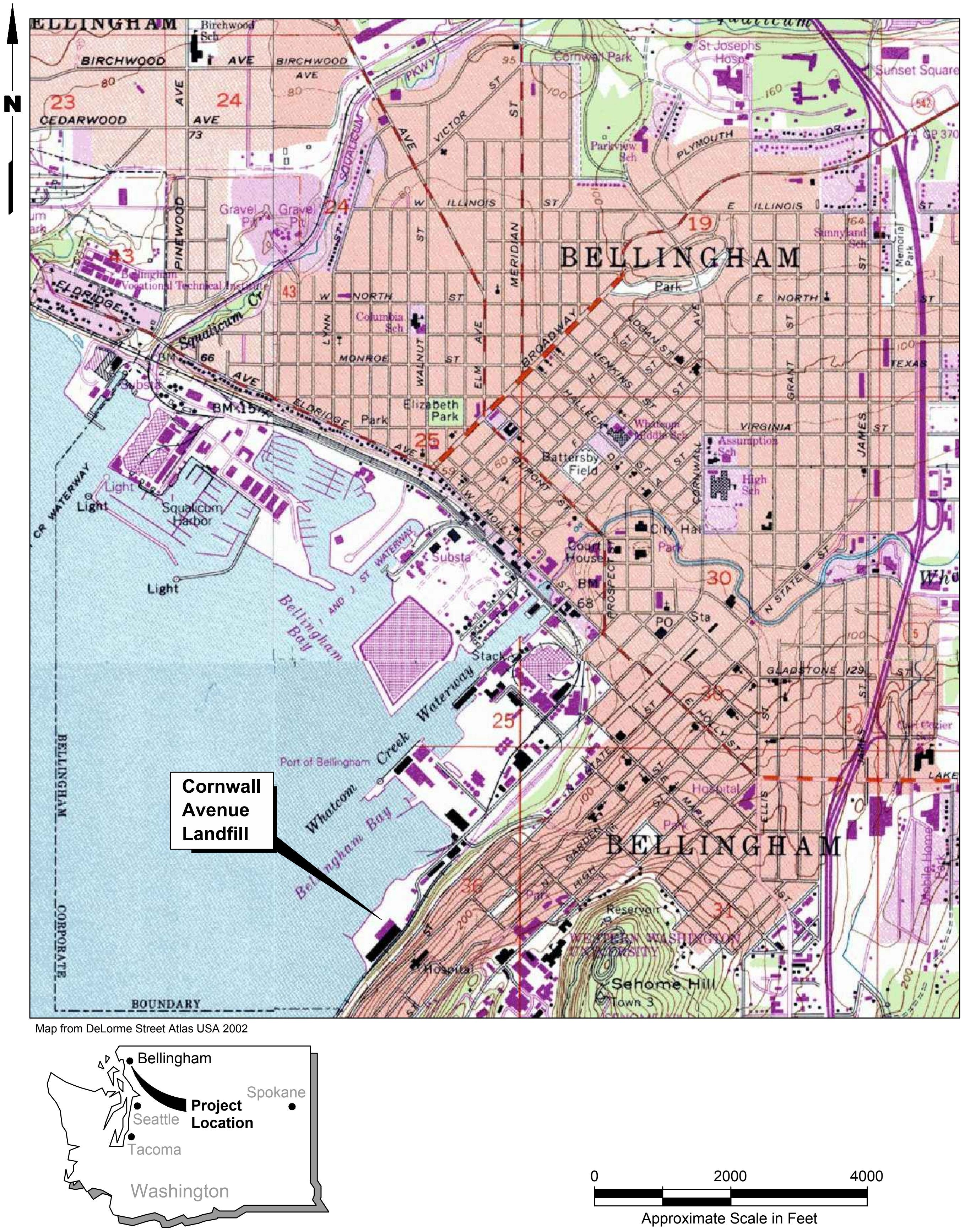
Sullivan. 2005. *The Hydrogeology of North Lummi Island.* M.S. Thesis, Western Washington University. October.

Tetra Tech and Historical Research Associates, Inc. 1995. *Initial Characterization of Contaminants and Uses at the Cornwall Landfill and in Bellingham Bay.* Prepared for Attorney General of Washington. June 30.

University of Washington Climate Impacts Group and the Washington Department of Ecology. 2008. *Sea Level Rise in the Coastal Waters of Washington State.* Prepared by Philip Mote, Alexander Petersen, Spencer Reeder, Hugh Shipman, and Lara Whitely Binder.

USGS. 1999. *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada.* Water Resources Investigations Report 98-4195

WCHHS. 1999. Letter: *Cornwall Avenue Landfill – Medical Waste Disposal Issues*. From R. Delahunt, Environmental Health Manager, Whatcom County Health and Human Services, to M. Stoner, Port of Bellingham. March 2.



Map from DeLorme Street Atlas USA 2002

Port of Bellingham \ Cornwall Avenue Landfill \ RI/FS | V:\001\020\400\510\RIFS 2013\Fig 1-01.dwg (A) "Figure 1-1" 8/13/2013

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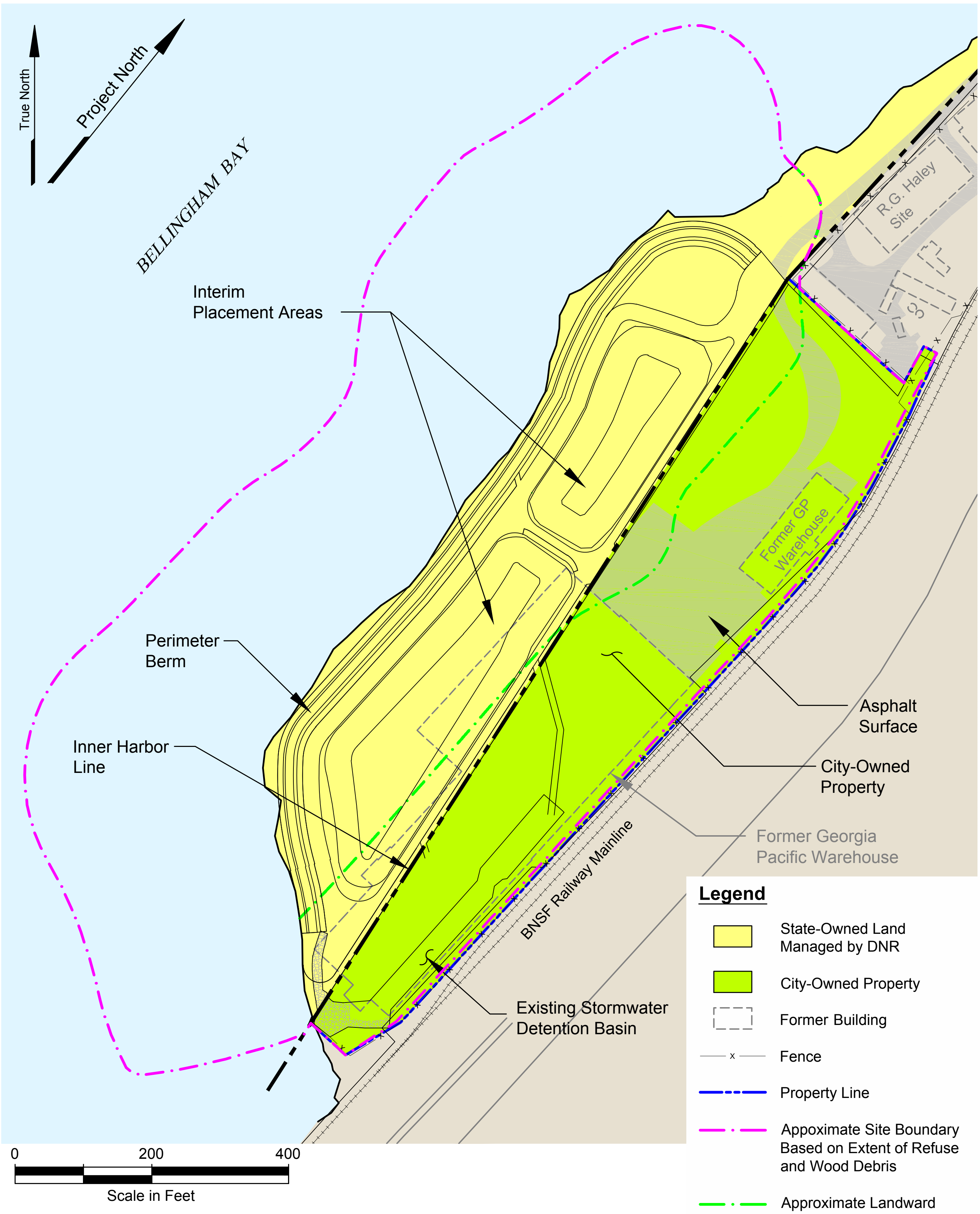
Cornwall Avenue Landfill
Bellingham, Washington

Vicinity Map

Figure
1-1



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 1-02.dwg (A) "Figure 1-2" 8/13/2013

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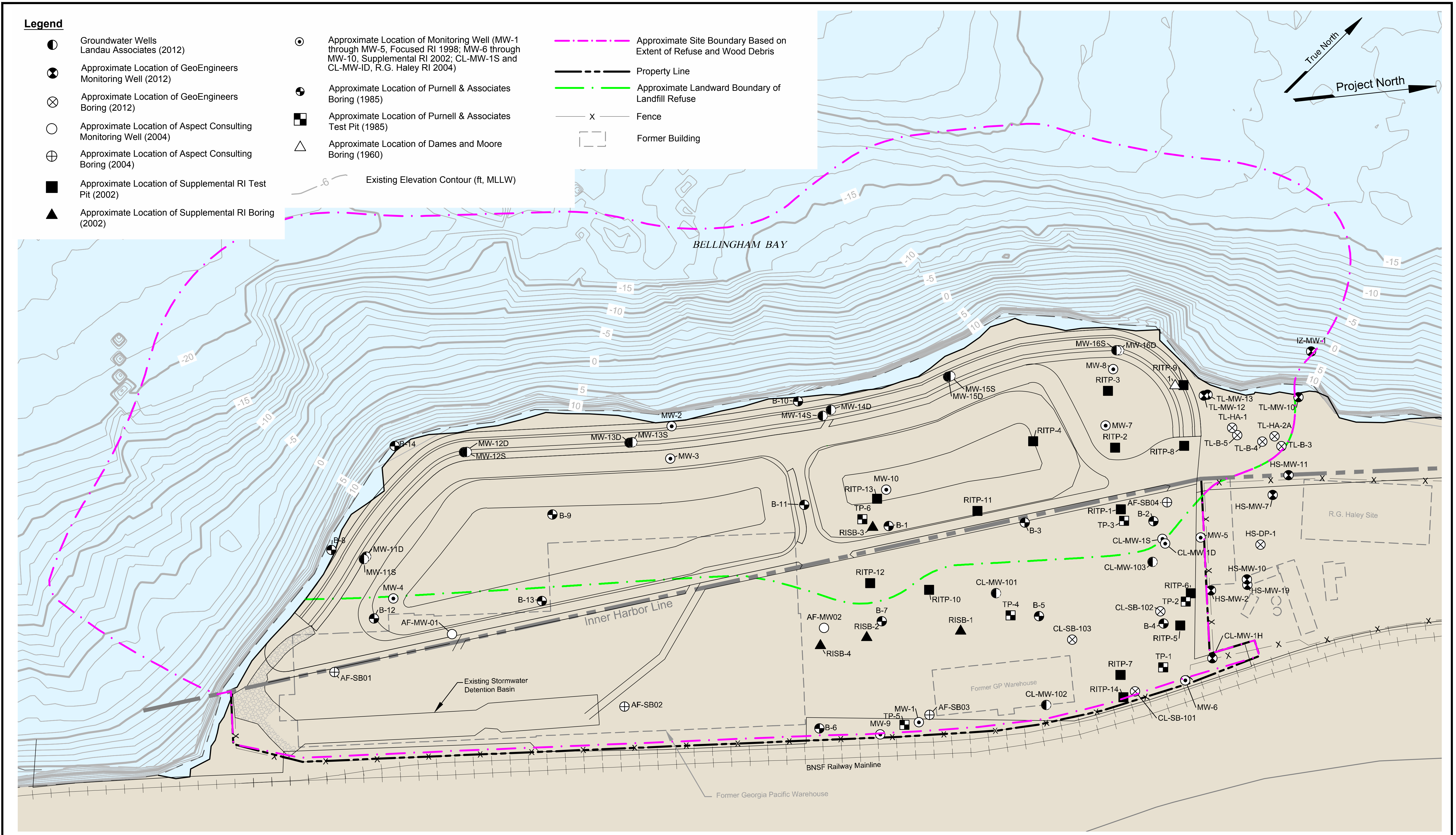
Cornwall Avenue Landfill
Bellingham, Washington

Current Conditions
Site Plan

Figure
1-2



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

0 120 240

Scale in Feet

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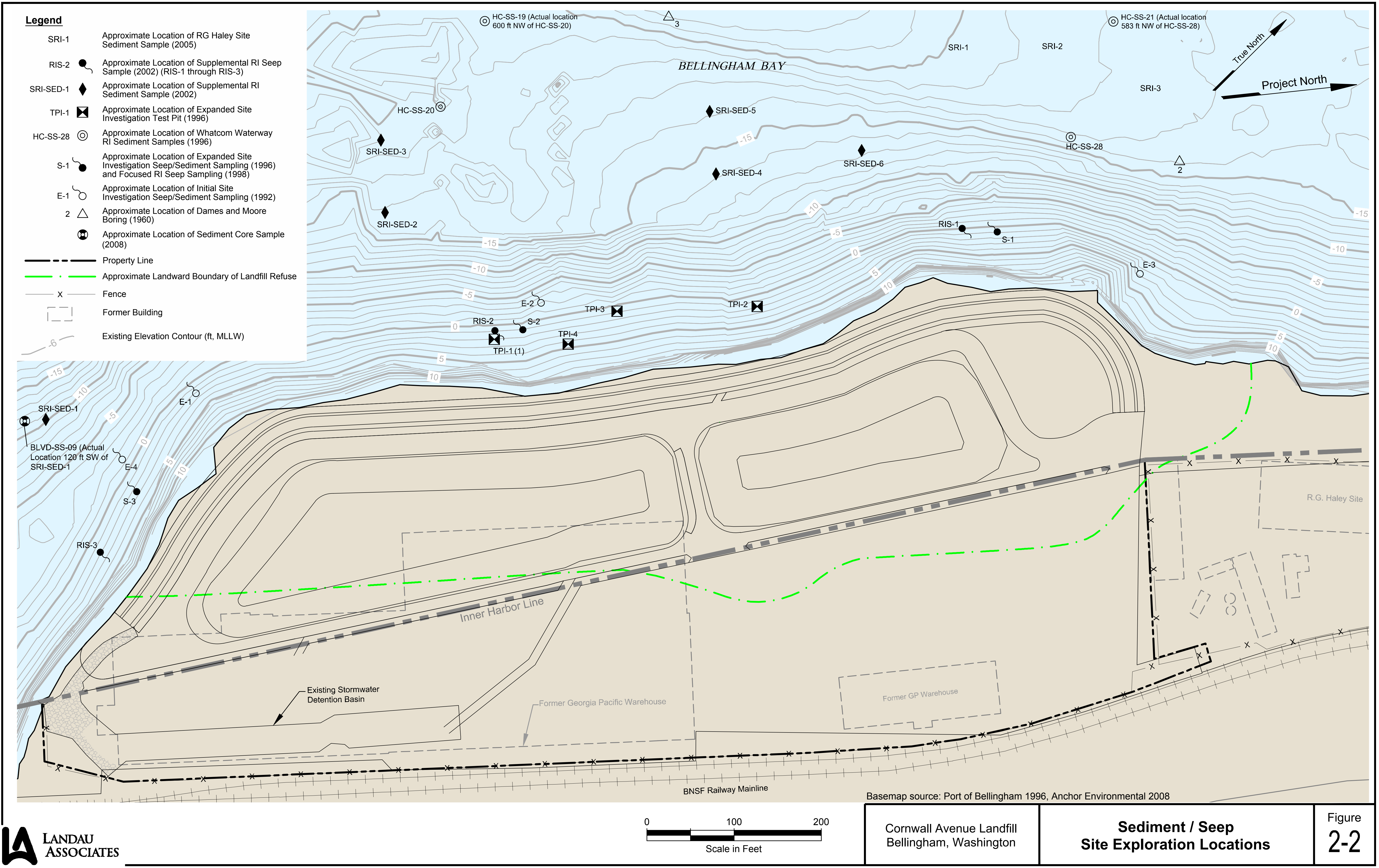
Cornwall Avenue Landfill
Bellingham, Washington

Upland Site
Exploration Locations

Figure
2-1

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 2-01.dwg (A) "Figure 2-1" 8/13/2013



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 2-02.dwg (A) "Figure 2-2" 8/13/2013

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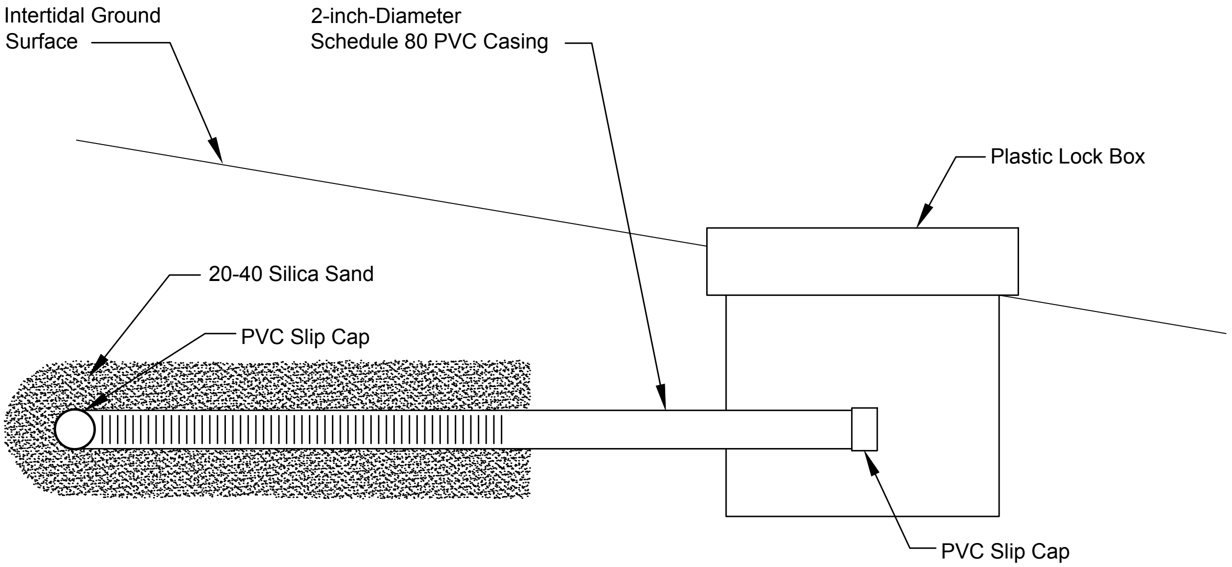
Cornwall Avenue Landfill
Bellingham, Washington

Sediment / Seep
Site Exploration Locations

Figure
2-2



Not to Scale

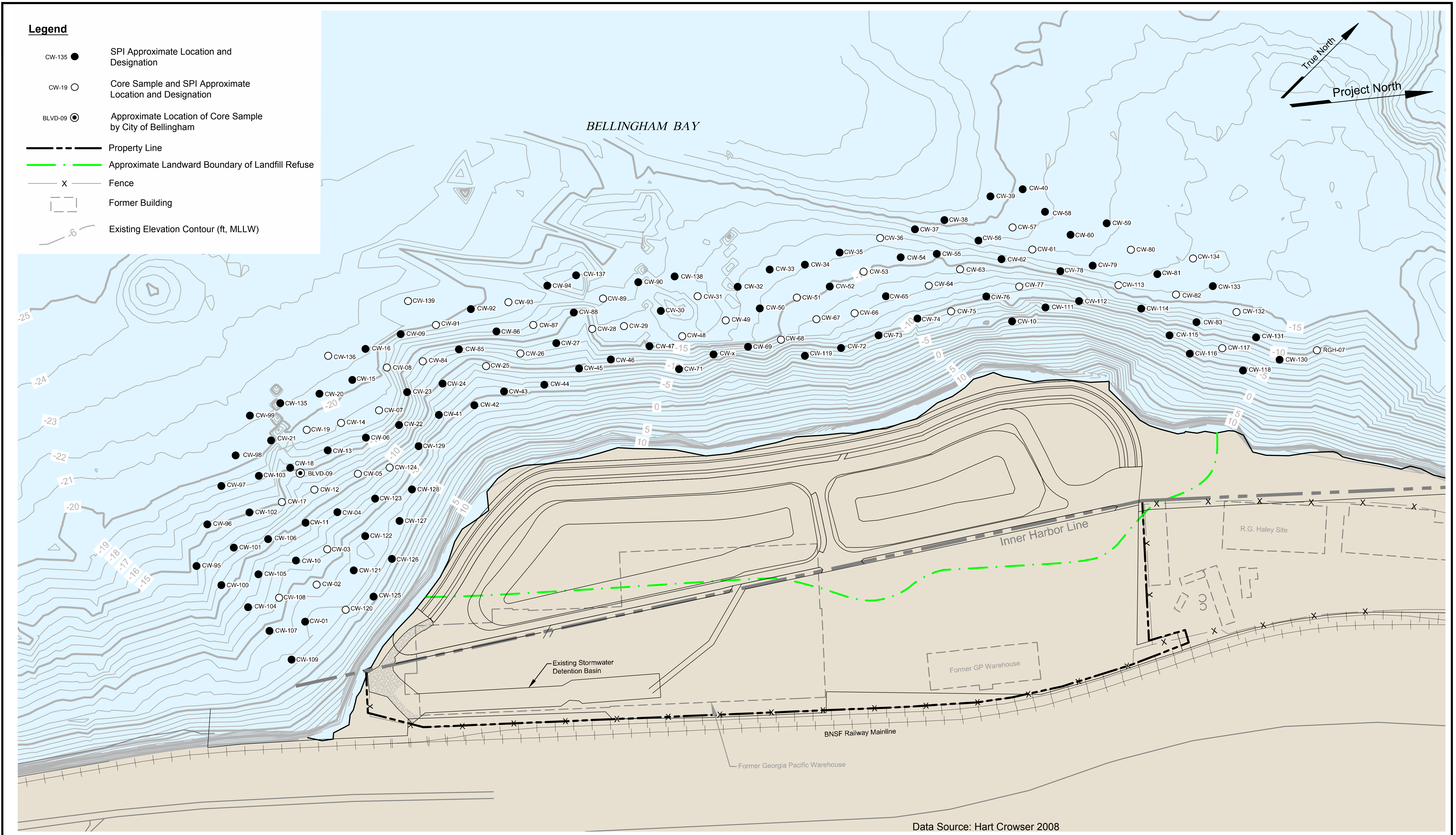
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 2-03.dwg (A) "Figure 2-3" 8/13/2013

Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Seep Collection Device
Construction Details

Figure
2-3



Data Source: Hart Crowser 2008
Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

0 150 300
Scale in Feet

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 3-01.dwg (A) "Figure 3-1" 8/13/2013

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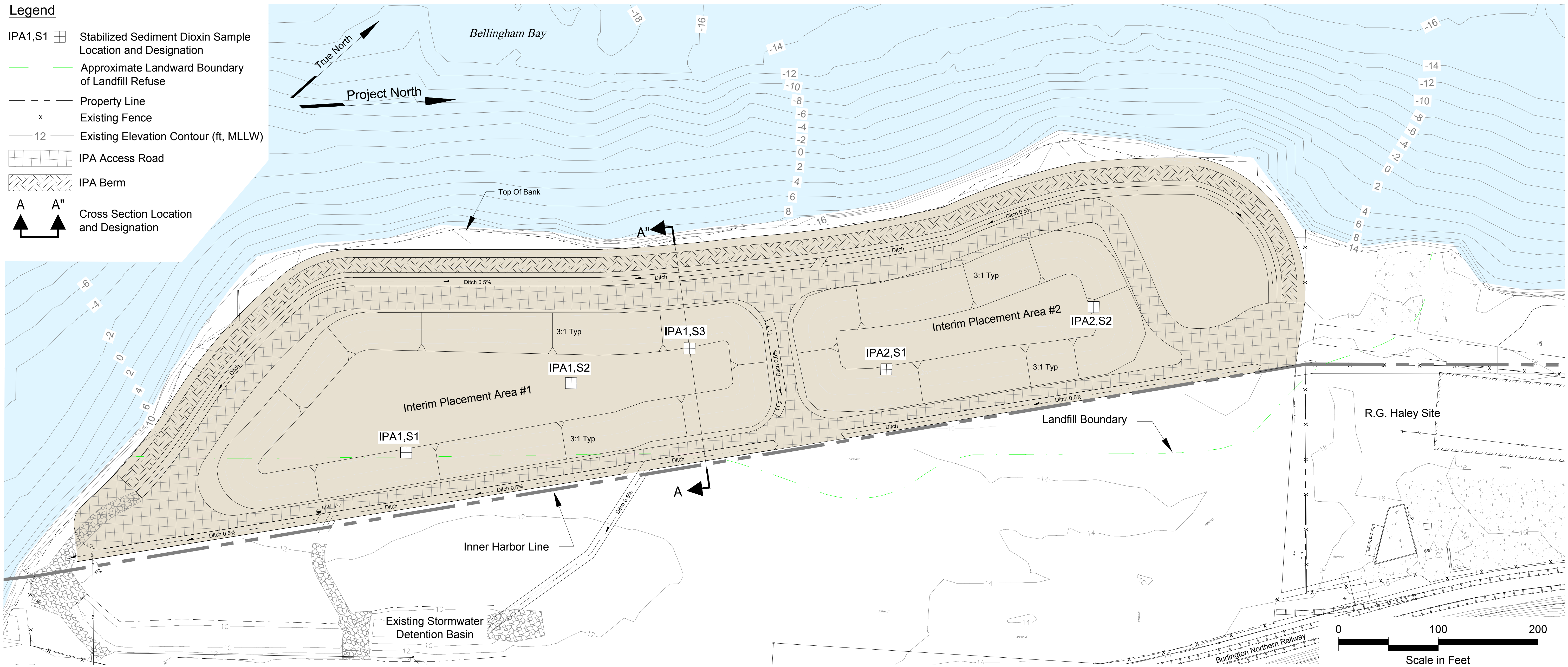
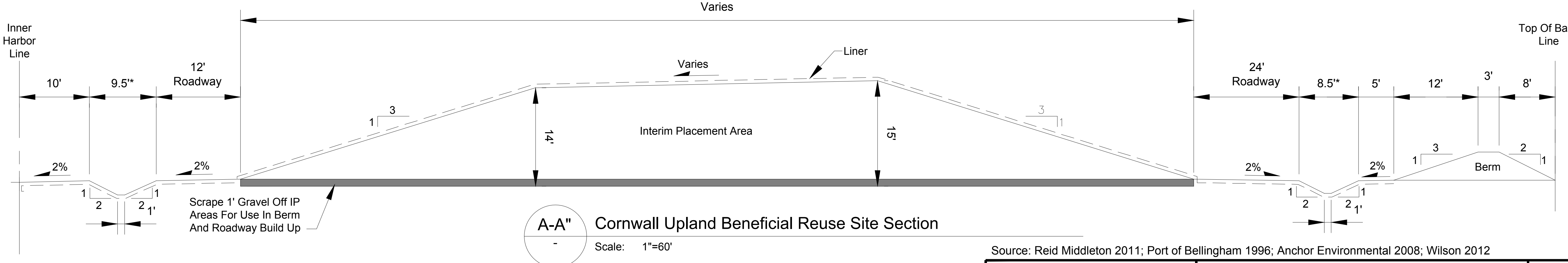
Cornwall Avenue Landfill
Bellingham, Washington

2008 Ecology Sediment Investigation Exploration Locations

Figure
3-1





A-A"

Cornwall Upland Beneficial Reuse Site Section

Scale: 1"=60'

Source: Reid Middleton 2011; Port of Bellingham 1996; Anchor Environmental 2008; Wilson 2012

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 3-02.dwg (A) "Figure 3-2" 8/13/2013

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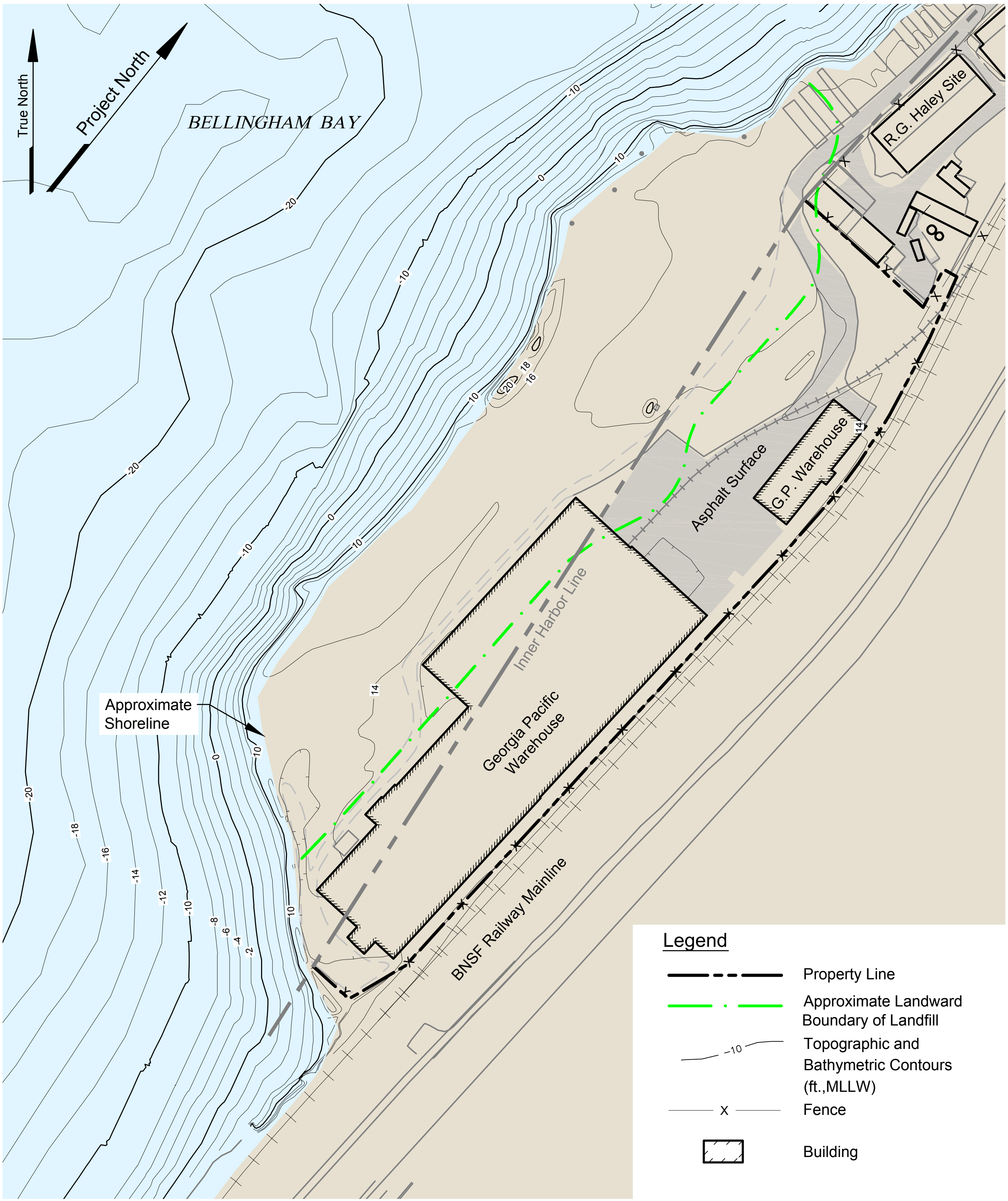
Cornwall Avenue Landfill
Bellingham, Washington

Interim Action
Site Plan and Section

Figure
3-2



Site Topography is based on Walker and Associates (1993) Photogrametric Survey. Bathymetric data is based on soundings collected by Georgia Pacific (1996) and by the Army Corps of Engineers (1996).

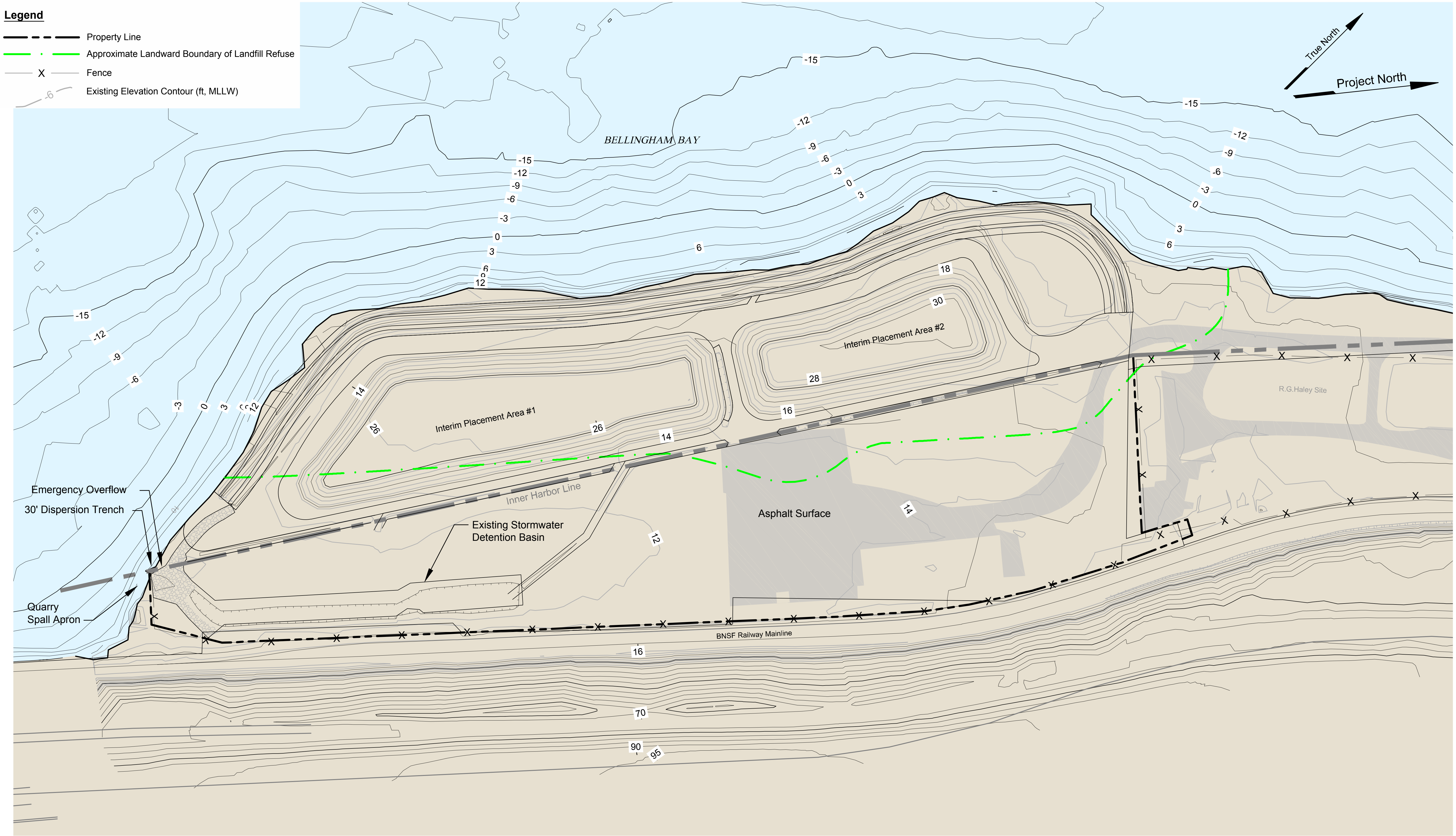
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-01.dwg (A) "Figure 4-1" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Site Topography and Bathymetry Prior to 2003

Figure
4-1



Source: Bennett Engineering, LLC 2007, Anchor Environmental 2008

0 120 240
Scale in Feet

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-02.dwg (A) "Figure 4-2" 8/13/2013

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Cornwall Avenue Landfill
Bellingham, Washington

Current Site Topography and Bathymetry

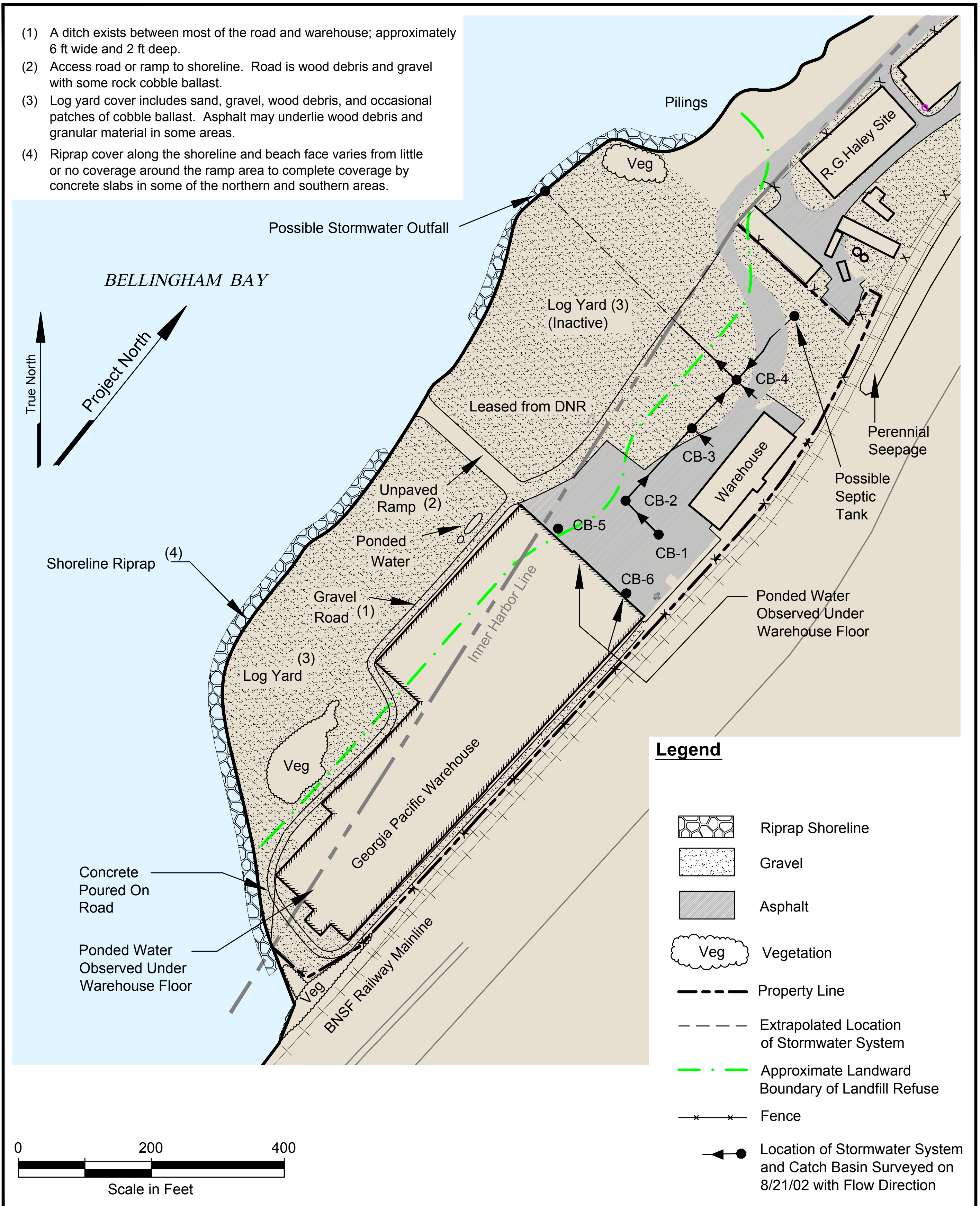
Figure
4-2

(1) A ditch exists between most of the road and warehouse; approximately 6 ft wide and 2 ft deep.

(2) Access road or ramp to shoreline. Road is wood debris and gravel with some rock cobble ballast.

(3) Log yard cover includes sand, gravel, wood debris, and occasional patches of cobble ballast. Asphalt may underlie wood debris and granular material in some areas.

(4) Riprap cover along the shoreline and beach face varies from little or no coverage around the ramp area to complete coverage by concrete slabs in some of the northern and southern areas.



Basemap source: Port of Bellingham 1996

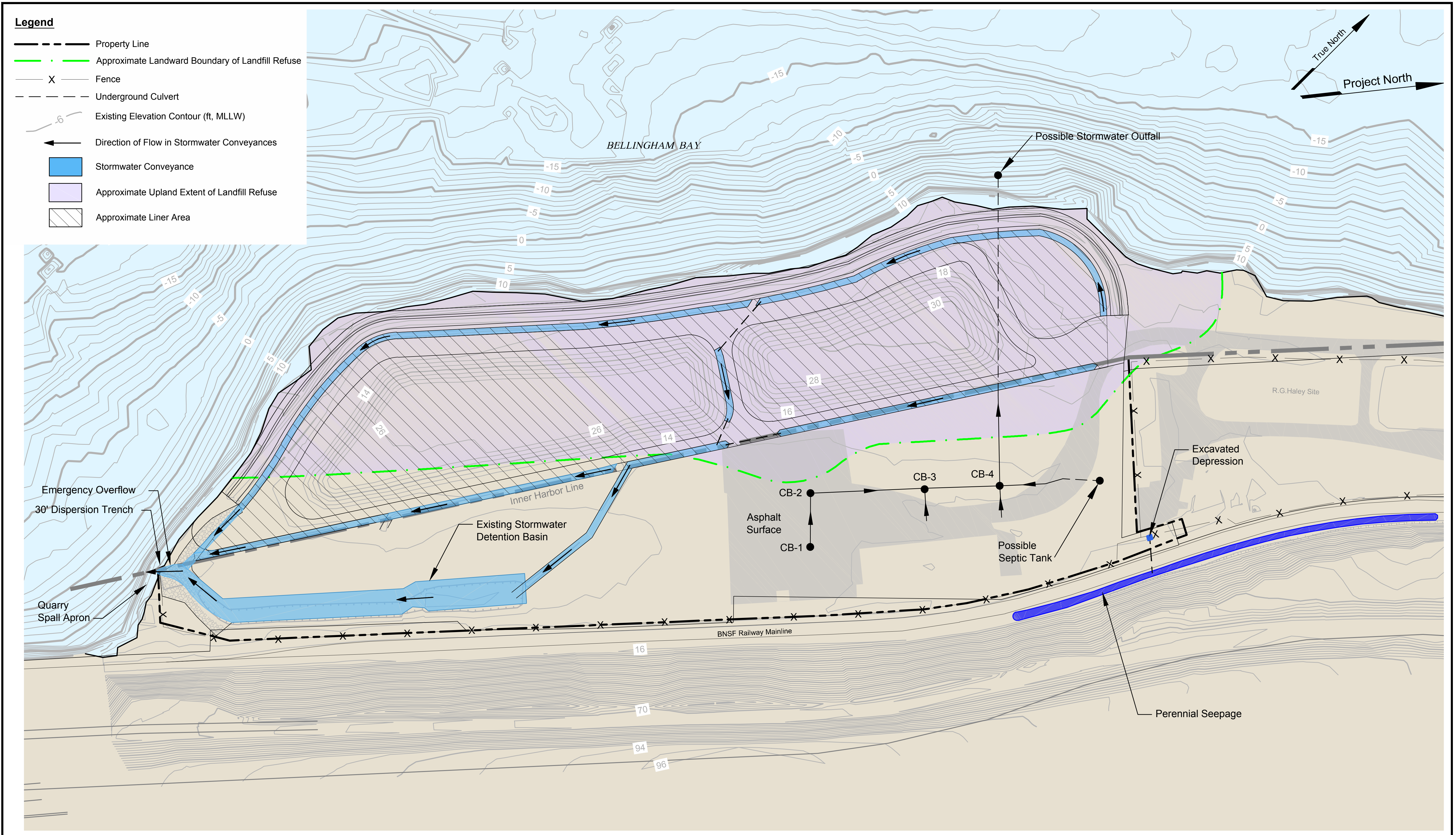
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-03.dwg (A) "Figure 4-3" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Upland Cover and Drainage Conditions 2003

Figure
4-3



Source: Bennett Engineering, LLC 2007, Anchor Environmental 2008

0 120 240

Scale in Feet

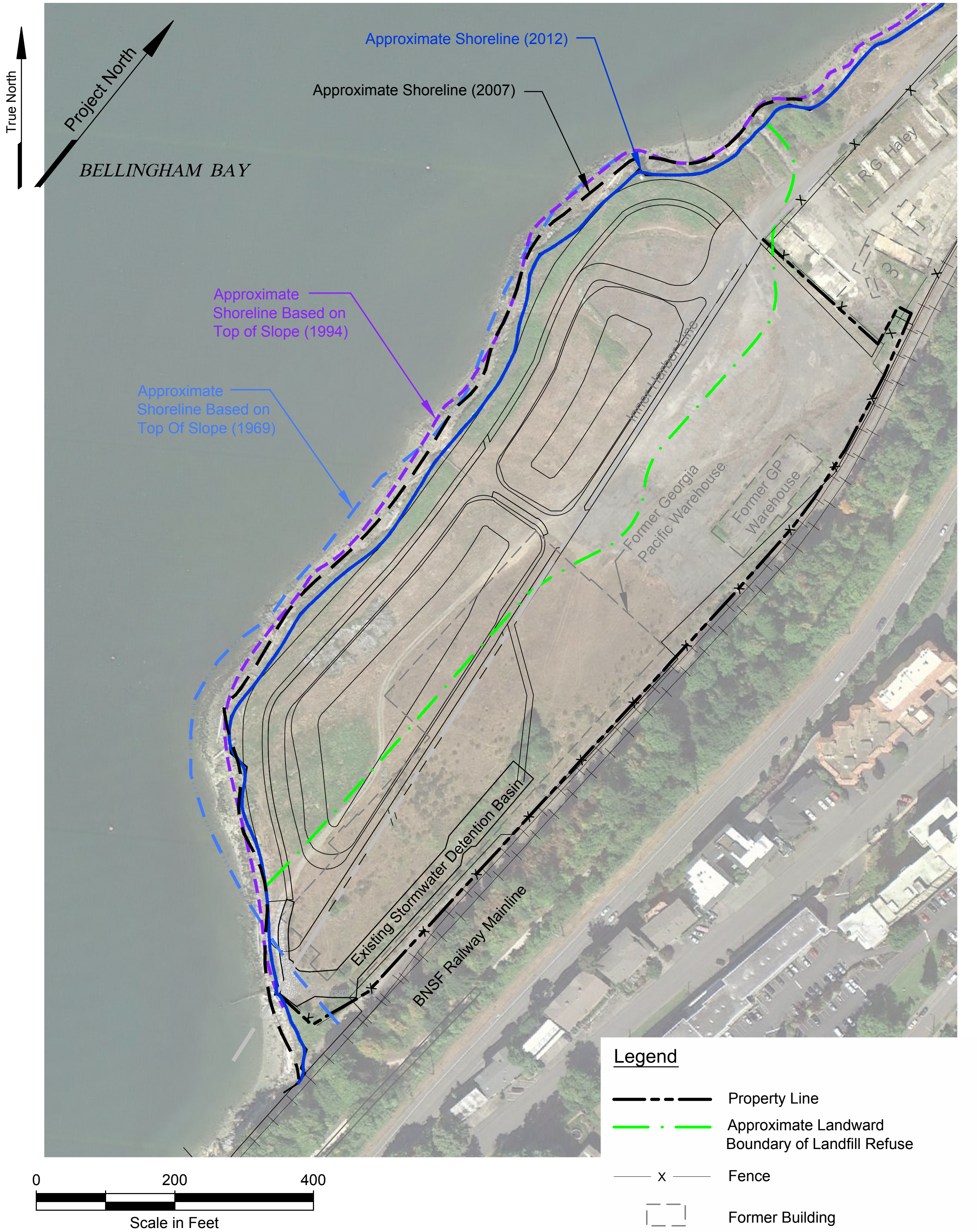
Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Upland Cover and Drainage Conditions 2012

Figure
4-4

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-04.dwg (A) "Figure 4-4" 8/13/2013



Basemap source: Port of Bellingham 1996, Google Earth 2011

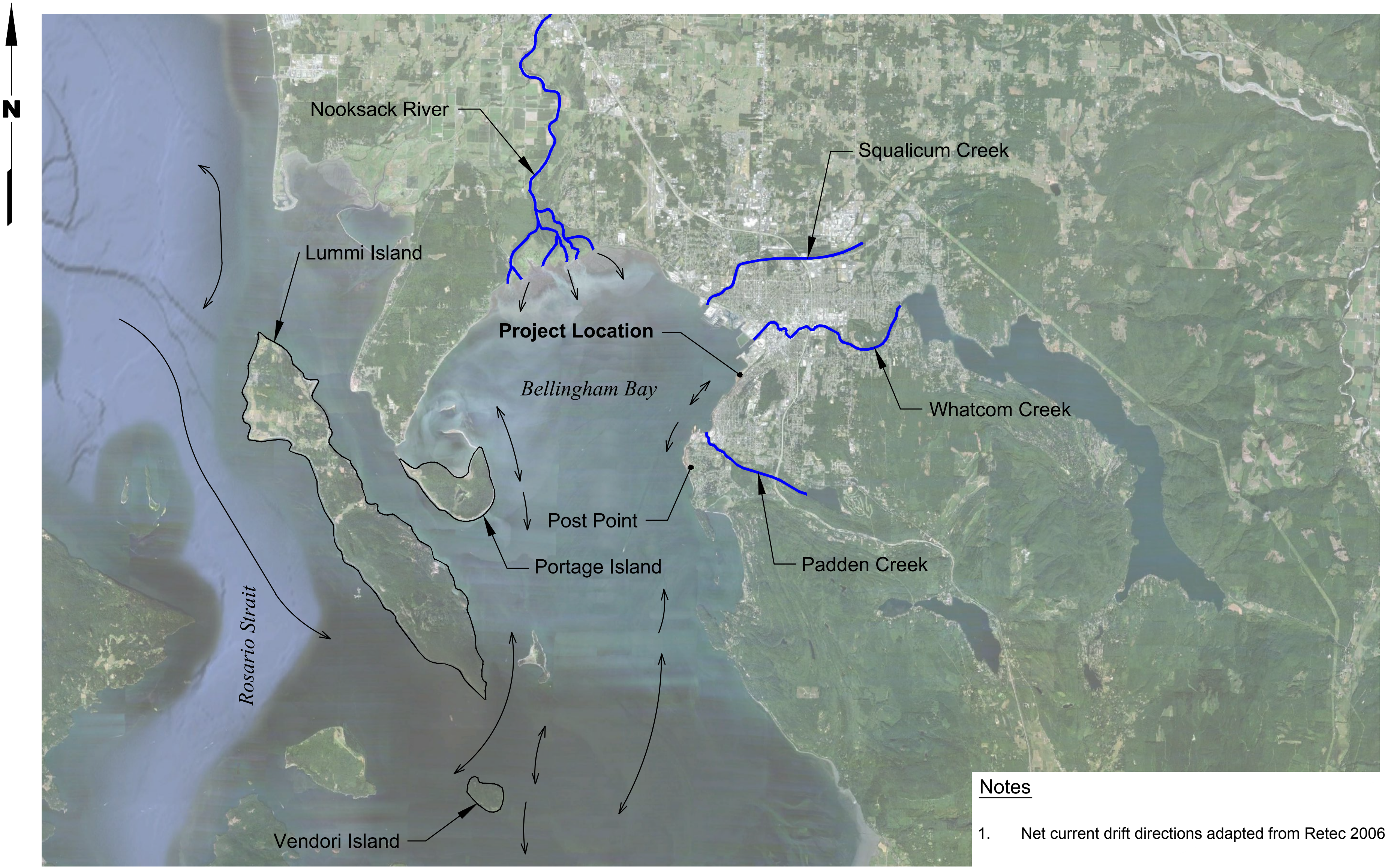
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-05.dwg (A) "Figure 4-5" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

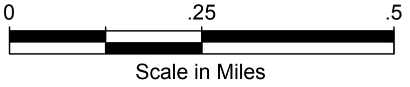
Shoreline Erosion Evaluation

Figure
4-5



Legend

Net Current Drift Directions



Source: Google Earth Pro 2010

Notes

1. Net current drift directions adapted from Retec 2006

2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

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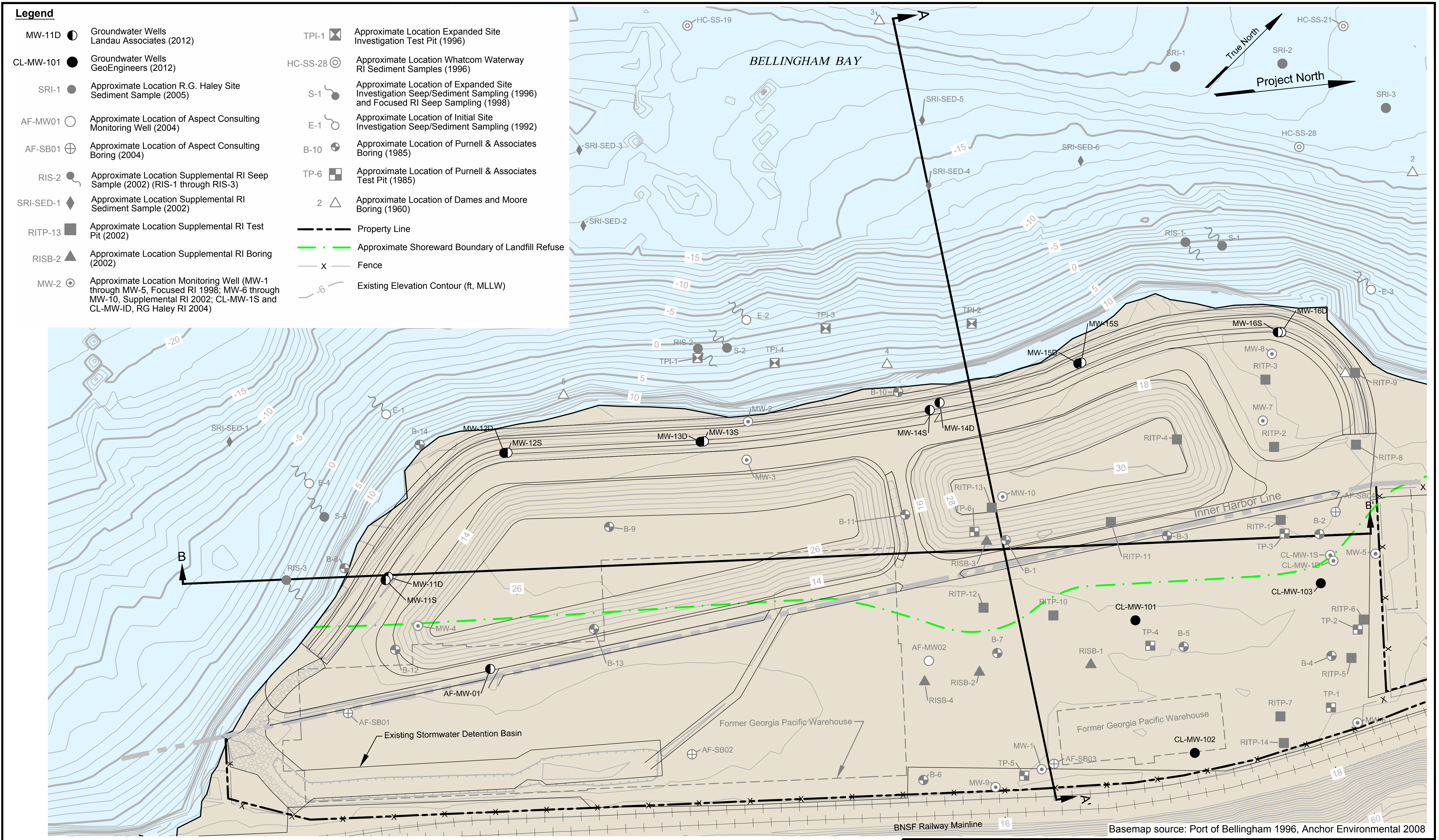
Cornwall Avenue Landfill
Bellingham, Washington

Watershed Discharges and Current Directions in Greater Bellingham Bay Area

Figure
4-6



Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-07.dwg (A) "Figure 4-7" 8/13/2013

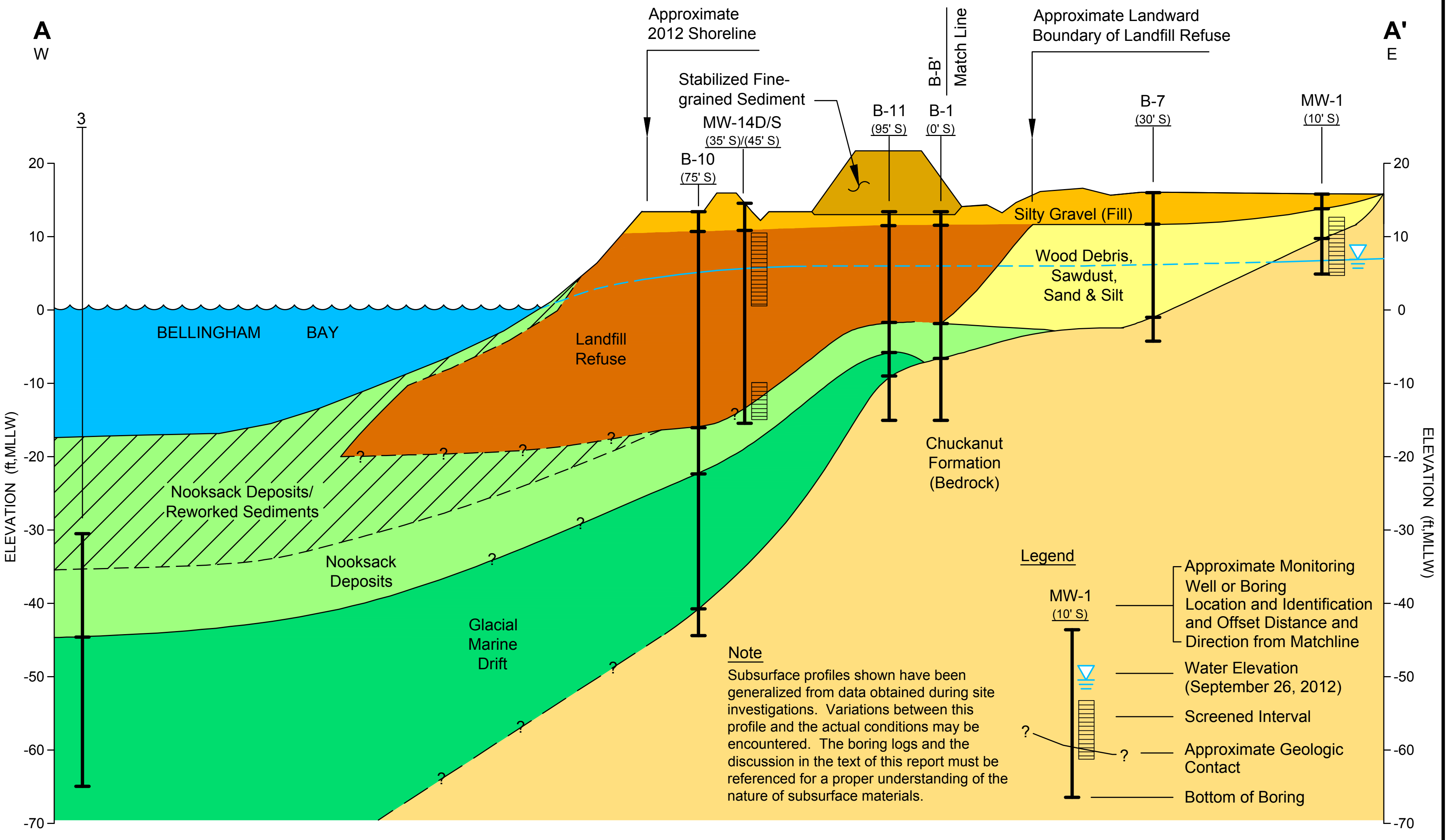
LANDAU ASSOCIATES

Note
Cross sections are shown on Figures 4-6 and 4-7.

Cornwall Avenue Landfill
Bellingham, Washington

Geologic Cross Section Locations

Figure
4-7



Note

Subsurface profiles shown have been generalized from data obtained during site investigations. Variations between this profile and the actual conditions may be encountered. The boring logs and the discussion in the text of this report must be referenced for a proper understanding of the nature of subsurface materials.

0 100 200

Scale in Feet

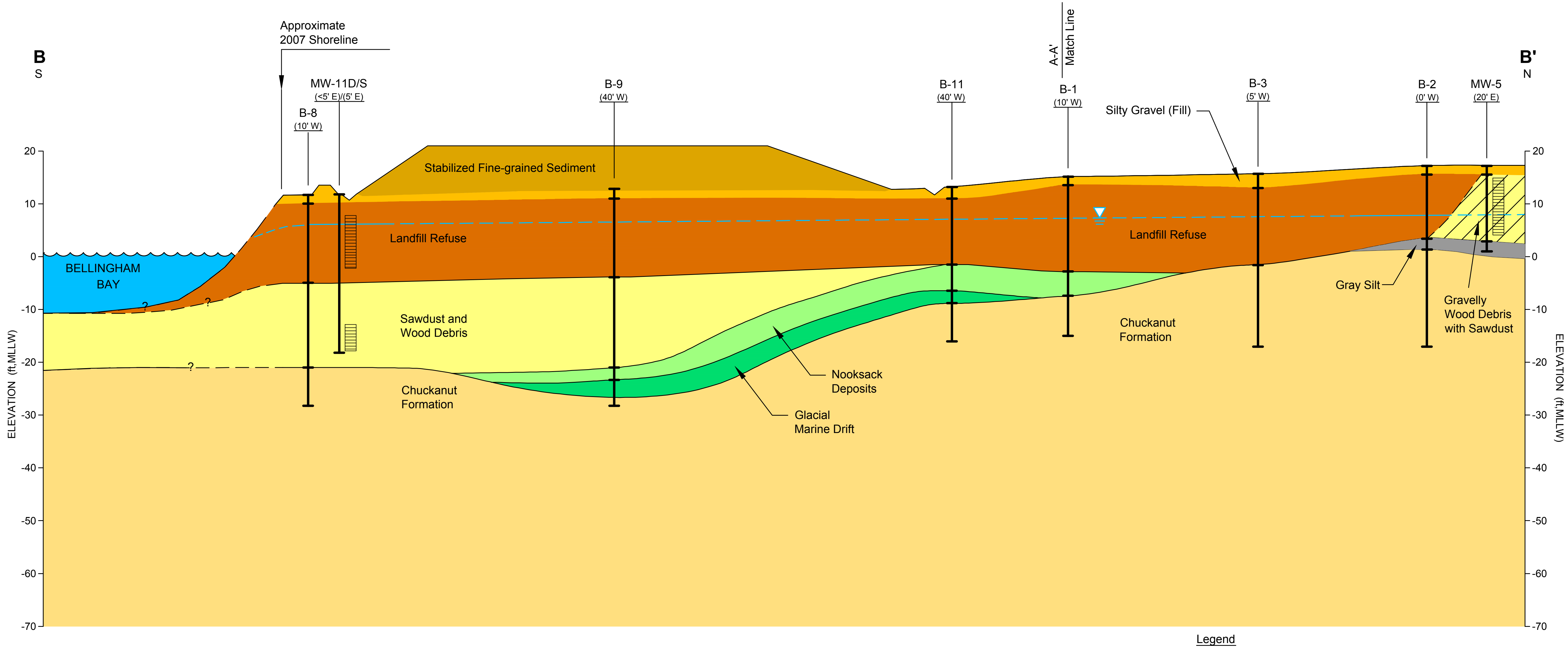
Vertical Exaggeration = 5x

Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Geologic Cross Section A-A'

Figure
4-8



Legend

MW-1 (10' W)	Approximate Monitoring Well or Boring Location, Identification, and Offset Distance and Direction from Matchline
▽	Water Elevation (September 26, 2012)
▤	Screened Interval
? — ?	Approximate Geologic Contact
⊥	Bottom of Boring

Note

Subsurface profiles shown have been generalized from data obtained during site investigations. Variations between this profile and the actual conditions may be encountered. The boring logs and the discussion in the text of this report must be referenced for a proper understanding of the nature of subsurface materials.

0 100 200

Scale in Feet

Vertical Exaggeration = 5x

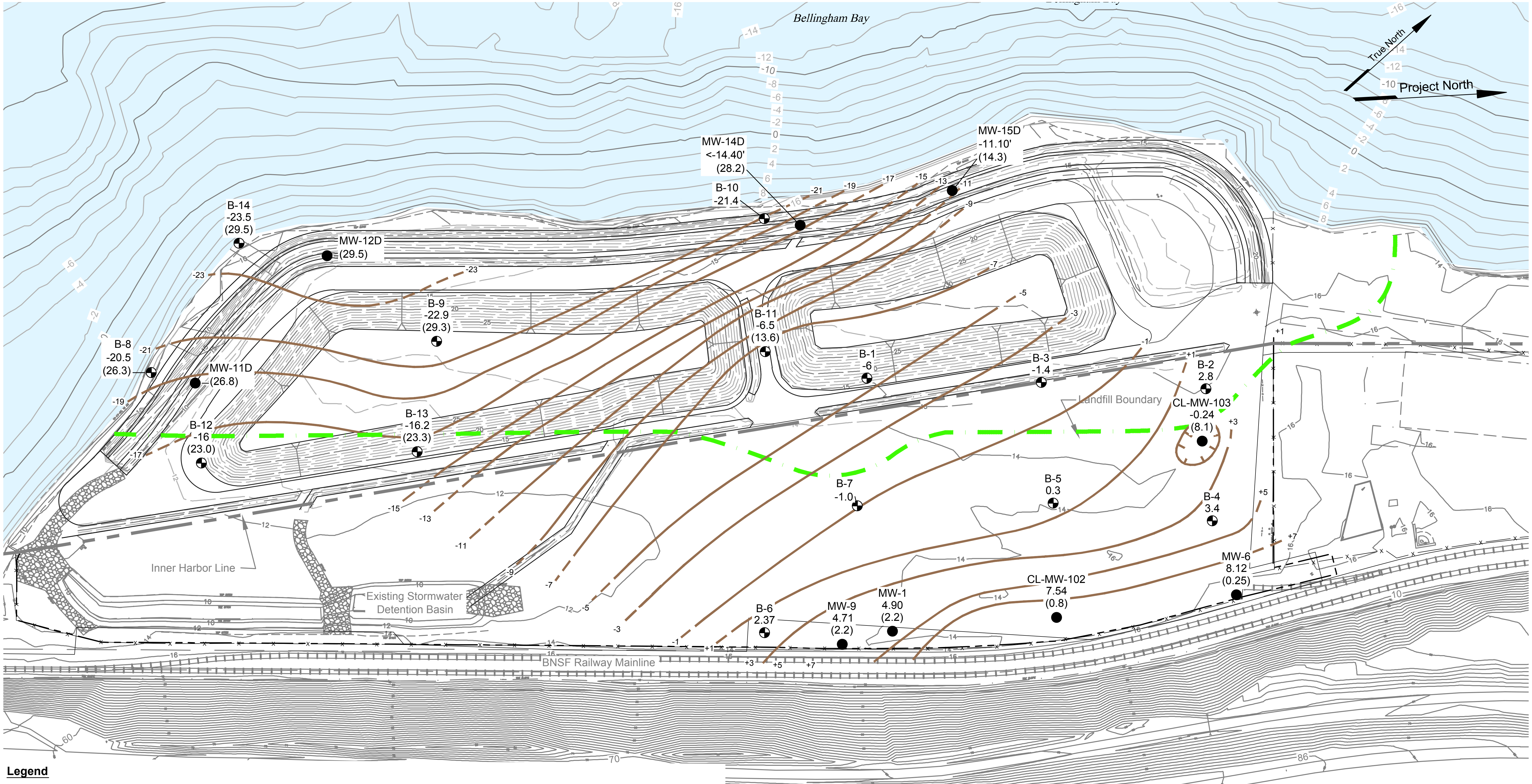
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-09.dwg (A) "Figure 4-9" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Geologic Cross Section B-B'

Figure
4-9



Legend

● MW-1 — Monitoring Well Location
(23.3) — Estimated Saturated Thickness of Uppermost Hydrostratigraphic Unit (ft, MLLW); based on groundwater monitoring results from September 2012

B-14 — Approximate Location of Purnell & Associates Boring (1985)
-23.5 — Aquitard Elevation (ft, MLLW)
(23.0) — Estimated Saturated Thickness of Uppermost Hydrostratigraphic Unit (ft, MLLW); based on groundwater monitoring results from September 2012

—x—x—	Existing Fence
— 12 —	Existing Elevation Contour (ft, MLLW)
— — —	Property Line
— — —	Approximate Landward Boundary of Landfill Refuse
-19 ——	Elevation Contour of the Top of the Aquitard Unit, or the Top of the Chuckanut Formation where the Aquitard is Not Present (as Noted).
▨	Existing Building

0 100 200
Scale in Feet

Source: Reid Middleton 2011; Port of Bellingham 1996; Anchor Environmental 2008; Wilson 2012

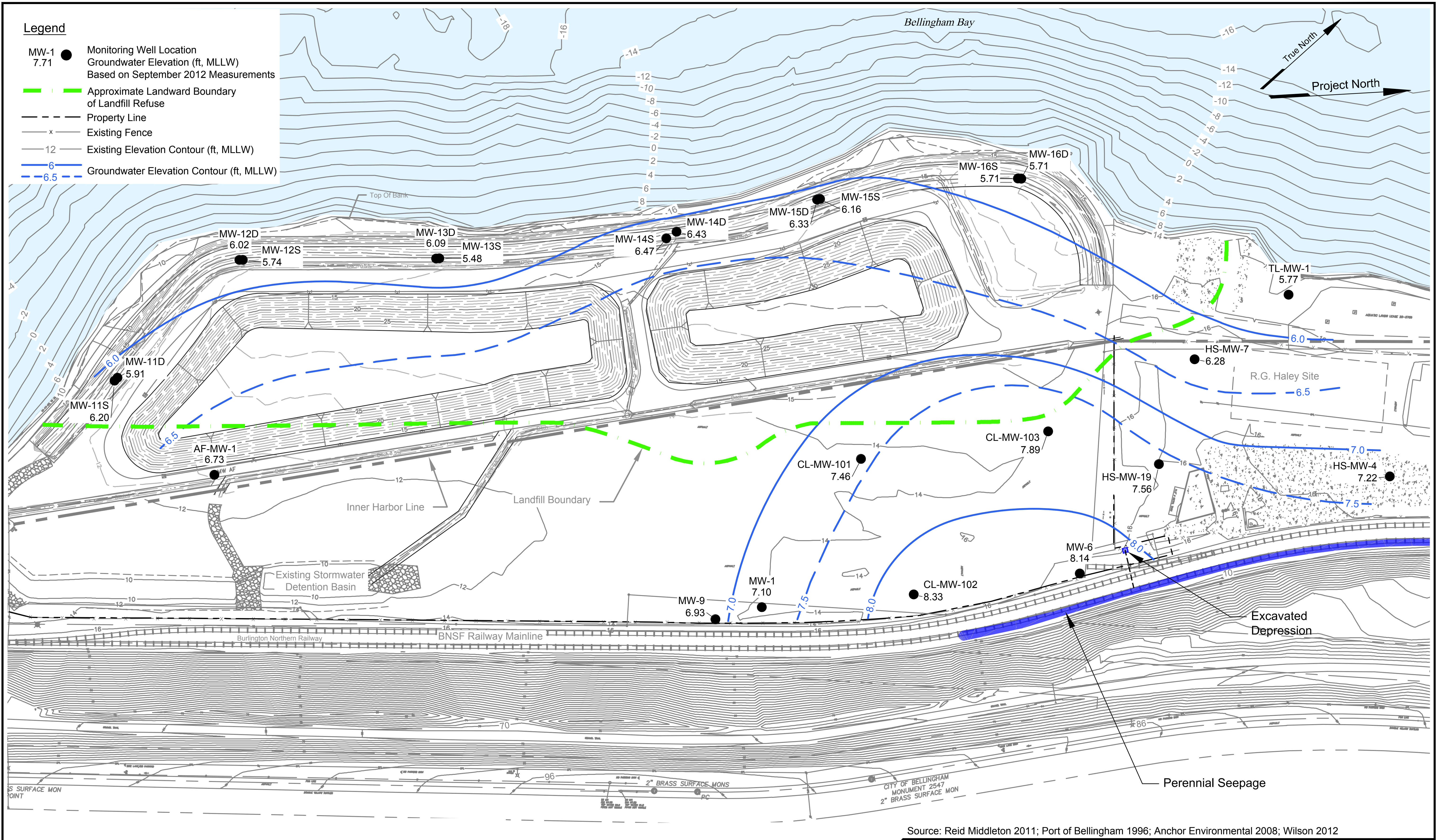
Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Base of Uppermost Hydrostratigraphic Unit and Saturated Thickness

Figure
4-10

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-10.dwg (A) "Figure 4-10" 8/13/2013



Source: Reid Middleton 2011; Port of Bellingham 1996; Anchor Environmental 2008; Wilson 2012

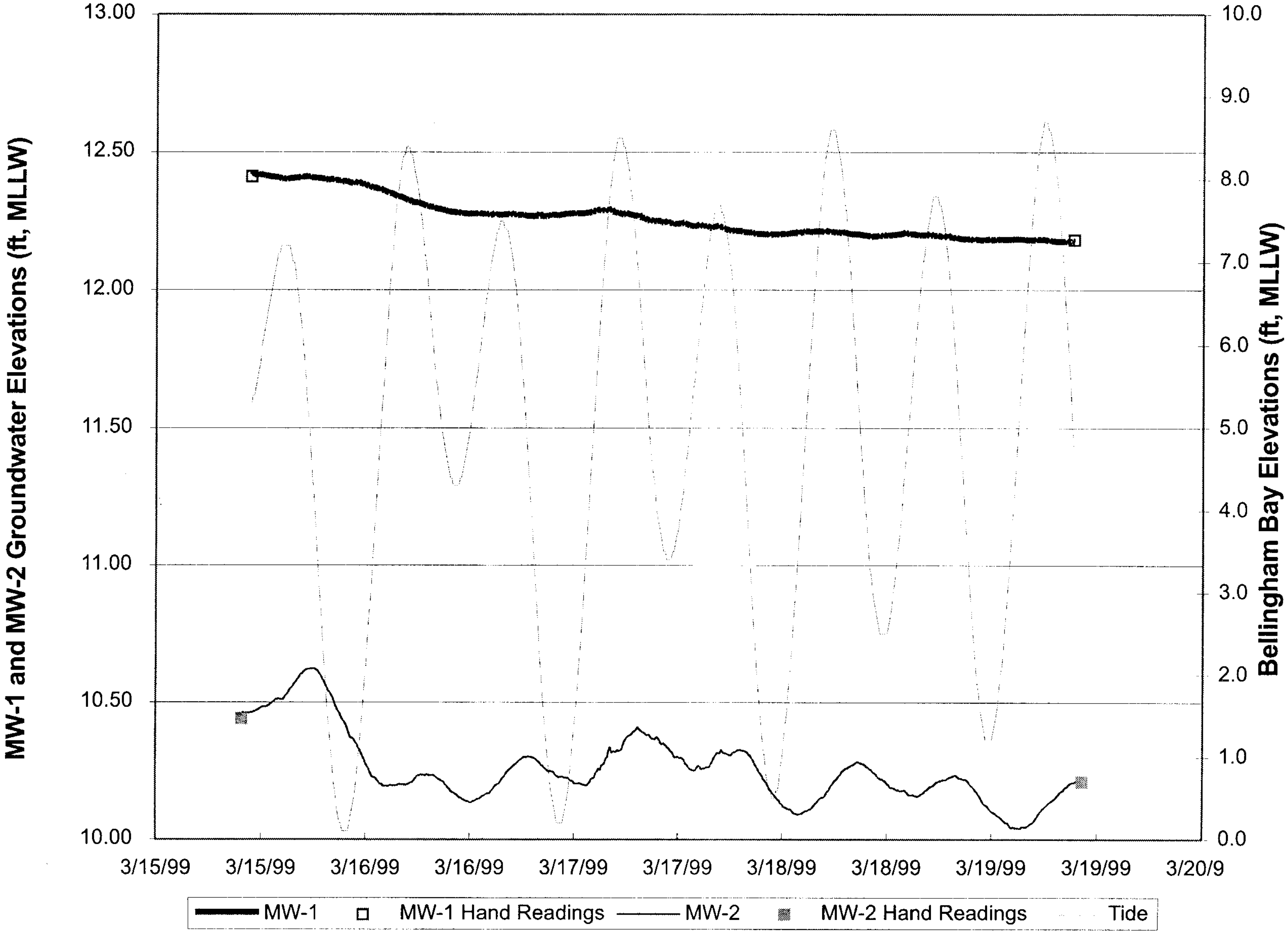
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-11.dwg (A) "Figure 4-11" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Water Table Map
September 2012

Figure
4-11

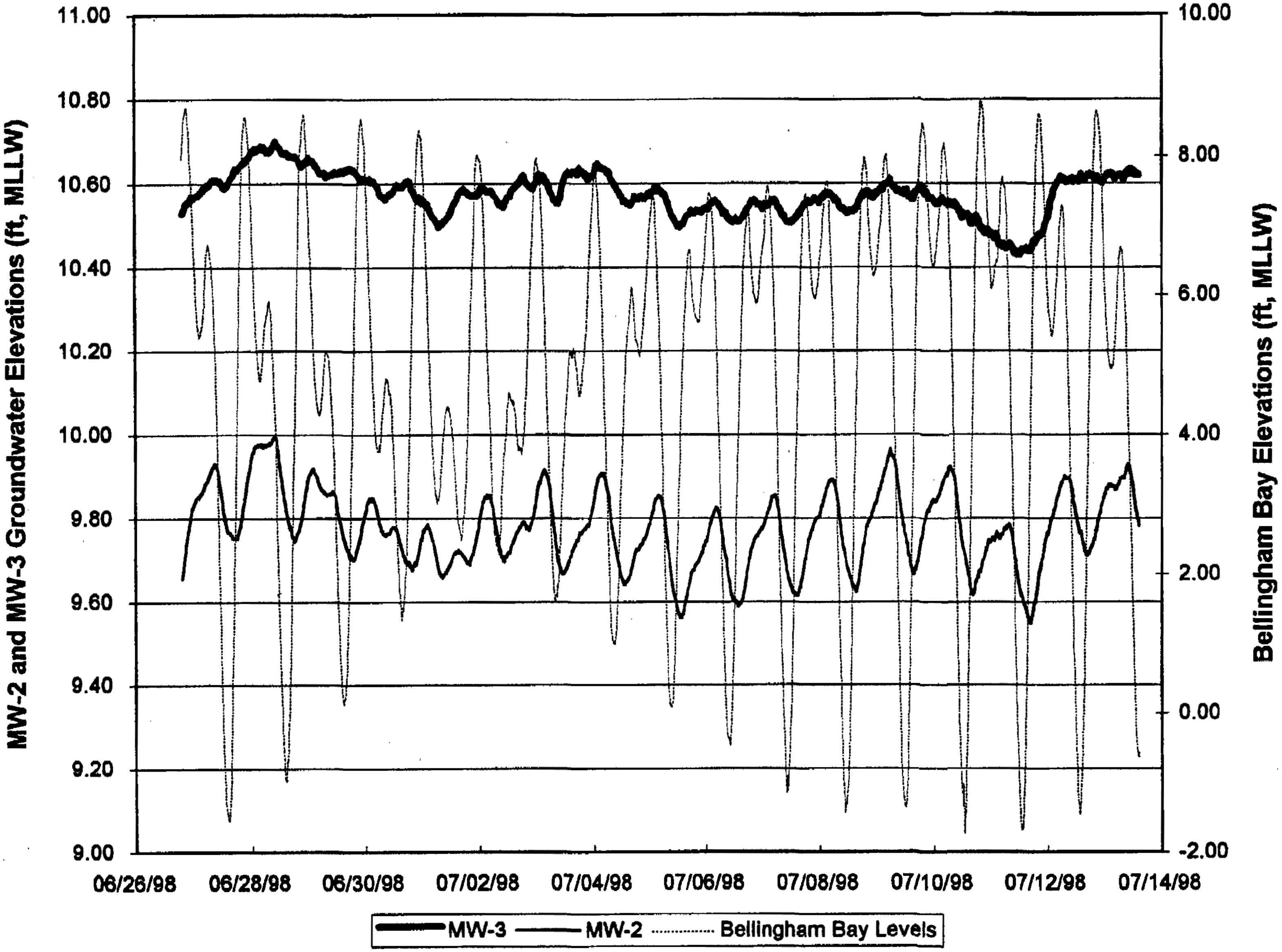


LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Groundwater Elevations for MW-1, MW-2, and Bellingham Bay Levels March 15 - March 20, 1999

Figure
4-12

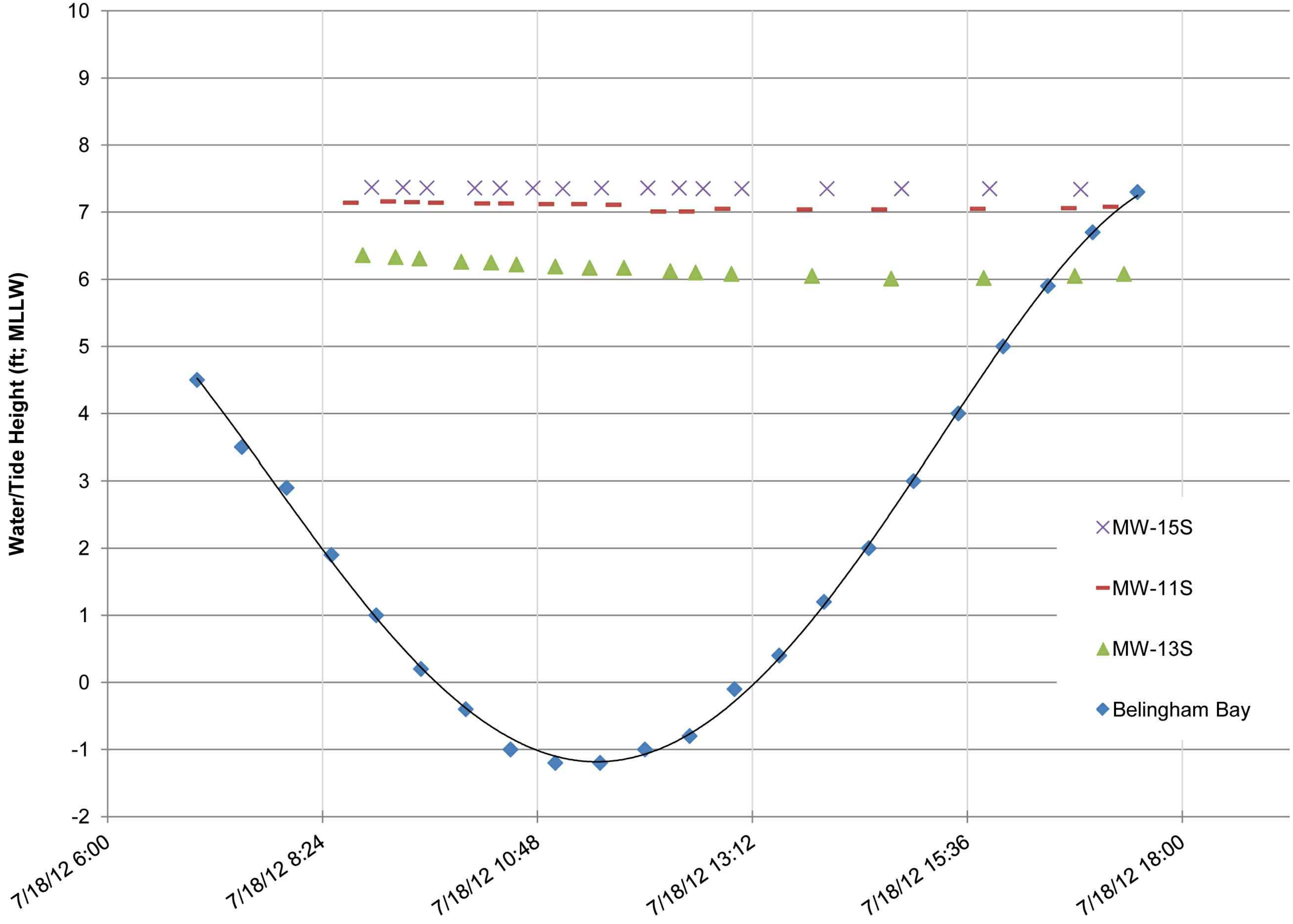


LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Groundwater Elevations for MW-2, MW-3, and Bellingham Bay Levels June 26 - July 13, 1998

Figure
4-13

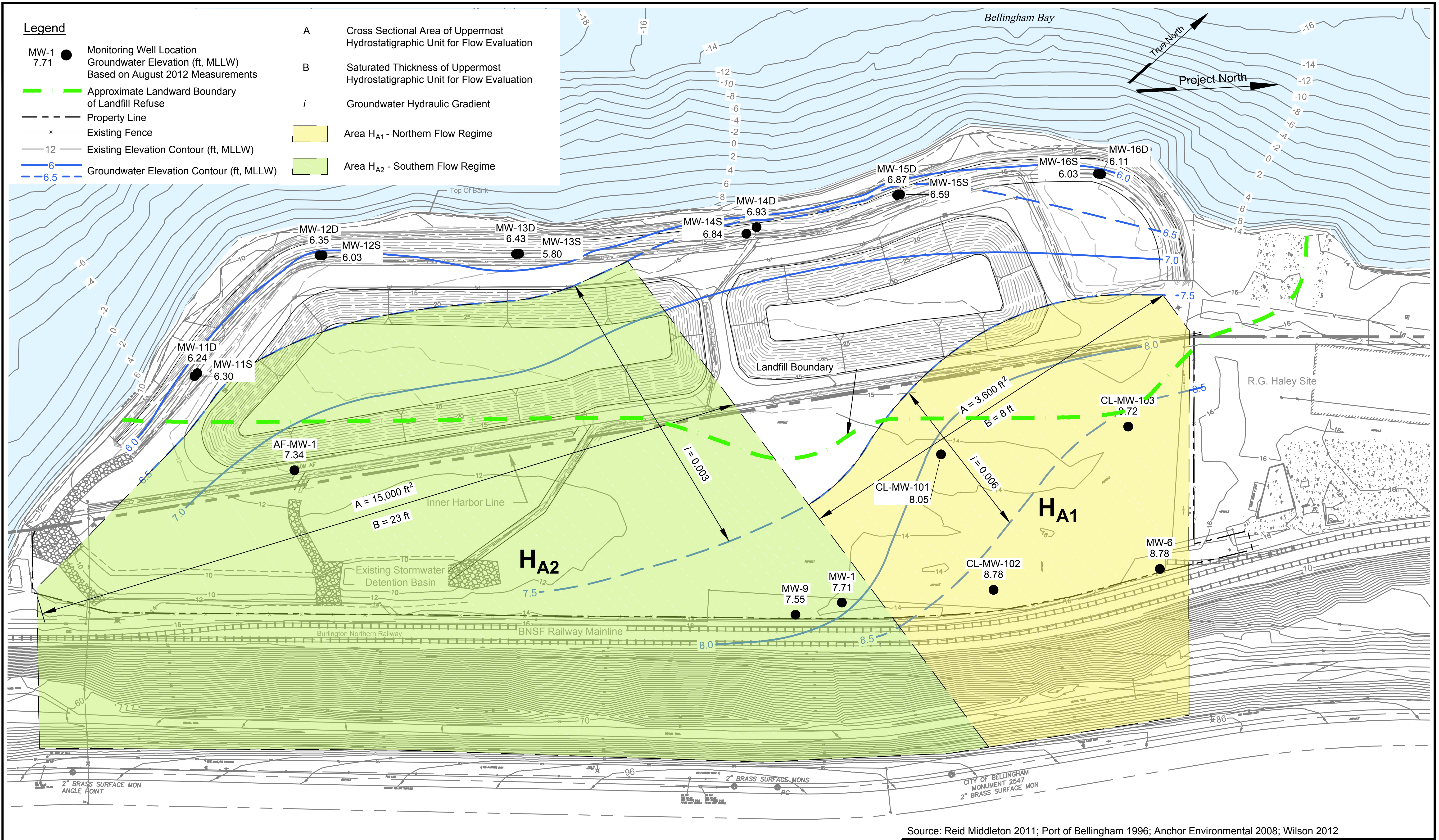


LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Groundwater Elevations for MW-11S, MW-13S, MW-15S, and Bellingham Bay Levels, July 18, 2012

Figure
4-14



Source: Reid Middleton 2011; Port of Bellingham 1996; Anchor Environmental 2008; Wilson 2012

0 100 200
Scale in Feet

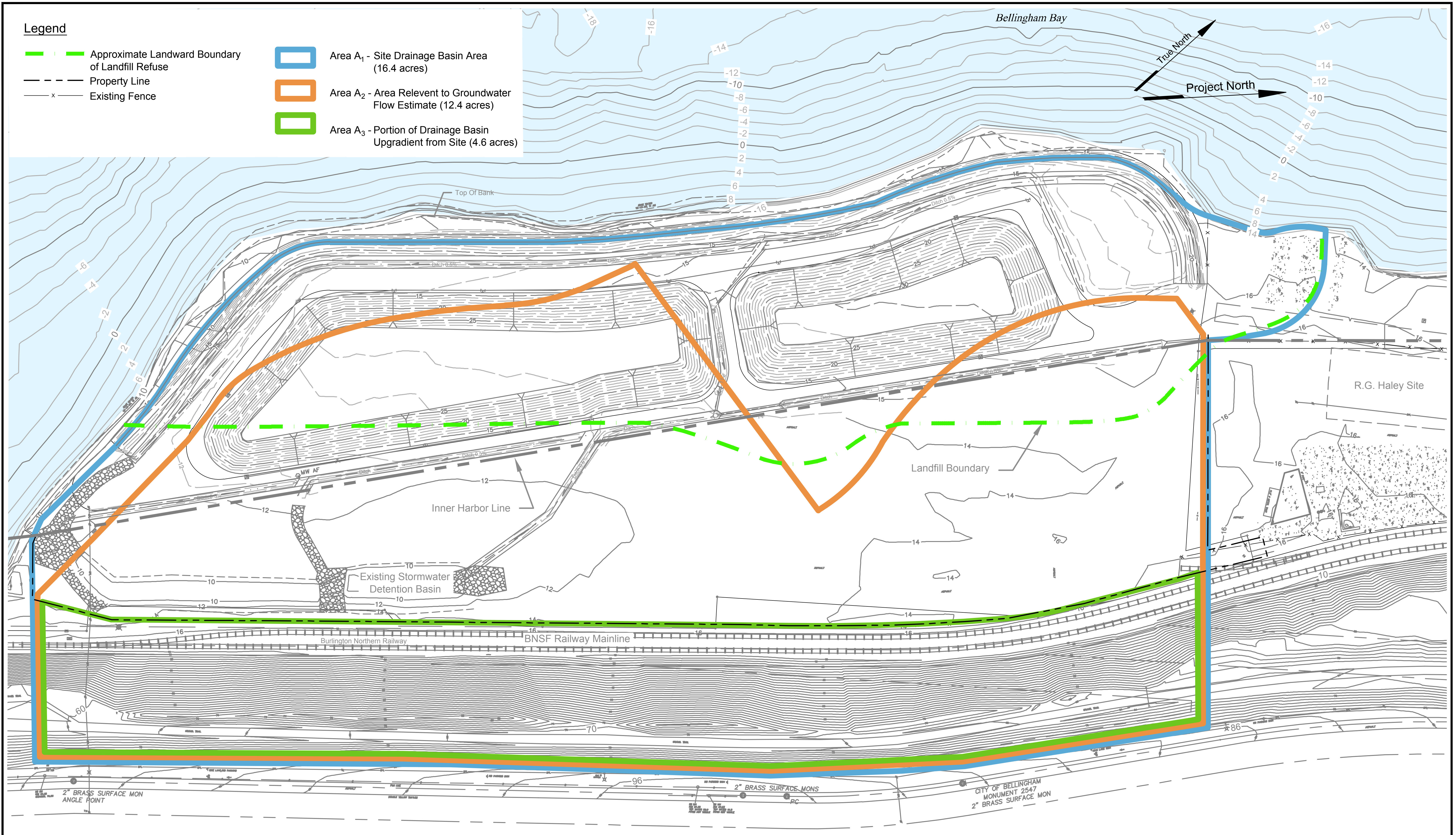
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-15.dwg (A) "Figure 4-15" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Groundwater Elevation Contours and Flow Regimes August 2012

Figure
4-15



Source: Reid Middleton 2011; Port of Bellingham 1996; Anchor Environmental 2008; Wilson 2012

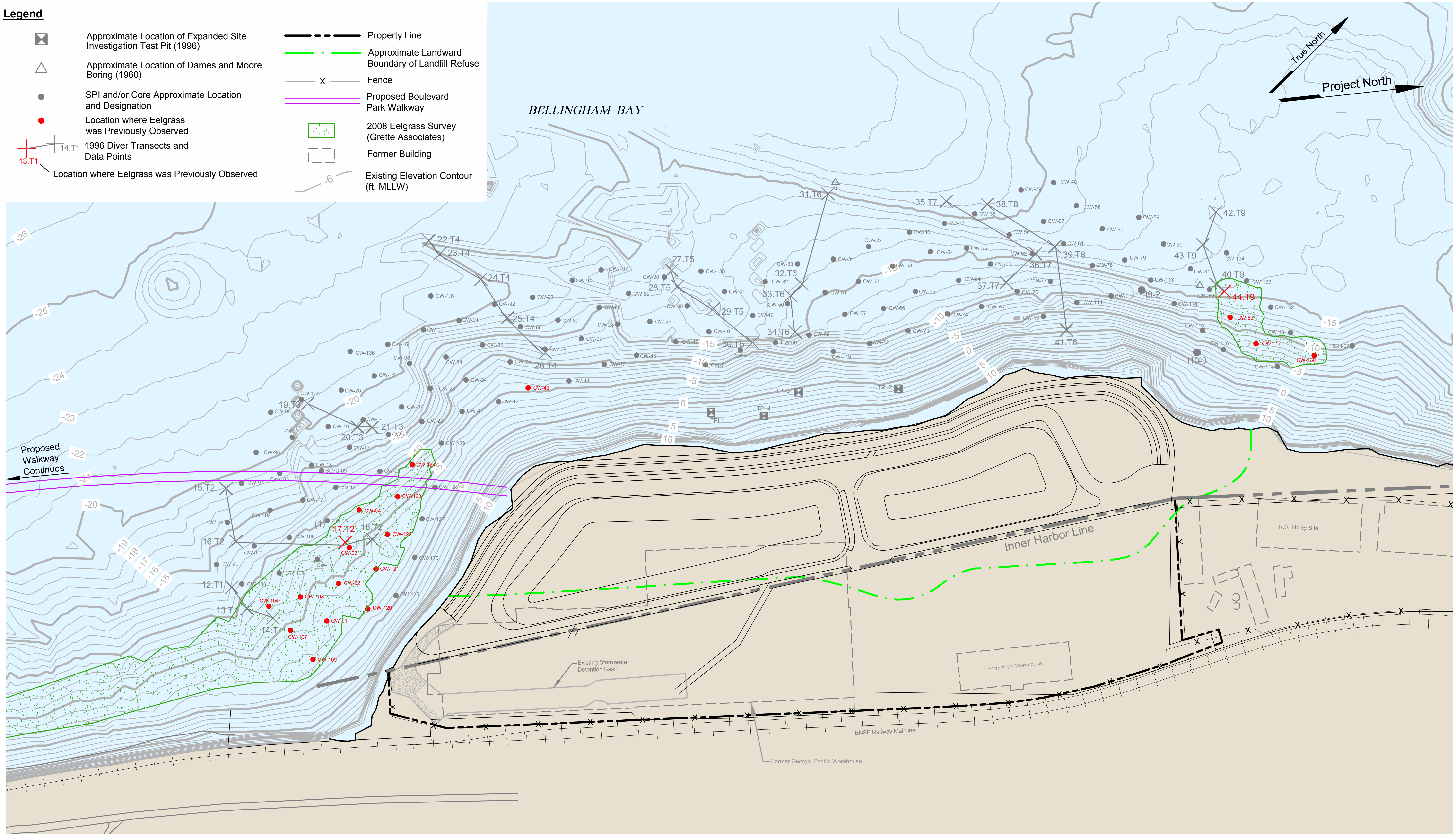
0 100 200
Scale in Feet

Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Site Drainage Basin and Subareas

Figure
4-16



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008, Grette Associates 2008

0 150 300
Scale in Feet

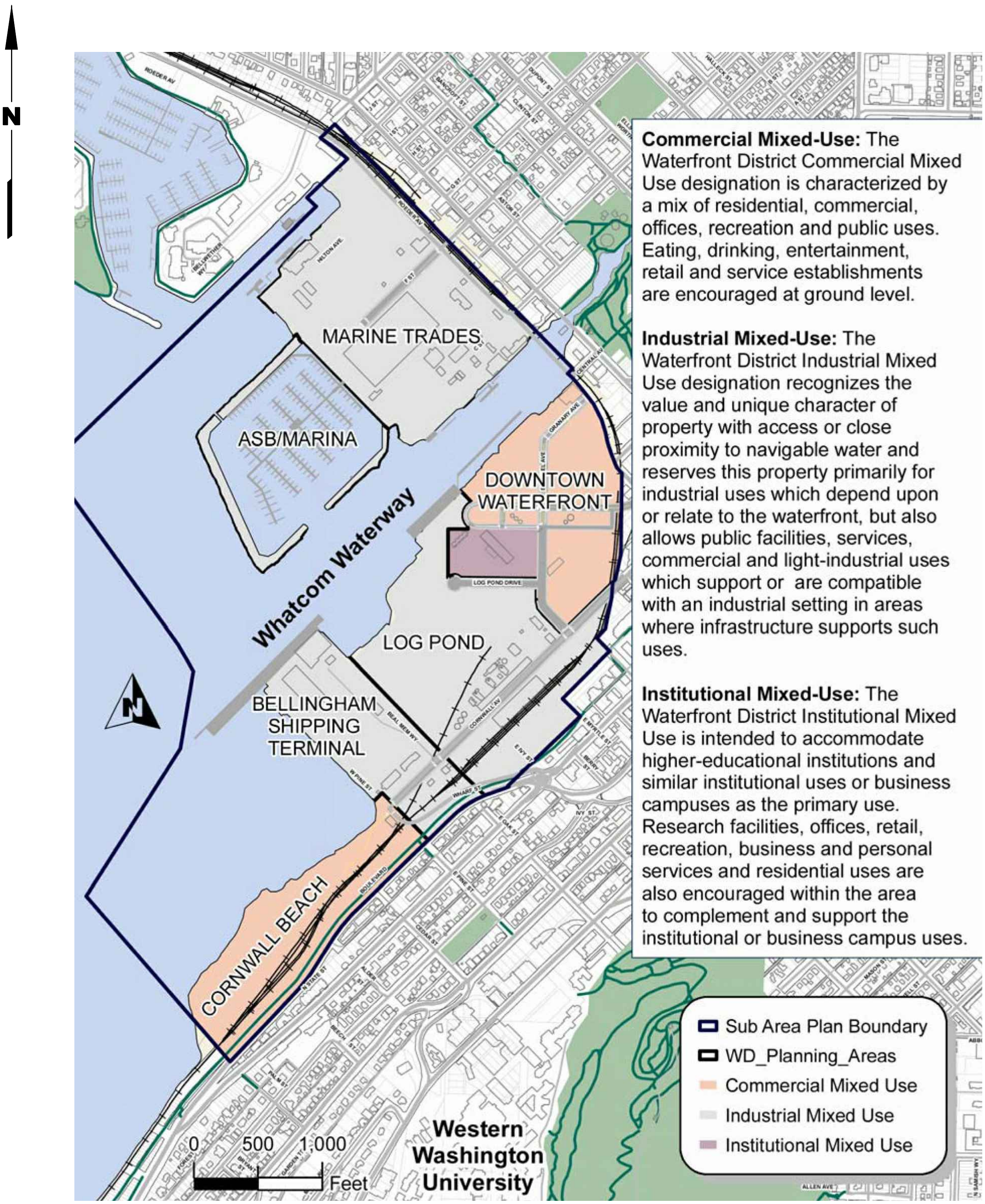
Cornwall Avenue Landfill
Bellingham, Washington

Extent of Eelgrass

Figure
4-17

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-17.dwg (A) "Figure 4-17" 8/13/2013

LANDAU ASSOCIATES



Commercial Mixed-Use: The Waterfront District Commercial Mixed Use designation is characterized by a mix of residential, commercial, offices, recreation and public uses. Eating, drinking, entertainment, retail and service establishments are encouraged at ground level.

Industrial Mixed-Use: The Waterfront District Industrial Mixed Use designation recognizes the value and unique character of property with access or close proximity to navigable water and reserves this property primarily for industrial uses which depend upon or relate to the waterfront, but also allows public facilities, services, commercial and light-industrial uses which support or are compatible with an industrial setting in areas where infrastructure supports such uses.

Institutional Mixed-Use: The Waterfront District Institutional Mixed Use is intended to accommodate higher-educational institutions and similar institutional uses or business campuses as the primary use. Research facilities, offices, retail, recreation, business and personal services and residential uses are also encouraged within the area to complement and support the institutional or business campus uses.

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Port of Bellingham

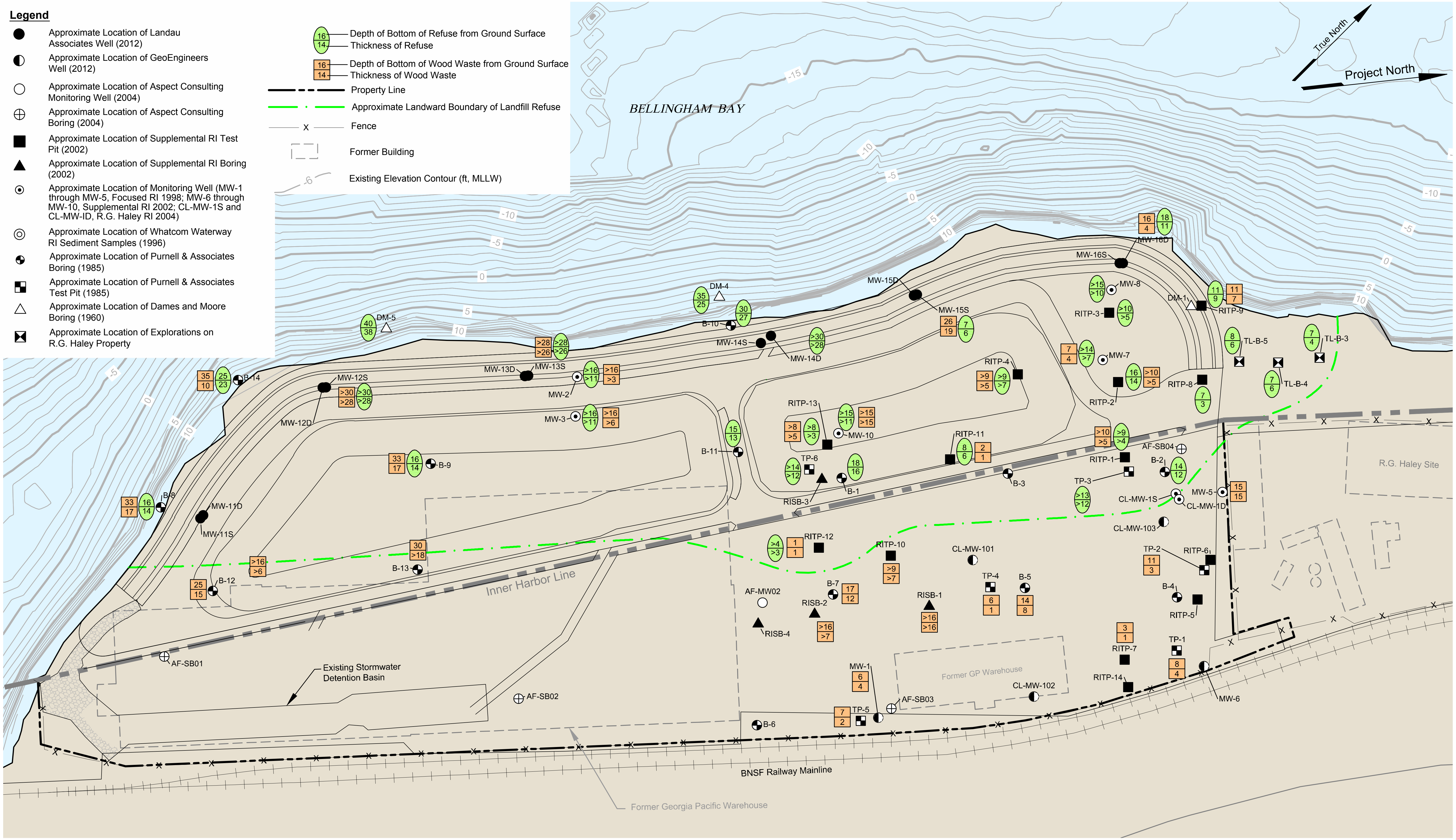
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 4-18.dwg (A) "Figure 4-18" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Waterfront District Redevelopment
Medium Density Alternative

Figure
4-18



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

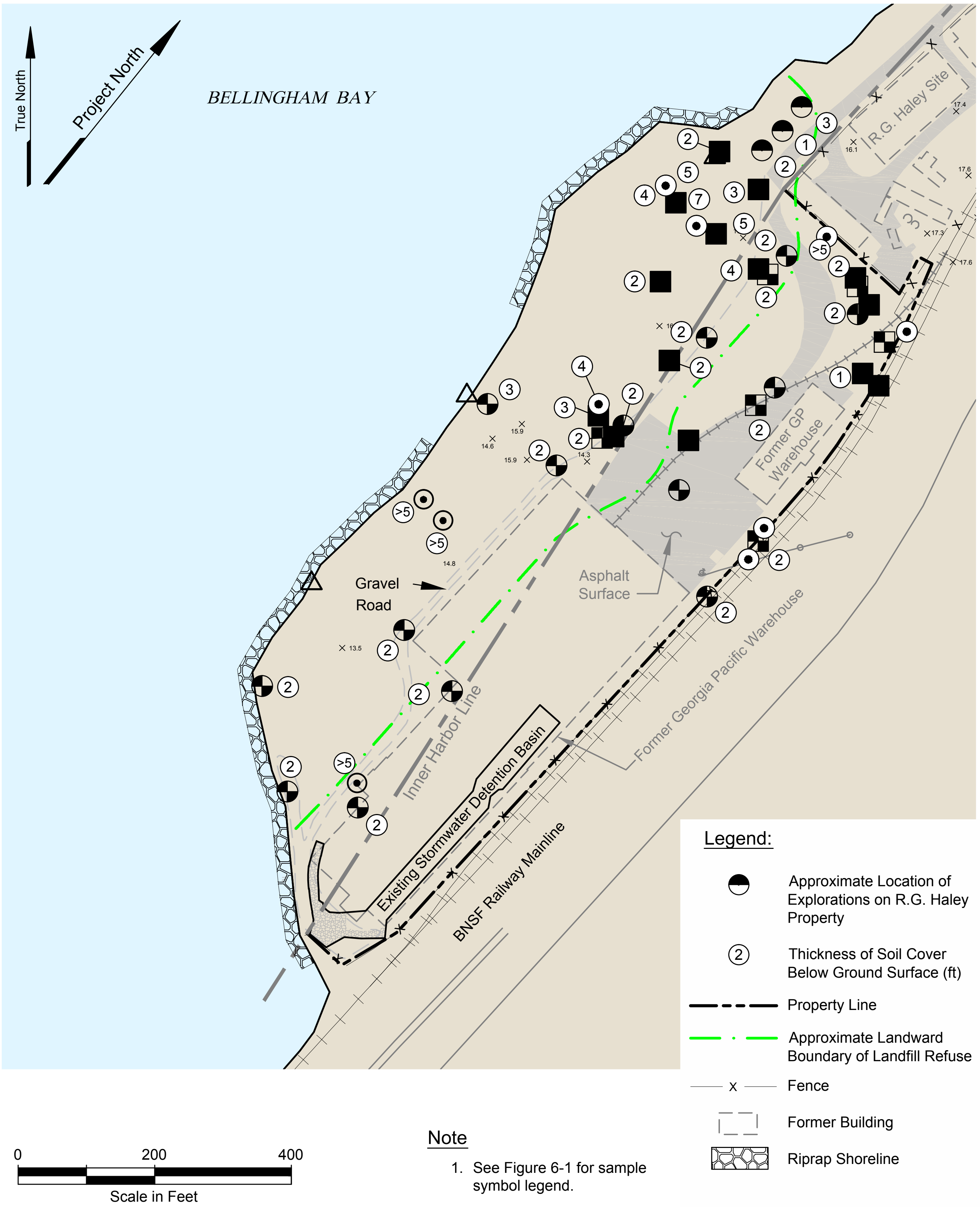
Cornwall Avenue Landfill
Bellingham, Washington

Approximate Extent of *In Situ* Landfill Refuse and Wood Waste in Upland Area

Figure
6-1

LANDAU ASSOCIATES

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-01.dwg (A) "Figure 6-1" 8/13/2013



Note

1. See Figure 6-1 for sample symbol legend.

Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

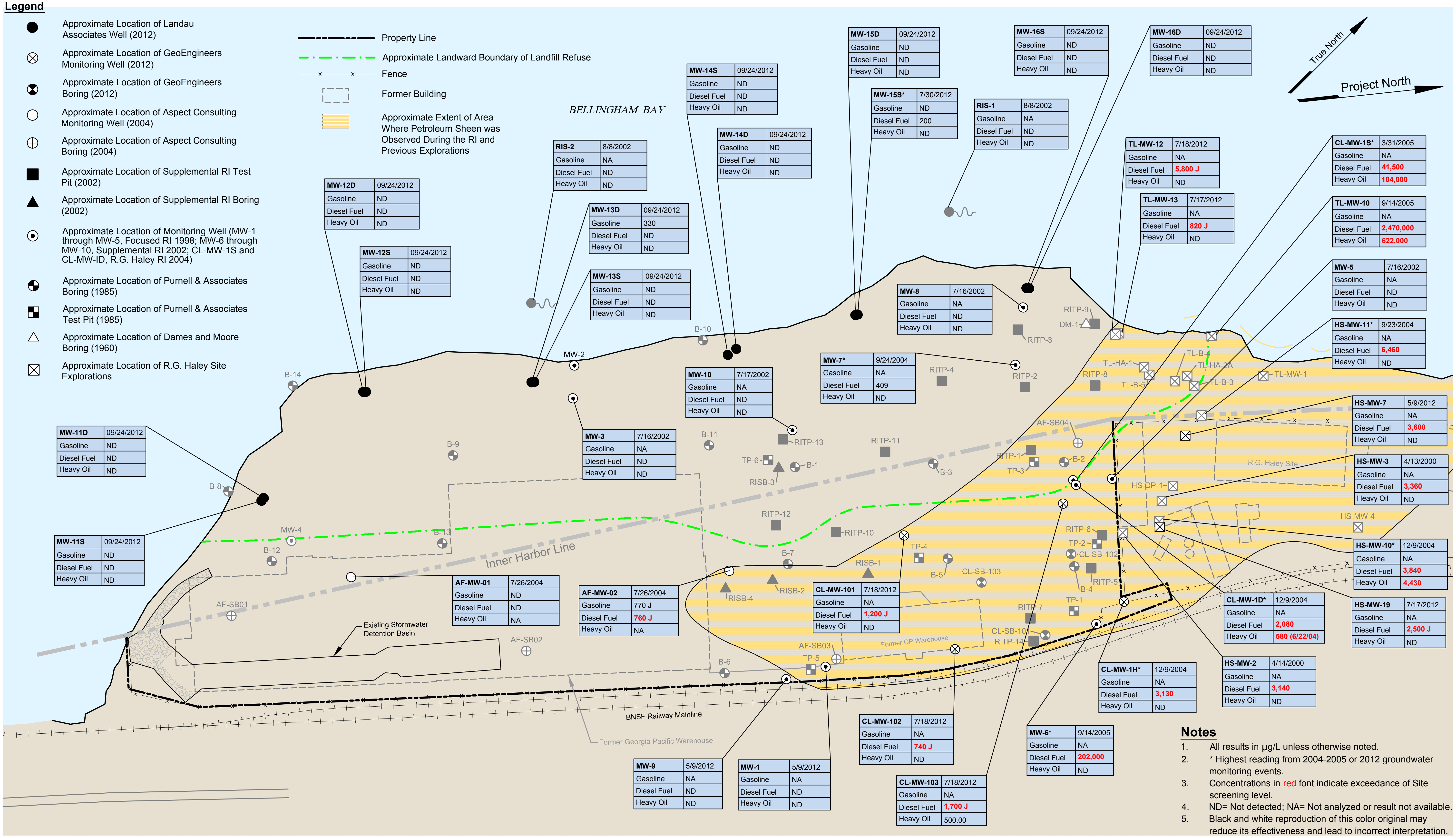
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-02.dwg (A) "Figure 6-2" 8/14/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Soil Cover Thickness
Prior to Interim Action

Figure
6-2



Legend

- ● Approximate Location of Landau Associates Well (2012)
- ⊗ Approximate Location of GeoEngineers Monitoring Well (2012)
- ◉ Approximate Location of GeoEngineers Boring (2012)
- ○ Approximate Location of Aspect Consulting Monitoring Well (2004)
- ⊕ Approximate Location of Aspect Consulting Boring (2004)
- ■ Approximate Location of Supplemental RI Test Pit (2002)
- ▲ Approximate Location of Supplemental RI Boring (2002)
- ⊙ Approximate Location of Monitoring Well (MW-1 through MW-5, Focused RI 1998; MW-6 through MW-10, Supplemental RI 2002; CL-MW-1S and CL-MW-ID, R.G. Haley RI 2004)
- ◑ Approximate Location of Purnell & Associates Boring (1985)
- ▞ Approximate Location of Purnell & Associates Test Pit (1985)
- △ Approximate Location of Dames and Moore Boring (1960)
- ⊠ Approximate Location of R.G. Haley Site Explorations
- —·· — Property Line
- —·—·— Approximate Landward Boundary of Landfill Refuse
- —x—x— Fence
- ⬚ Former Building
- 🟨 Approximate Extent of Area Where Petroleum Sheen was Observed During the RI and Previous Explorations

MW-11D	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-11S	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-12D	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-12S	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

RIS-2	8/8/2002
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

MW-13D	09/24/2012
Gasoline	330
Diesel Fuel	ND
Heavy Oil	ND

MW-13S	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-14S	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-14D	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-15D	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-15S*	7/30/2012
Gasoline	ND
Diesel Fuel	200
Heavy Oil	ND

RIS-1	8/8/2002
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

MW-16S	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

MW-16D	09/24/2012
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	ND

TL-MW-12	7/18/2012
Gasoline	NA
Diesel Fuel	**5,800 J**
Heavy Oil	ND

TL-MW-13	7/17/2012
Gasoline	NA
Diesel Fuel	**820 J**
Heavy Oil	ND

CL-MW-1S*	3/31/2005
Gasoline	NA
Diesel Fuel	**41,500**
Heavy Oil	**104,000**

TL-MW-10	9/14/2005
Gasoline	NA
Diesel Fuel	**2,470,000**
Heavy Oil	**622,000**

MW-5	7/16/2002
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

HS-MW-11*	9/23/2004
Gasoline	NA
Diesel Fuel	**6,460**
Heavy Oil	ND

MW-8	7/16/2002
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

MW-7*	9/24/2004
Gasoline	NA
Diesel Fuel	409
Heavy Oil	ND

MW-10	7/17/2002
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

MW-3	7/16/2002
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

HS-MW-7	5/9/2012
Gasoline	NA
Diesel Fuel	**3,600**
Heavy Oil	ND

HS-MW-3	4/13/2000
Gasoline	NA
Diesel Fuel	**3,360**
Heavy Oil	ND

HS-MW-10*	12/9/2004
Gasoline	NA
Diesel Fuel	**3,840**
Heavy Oil	**4,430**

AF-MW-01	7/26/2004
Gasoline	ND
Diesel Fuel	ND
Heavy Oil	NA

AF-MW-02	7/26/2004
Gasoline	770 J
Diesel Fuel	**760 J**
Heavy Oil	NA

CL-MW-101	7/18/2012
Gasoline	NA
Diesel Fuel	**1,200 J**
Heavy Oil	ND

CL-MW-1D*	12/9/2004
Gasoline	NA
Diesel Fuel	**2,080**
Heavy Oil	**580 (6/22/04)**

HS-MW-19	7/17/2012
Gasoline	NA
Diesel Fuel	**2,500 J**
Heavy Oil	ND

CL-MW-1H*	12/9/2004
Gasoline	NA
Diesel Fuel	**3,130**
Heavy Oil	ND

HS-MW-2	4/14/2000
Gasoline	NA
Diesel Fuel	**3,140**
Heavy Oil	ND

CL-MW-102	7/18/2012
Gasoline	NA
Diesel Fuel	**740 J**
Heavy Oil	ND

MW-6*	9/14/2005
Gasoline	NA
Diesel Fuel	**202,000**
Heavy Oil	ND

MW-9	5/9/2012
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

MW-1	5/9/2012
Gasoline	NA
Diesel Fuel	ND
Heavy Oil	ND

CL-MW-103	7/18/2012
Gasoline	NA
Diesel Fuel	**1,700 J**
Heavy Oil	500.00

Notes

1. All results in µg/L unless otherwise noted.
2. * Highest reading from 2004-2005 or 2012 groundwater monitoring events.
3. Concentrations in red font indicate exceedance of Site screening level.
4. ND= Not detected; NA= Not analyzed or result not available.
5. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Basemap source: Port of Bellingham 1996

0 120 240
Scale in Feet

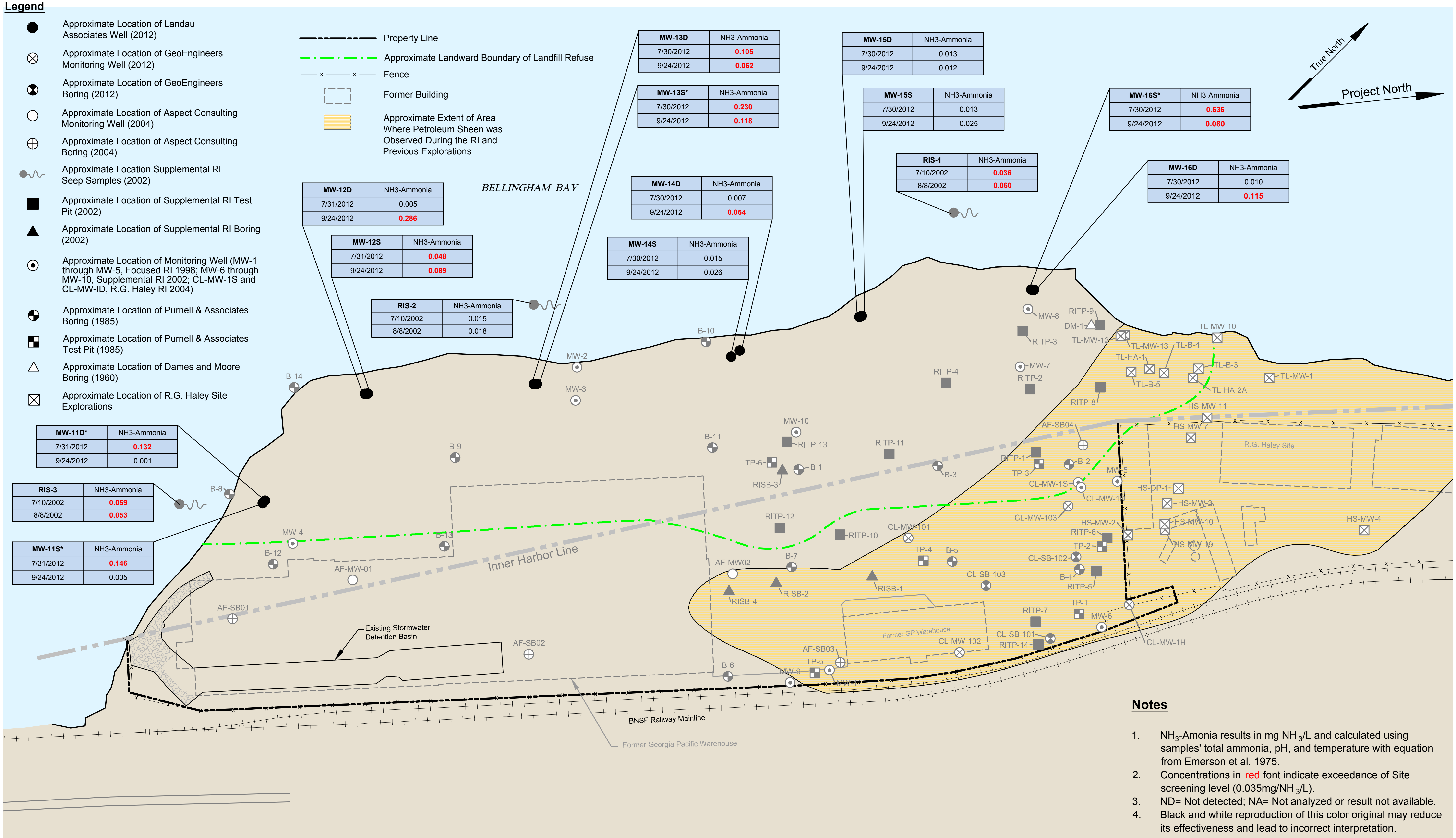
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-03.dwg (A) "Figure 6-3" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Petroleum Hydrocarbon Concentrations in Groundwater

Figure
6-3



Legend

- ● Approximate Location of Landau Associates Well (2012)
- ⊗ Approximate Location of GeoEngineers Monitoring Well (2012)
- ◓ Approximate Location of GeoEngineers Boring (2012)
- ○ Approximate Location of Aspect Consulting Monitoring Well (2004)
- ⊕ Approximate Location of Aspect Consulting Boring (2004)
- ●∿ Approximate Location Supplemental RI Seep Samples (2002)
- ■ Approximate Location of Supplemental RI Test Pit (2002)
- ▲ Approximate Location of Supplemental RI Boring (2002)
- ⊙ Approximate Location of Monitoring Well (MW-1 through MW-5, Focused RI 1998; MW-6 through MW-10, Supplemental RI 2002; CL-MW-1S and CL-MW-ID, R.G. Haley RI 2004)
- ◑ Approximate Location of Purnell & Associates Boring (1985)
- ▚ Approximate Location of Purnell & Associates Test Pit (1985)
- △ Approximate Location of Dames and Moore Boring (1960)
- ☒ Approximate Location of R.G. Haley Site Explorations
- ━ ━ ━ Property Line
- ─ · ─ · Approximate Landward Boundary of Landfill Refuse
- —x—x— Fence
- ┌ ┐ Former Building
- ▤ Approximate Extent of Area Where Petroleum Sheen was Observed During the RI and Previous Explorations

MW-11D*	NH3-Ammonia
7/31/2012	**0.132**
9/24/2012	0.001

RIS-3	NH3-Ammonia
7/10/2002	**0.059**
8/8/2002	**0.053**

MW-11S*	NH3-Ammonia
7/31/2012	**0.146**
9/24/2012	0.005

MW-12D	NH3-Ammonia
7/31/2012	0.005
9/24/2012	**0.286**

MW-12S	NH3-Ammonia
7/31/2012	**0.048**
9/24/2012	**0.089**

RIS-2	NH3-Ammonia
7/10/2002	0.015
8/8/2002	0.018

MW-13D	NH3-Ammonia
7/30/2012	**0.105**
9/24/2012	**0.062**

MW-13S*	NH3-Ammonia
7/30/2012	**0.230**
9/24/2012	**0.118**

MW-14D	NH3-Ammonia
7/30/2012	0.007
9/24/2012	**0.054**

MW-14S	NH3-Ammonia
7/30/2012	0.015
9/24/2012	0.026

MW-15D	NH3-Ammonia
7/30/2012	0.013
9/24/2012	0.012

MW-15S	NH3-Ammonia
7/30/2012	0.013
9/24/2012	0.025

RIS-1	NH3-Ammonia
7/10/2002	**0.036**
8/8/2002	**0.060**

MW-16S*	NH3-Ammonia
7/30/2012	**0.636**
9/24/2012	**0.080**

MW-16D	NH3-Ammonia
7/30/2012	0.010
9/24/2012	**0.115**

Notes

1. NH$_3$-Amonia results in mg NH$_3$/L and calculated using samples' total ammonia, pH, and temperature with equation from Emerson et al. 1975.
2. Concentrations in red font indicate exceedance of Site screening level (0.035mg/NH$_3$/L).
3. ND= Not detected; NA= Not analyzed or result not available.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Basemap source: Port of Bellingham 1996

0 120 240
Scale in Feet

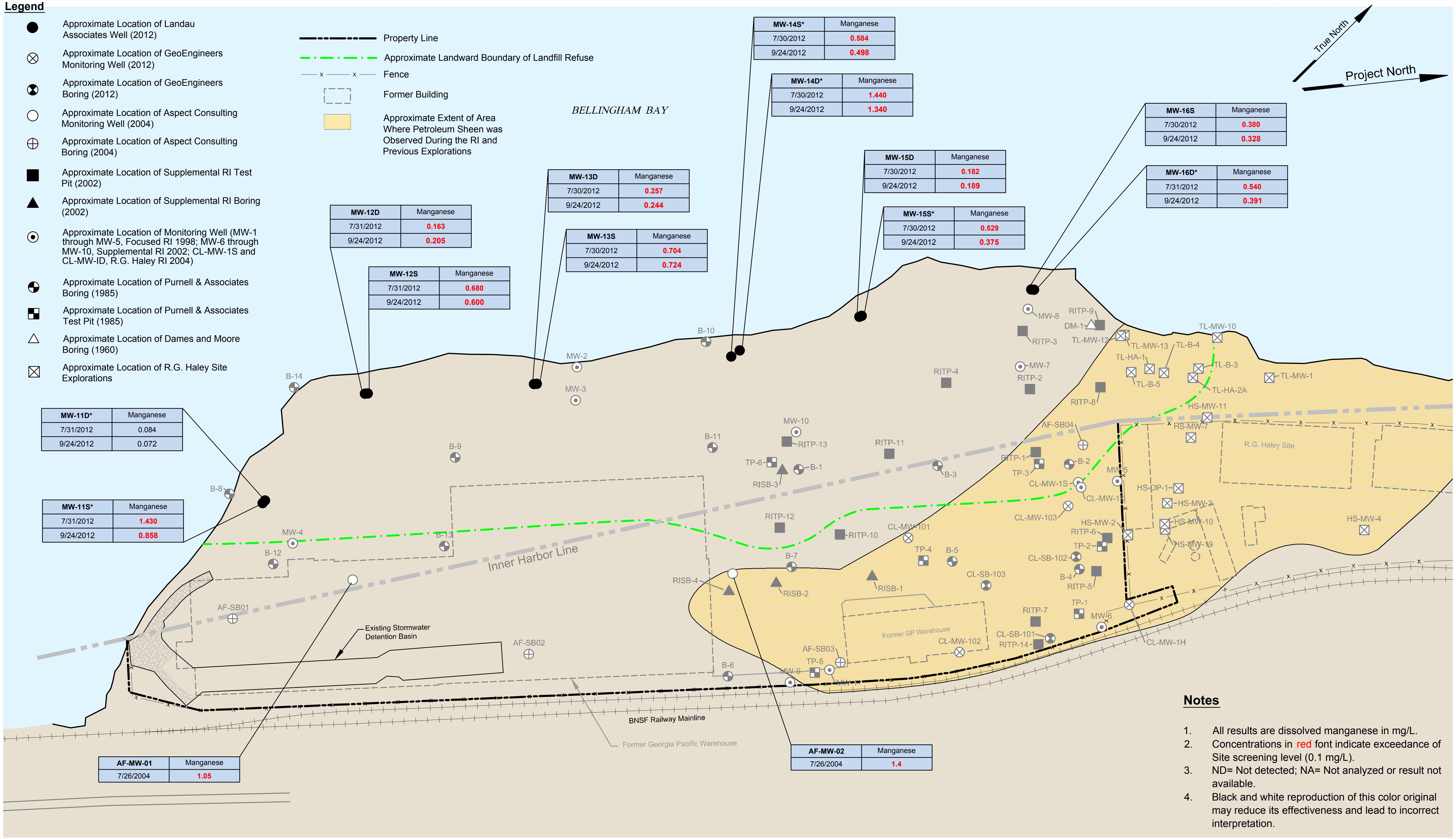
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-04.dwg (A) "Figure 6-4" 8/14/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Ammonia Concentrations in Groundwater

Figure
6-4



Legend

●	Approximate Location of Landau Associates Well (2012)
⊗	Approximate Location of GeoEngineers Monitoring Well (2012)
⊗	Approximate Location of GeoEngineers Boring (2012)
○	Approximate Location of Aspect Consulting Monitoring Well (2004)
⊕	Approximate Location of Aspect Consulting Boring (2004)
■	Approximate Location of Supplemental RI Test Pit (2002)
▲	Approximate Location of Supplemental RI Boring (2002)
⊙	Approximate Location of Monitoring Well (MW-1 through MW-5, Focused RI 1998; MW-6 through MW-10, Supplemental RI 2002; CL-MW-1S and CL-MW-ID, R.G. Haley RI 2004)
◐	Approximate Location of Purnell & Associates Boring (1985)
▚	Approximate Location of Purnell & Associates Test Pit (1985)
△	Approximate Location of Dames and Moore Boring (1960)
☒	Approximate Location of R.G. Haley Site Explorations
‒ ‒ · ‒ ‒	Property Line
‒ · ‒ · ‒	Approximate Landward Boundary of Landfill Refuse
— x — x —	Fence
⬚	Former Building
▤	Approximate Extent of Area Where Petroleum Sheen was Observed During the RI and Previous Explorations

MW-14S*	Manganese
7/30/2012	0.584
9/24/2012	0.498

MW-14D*	Manganese
7/30/2012	1.440
9/24/2012	1.340

MW-16S	Manganese
7/30/2012	0.380
9/24/2012	0.328

MW-15D	Manganese
7/30/2012	0.182
9/24/2012	0.189

MW-16D*	Manganese
7/31/2012	0.540
9/24/2012	0.391

MW-13D	Manganese
7/30/2012	0.257
9/24/2012	0.244

MW-15S*	Manganese
7/30/2012	0.529
9/24/2012	0.375

MW-12D	Manganese
7/31/2012	0.163
9/24/2012	0.205

MW-13S	Manganese
7/30/2012	0.704
9/24/2012	0.724

MW-12S	Manganese
7/31/2012	0.680
9/24/2012	0.600

MW-11D*	Manganese
7/31/2012	0.084
9/24/2012	0.072

MW-11S*	Manganese
7/31/2012	1.430
9/24/2012	0.858

AF-MW-01	Manganese
7/26/2004	1.05

AF-MW-02	Manganese
7/26/2004	1.4

Notes

1. All results are dissolved manganese in mg/L.
2. Concentrations in red font indicate exceedance of Site screening level (0.1 mg/L).
3. ND= Not detected; NA= Not analyzed or result not available.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Basemap source: Port of Bellingham 1996

0 120 240
Scale in Feet

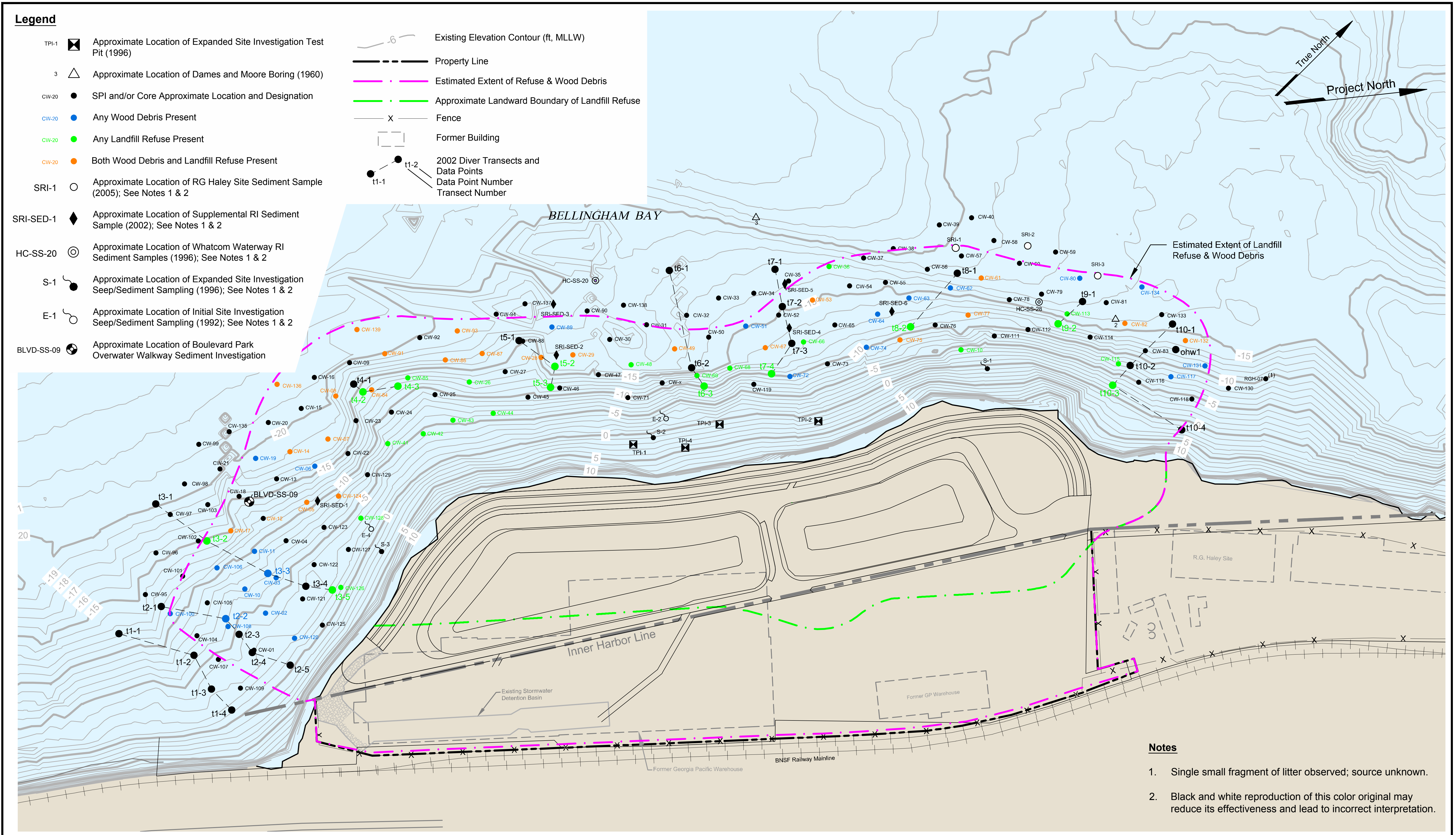
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-05.dwg (A) "Figure 6-5" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Manganese Concentrations in Groundwater

Figure
6-5



Legend

TPI-1 ☒	Approximate Location of Expanded Site Investigation Test Pit (1996)
3 △	Approximate Location of Dames and Moore Boring (1960)
CW-20 ●	SPI and/or Core Approximate Location and Designation
CW-20 ●	Any Wood Debris Present
CW-20 ●	Any Landfill Refuse Present
CW-20 ●	Both Wood Debris and Landfill Refuse Present
SRI-1 ○	Approximate Location of RG Haley Site Sediment Sample (2005); See Notes 1 & 2
SRI-SED-1 ◆	Approximate Location of Supplemental RI Sediment Sample (2002); See Notes 1 & 2
HC-SS-20 ◎	Approximate Location of Whatcom Waterway RI Sediment Samples (1996); See Notes 1 & 2
S-1	Approximate Location of Expanded Site Investigation Seep/Sediment Sampling (1996); See Notes 1 & 2
E-1	Approximate Location of Initial Site Investigation Seep/Sediment Sampling (1992); See Notes 1 & 2
BLVD-SS-09	Approximate Location of Boulevard Park Overwater Walkway Sediment Investigation
-6	Existing Elevation Contour (ft, MLLW)
	Property Line
	Estimated Extent of Refuse & Wood Debris
	Approximate Landward Boundary of Landfill Refuse
x	Fence
	Former Building
t1-1, t1-2	2002 Diver Transects and Data Points Data Point Number Transect Number

Notes

1. Single small fragment of litter observed; source unknown.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

0 150 300
Scale in Feet

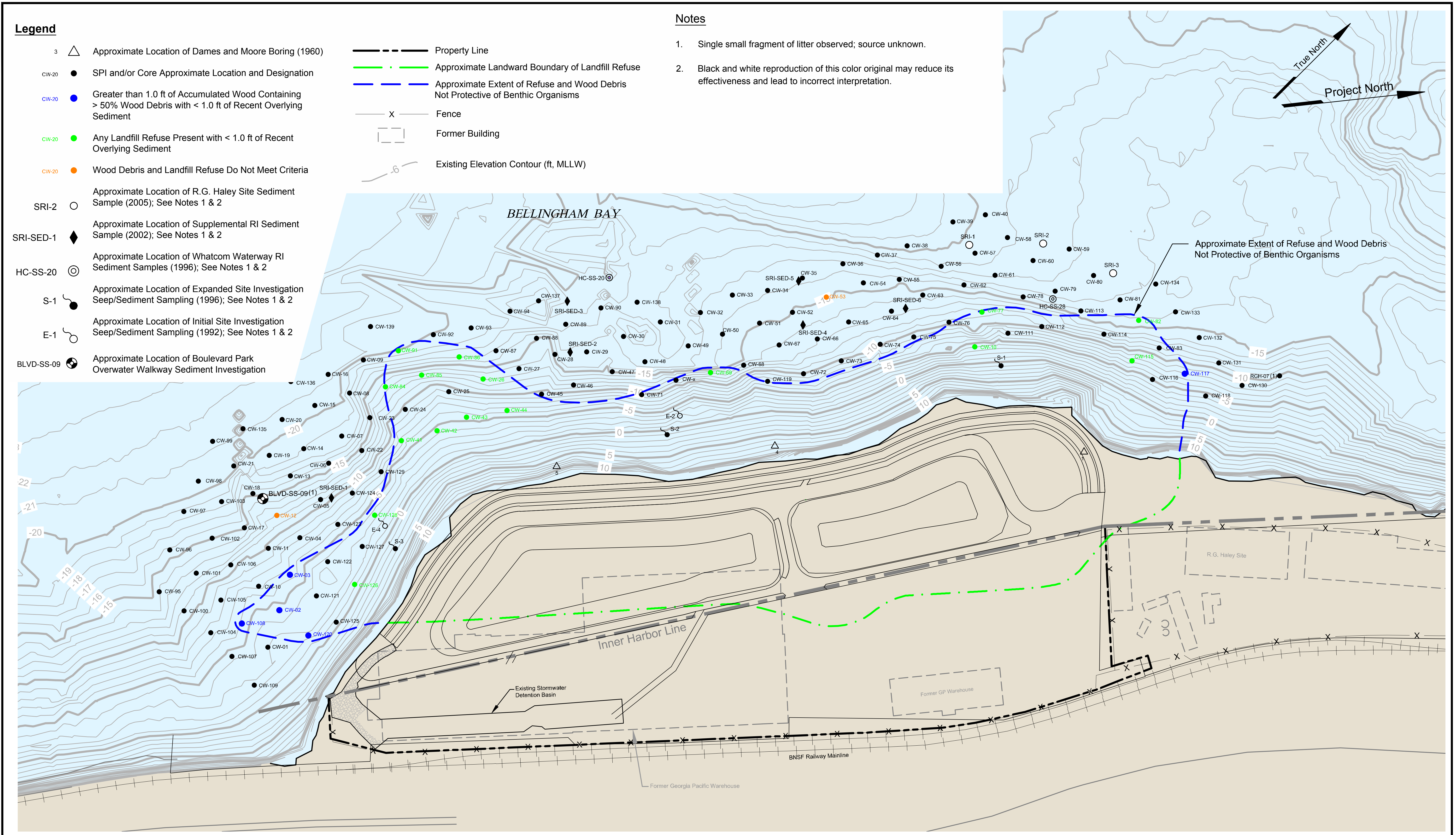
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-06.dwg (A) "Figure 6-6" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Extent of Landfill Subtidal Refuse and Wood Debris

Figure
6-6



Legend

3	△	Approximate Location of Dames and Moore Boring (1960)
CW-20	●	SPI and/or Core Approximate Location and Designation
CW-20	●	Greater than 1.0 ft of Accumulated Wood Containing > 50% Wood Debris with < 1.0 ft of Recent Overlying Sediment
CW-20	●	Any Landfill Refuse Present with < 1.0 ft of Recent Overlying Sediment
CW-20	●	Wood Debris and Landfill Refuse Do Not Meet Criteria
SRI-2	○	Approximate Location of R.G. Haley Site Sediment Sample (2005); See Notes 1 & 2
SRI-SED-1	◆	Approximate Location of Supplemental RI Sediment Sample (2002); See Notes 1 & 2
HC-SS-20	◎	Approximate Location of Whatcom Waterway RI Sediment Samples (1996); See Notes 1 & 2
S-1	●	Approximate Location of Expanded Site Investigation Seep/Sediment Sampling (1996); See Notes 1 & 2
E-1	○	Approximate Location of Initial Site Investigation Seep/Sediment Sampling (1992); See Notes 1 & 2
BLVD-SS-09	●	Approximate Location of Boulevard Park Overwater Walkway Sediment Investigation

- Property Line
- Approximate Landward Boundary of Landfill Refuse
- Approximate Extent of Refuse and Wood Debris Not Protective of Benthic Organisms
- Fence
- Former Building
- Existing Elevation Contour (ft, MLLW)

Notes

1. Single small fragment of litter observed; source unknown.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

0 150 300
Scale in Feet

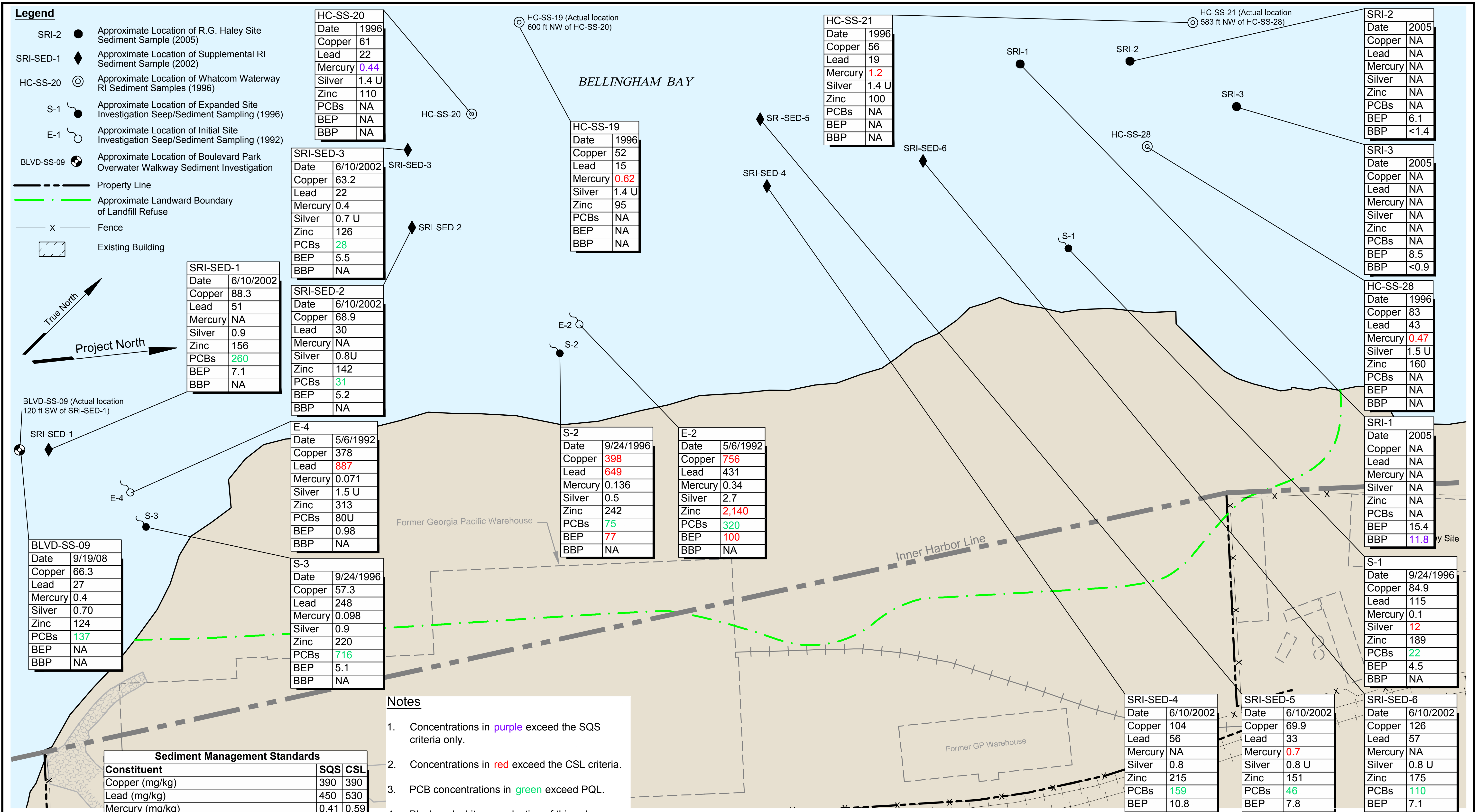
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-07.dwg (A) "Figure 6-7" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Extent of Subtidal Refuse and Wood Debris Not Protective of Benthic Organisms

Figure
6-7



Legend

SRI-2	●	Approximate Location of R.G. Haley Site Sediment Sample (2005)
SRI-SED-1	◆	Approximate Location of Supplemental RI Sediment Sample (2002)
HC-SS-20	◎	Approximate Location of Whatcom Waterway RI Sediment Samples (1996)
S-1	●	Approximate Location of Expanded Site Investigation Seep/Sediment Sampling (1996)
E-1	○	Approximate Location of Initial Site Investigation Seep/Sediment Sampling (1992)
BLVD-SS-09	◎	Approximate Location of Boulevard Park Overwater Walkway Sediment Investigation
	― · ―	Property Line
	― · ―	Approximate Landward Boundary of Landfill Refuse
	― x ―	Fence
	▨	Existing Building

HC-SS-20	
Date	1996
Copper	61
Lead	22
Mercury	0.44
Silver	1.4 U
Zinc	110
PCBs	NA
BEP	NA
BBP	NA

HC-SS-19	
Date	1996
Copper	52
Lead	15
Mercury	0.62
Silver	1.4 U
Zinc	95
PCBs	NA
BEP	NA
BBP	NA

HC-SS-21	
Date	1996
Copper	56
Lead	19
Mercury	1.2
Silver	1.4 U
Zinc	100
PCBs	NA
BEP	NA
BBP	NA

SRI-2	
Date	2005
Copper	NA
Lead	NA
Mercury	NA
Silver	NA
Zinc	NA
PCBs	NA
BEP	6.1
BBP	<1.4

SRI-3	
Date	2005
Copper	NA
Lead	NA
Mercury	NA
Silver	NA
Zinc	NA
PCBs	NA
BEP	8.5
BBP	<0.9

SRI-SED-3	
Date	6/10/2002
Copper	63.2
Lead	22
Mercury	0.4
Silver	0.7 U
Zinc	126
PCBs	28
BEP	5.5
BBP	NA

SRI-SED-1	
Date	6/10/2002
Copper	88.3
Lead	51
Mercury	NA
Silver	0.9
Zinc	156
PCBs	260
BEP	7.1
BBP	NA

SRI-SED-2	
Date	6/10/2002
Copper	68.9
Lead	30
Mercury	NA
Silver	0.8U
Zinc	142
PCBs	31
BEP	5.2
BBP	NA

HC-SS-28	
Date	1996
Copper	83
Lead	43
Mercury	0.47
Silver	1.5 U
Zinc	160
PCBs	NA
BEP	NA
BBP	NA

E-4	
Date	5/6/1992
Copper	378
Lead	887
Mercury	0.071
Silver	1.5 U
Zinc	313
PCBs	80U
BEP	0.98
BBP	NA

S-2	
Date	9/24/1996
Copper	398
Lead	649
Mercury	0.136
Silver	0.5
Zinc	242
PCBs	75
BEP	77
BBP	NA

E-2	
Date	5/6/1992
Copper	756
Lead	431
Mercury	0.34
Silver	2.7
Zinc	2,140
PCBs	320
BEP	100
BBP	NA

SRI-1	
Date	2005
Copper	NA
Lead	NA
Mercury	NA
Silver	NA
Zinc	NA
PCBs	NA
BEP	15.4
BBP	11.8

BLVD-SS-09	
Date	9/19/08
Copper	66.3
Lead	27
Mercury	0.4
Silver	0.70
Zinc	124
PCBs	137
BEP	NA
BBP	NA

S-3	
Date	9/24/1996
Copper	57.3
Lead	248
Mercury	0.098
Silver	0.9
Zinc	220
PCBs	716
BEP	5.1
BBP	NA

S-1	
Date	9/24/1996
Copper	84.9
Lead	115
Mercury	0.1
Silver	12
Zinc	189
PCBs	22
BEP	4.5
BBP	NA

SRI-SED-4	
Date	6/10/2002
Copper	104
Lead	56
Mercury	NA
Silver	0.8
Zinc	215
PCBs	159
BEP	10.8
BBP	NA

SRI-SED-5	
Date	6/10/2002
Copper	69.9
Lead	33
Mercury	0.7
Silver	0.8 U
Zinc	151
PCBs	46
BEP	7.8
BBP	NA

SRI-SED-6	
Date	6/10/2002
Copper	126
Lead	57
Mercury	NA
Silver	0.8 U
Zinc	175
PCBs	110
BEP	7.1
BBP	NA

Sediment Management Standards

Constituent	SQS	CSL
Copper (mg/kg)	390	390
Lead (mg/kg)	450	530
Mercury (mg/kg)	0.41	0.59
Silver (mg/kg)	6.1	6.1
Zinc (mg/kg)	410	960
PCBs (µg/kg; SL Based on PQL)	6	
Bis(2-Ethylhexyl)phthalate (BEP) (mg/kg OC)	47	78
Butyl Benzyl Phthalate (BBP) (mg/kg OC)	5	64

Notes

1. Concentrations in purple exceed the SQS criteria only.
2. Concentrations in red exceed the CSL criteria.
3. PCB concentrations in green exceed PQL.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

NA = Not analyzed
U = Not detected above the value shown
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
OC = values normalized to organic carbon

0 100 200
Scale in Feet

Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

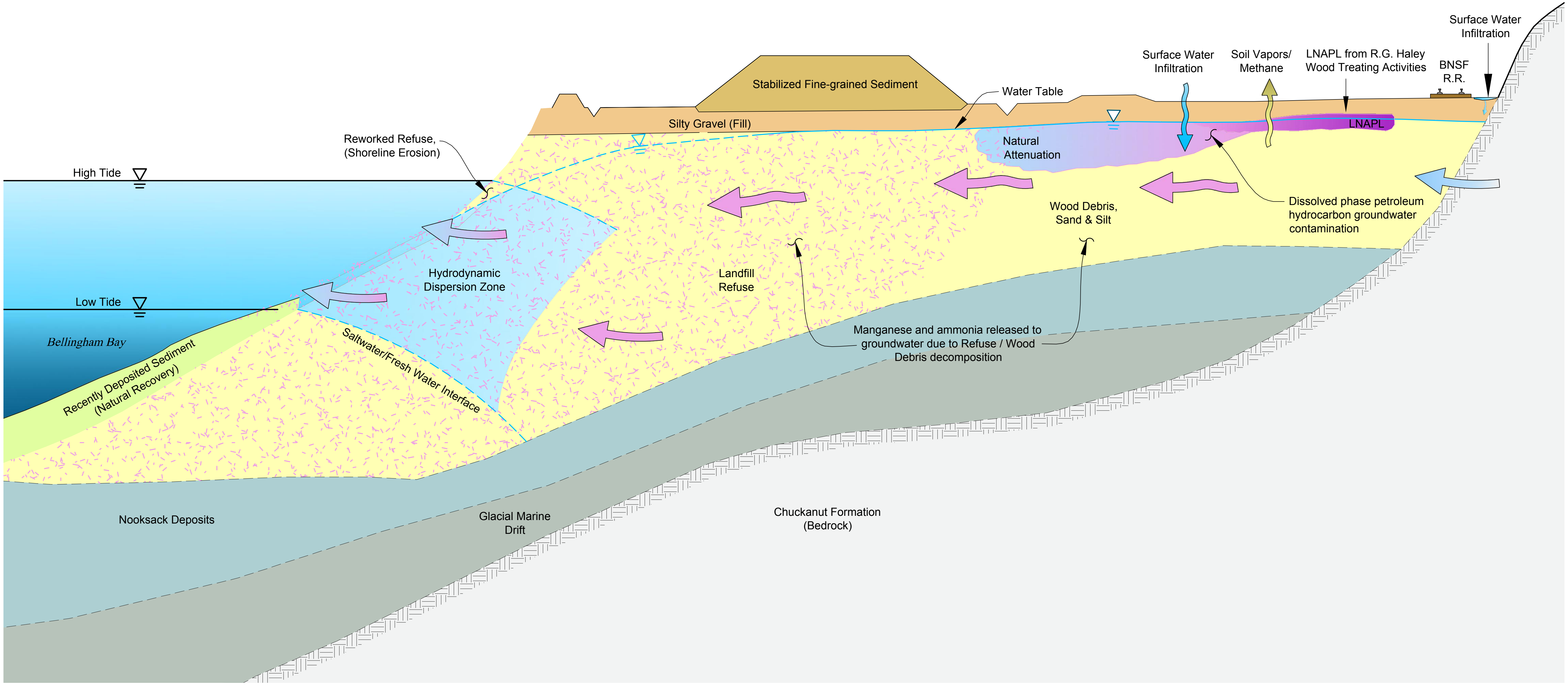
Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

**Surface Sediment
Site Exploration Locations
and Chemical Data**

Figure
6-8

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 6-08.dwg (A) "Figure 6-8" 8/13/2013



Legend

▽ Water Table

▽ Tidally Influenced Water Level

⇦ Groundwater Flow

Notes

1. The Blue color in arrows indicates clean groundwater.
2. The Pink color in arrows indicates dissolved phase groundwater contamination.

Not to Scale

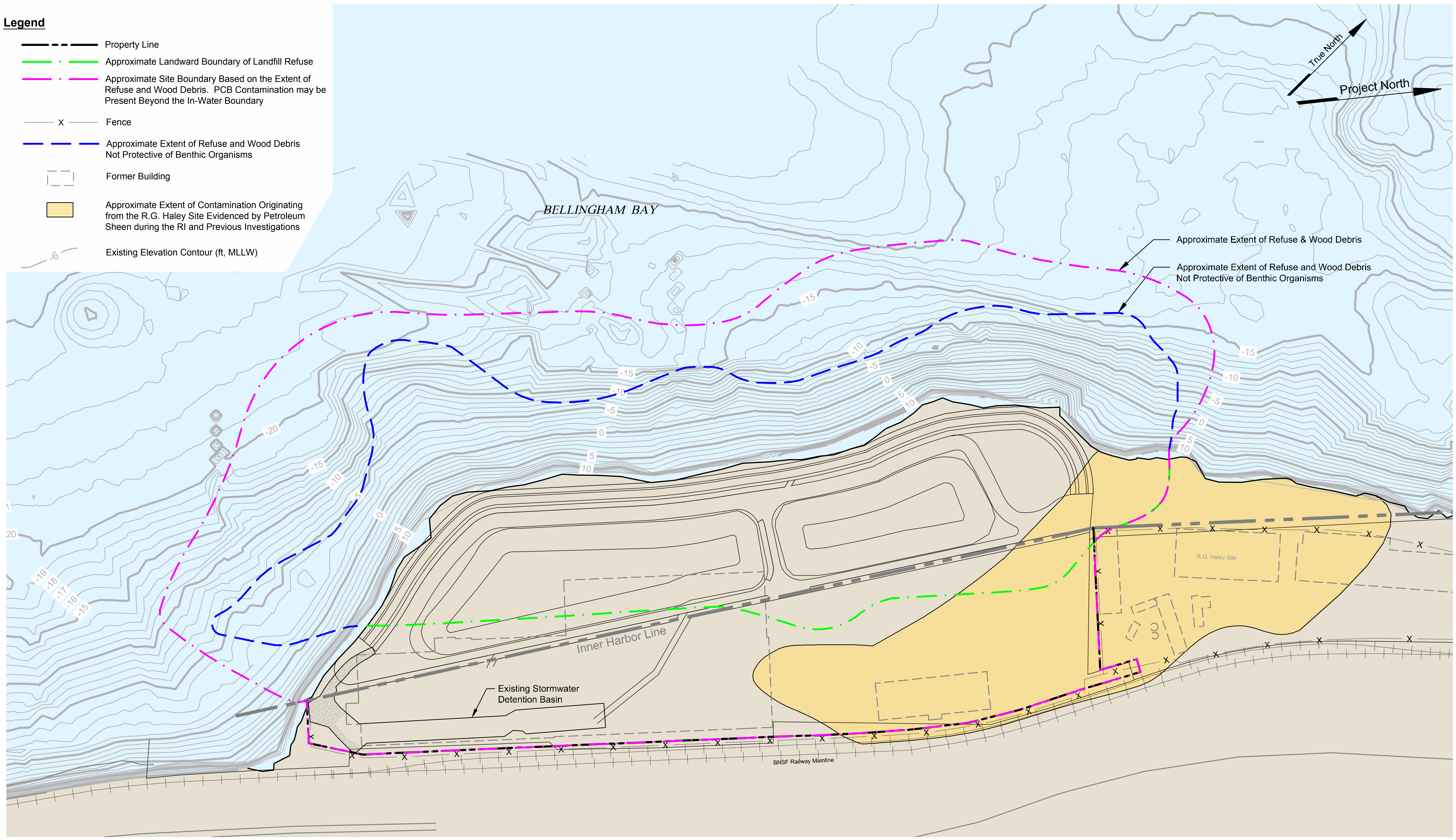
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 7-01.dwg (A) "Figure 7-1" 8/13/2013

Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Conceptual Site Model

Figure
7-1



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

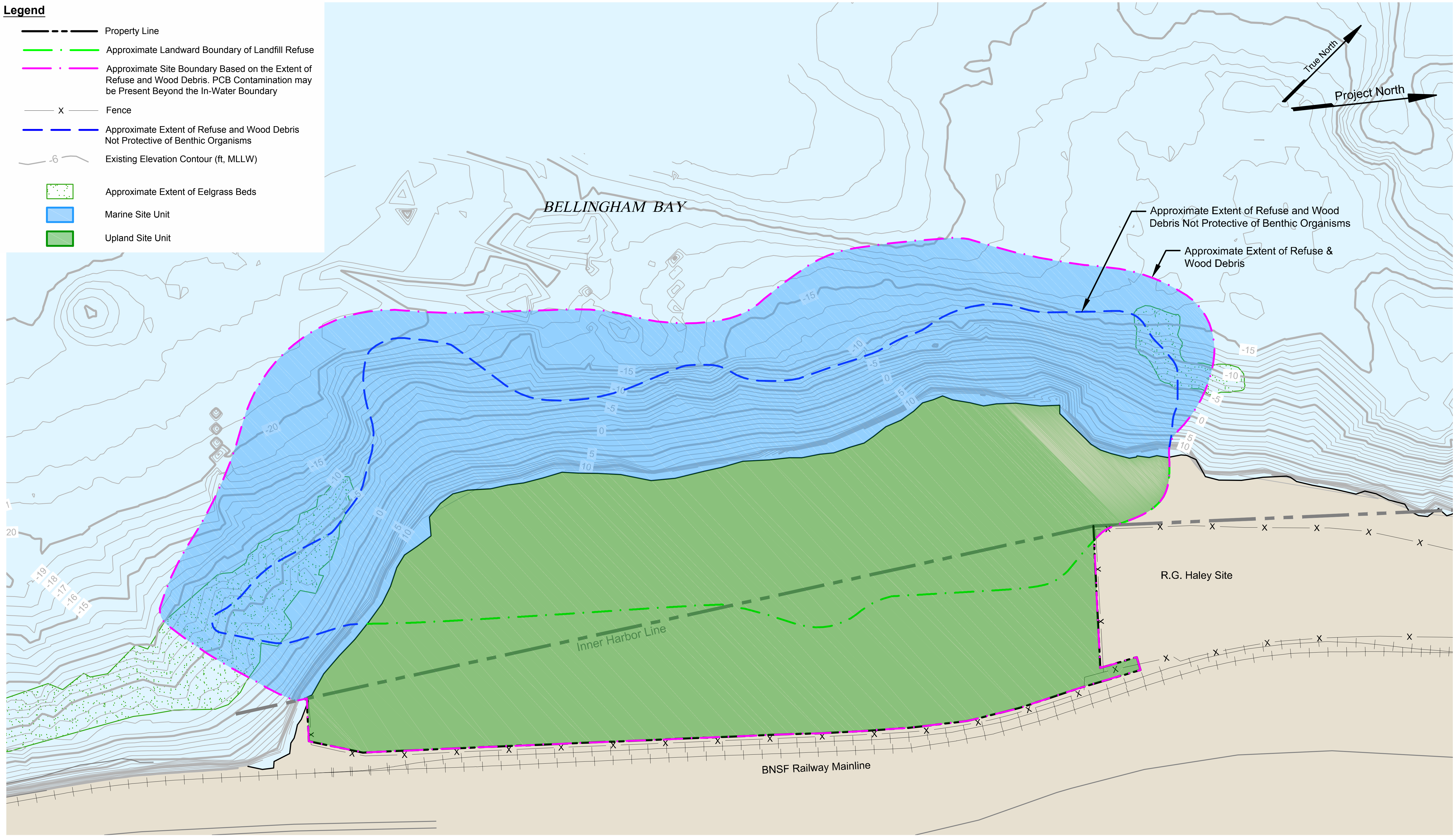
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 7-02.dwg (A) "Figure 7-2" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Extent of Site Contamination

Figure
7-2



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

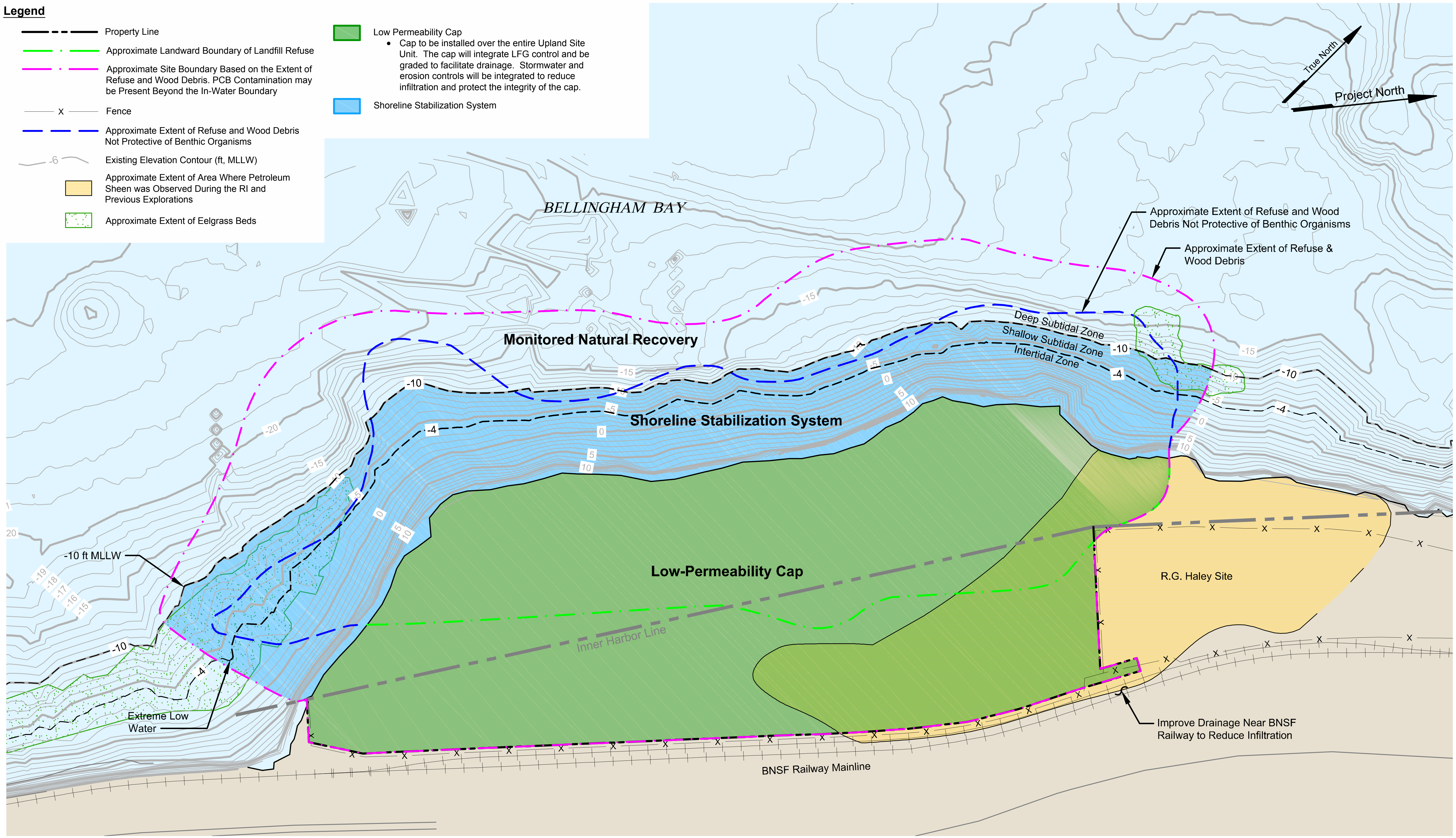
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 9-01.dwg (A) "Figure 9-1" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Site Units

Figure
9-1



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

Note
Monitored Natural Recovery (MNR) will be conducted in the Marine Site Unit. The boundaries of MNR will be determined during the design phase.

0 150 300
Scale in Feet

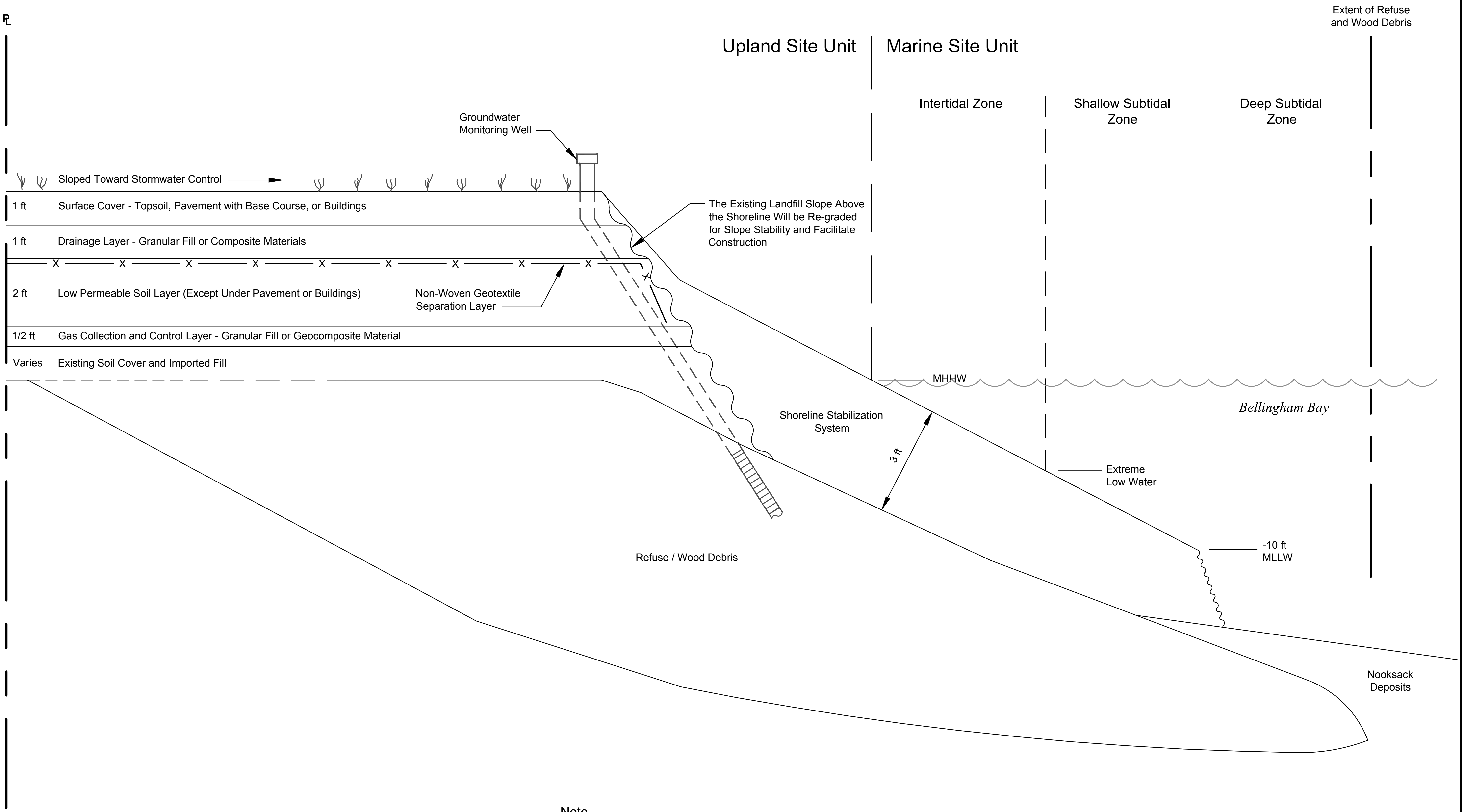
LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Alternative 1
Conceptual Site Plan

Figure
9-2

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 9-02.dwg (A) "Figure 9-2" 8/13/2013



Note

1. The profiles presented on this figure provide conceptual-level design details. The final selection of materials, layer thickness, and details for transitioning between zones will be determined during the remedial design process.

Not to Scale

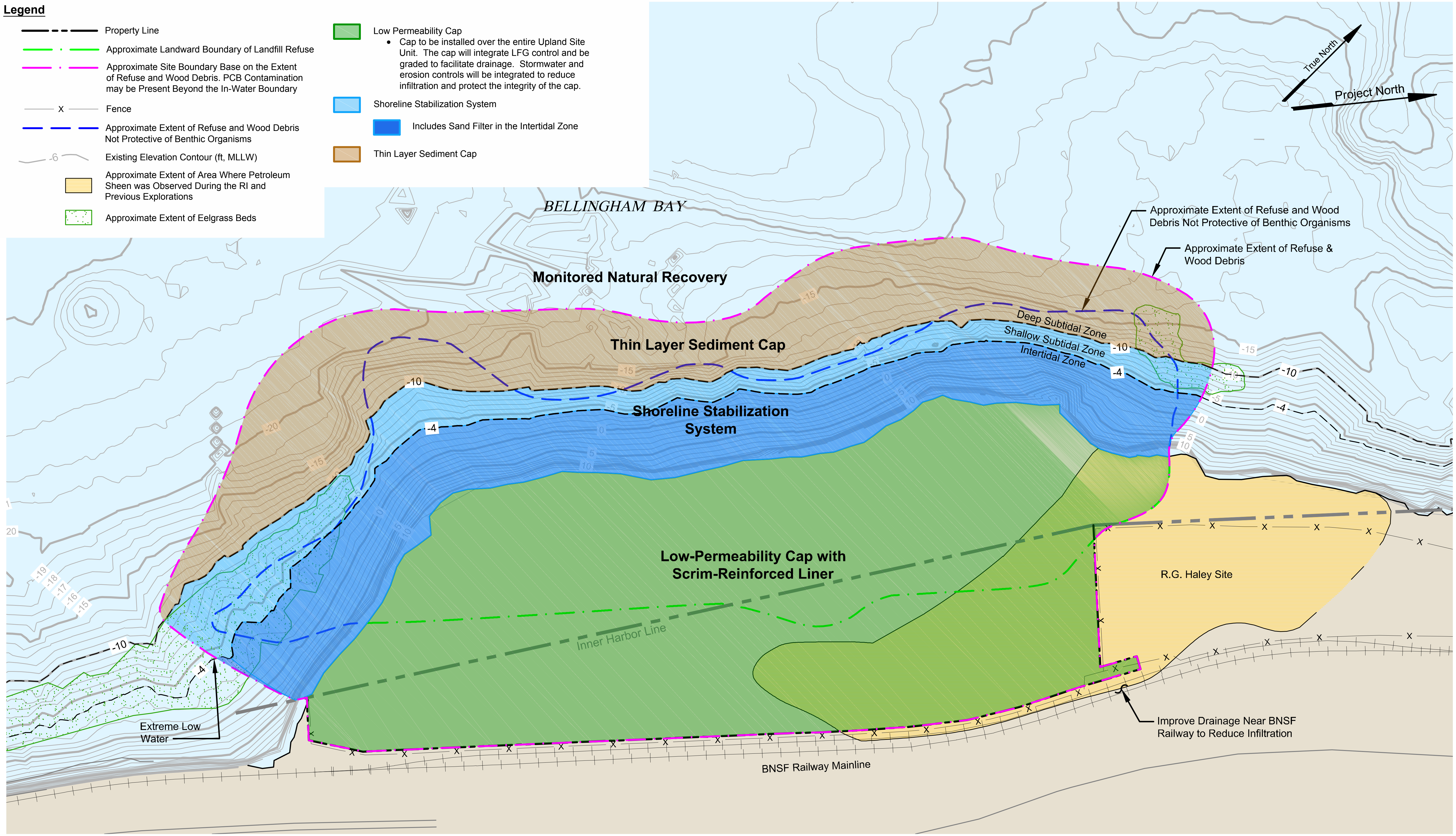
Cornwall Avenue Landfill
Bellingham, Washington

Alternative 1
Conceptual Site Profile

Figure
9-3

LANDAU ASSOCIATES

LANDAU ASSOCIATES, INC. | V:\001\020\400\510\RIFS 2013\Fig 9-03.dwg (A) "Figure 9-3" 8/13/2013



Legend

— - —	Property Line
— · —	Approximate Landward Boundary of Landfill Refuse
— · —	Approximate Site Boundary Base on the Extent of Refuse and Wood Debris. PCB Contamination may be Present Beyond the In-Water Boundary
—x—	Fence
— —	Approximate Extent of Refuse and Wood Debris Not Protective of Benthic Organisms
-6	Existing Elevation Contour (ft, MLLW)
🟨	Approximate Extent of Area Where Petroleum Sheen was Observed During the RI and Previous Explorations
▨	Approximate Extent of Eelgrass Beds
🟩	Low Permeability Cap • Cap to be installed over the entire Upland Site Unit. The cap will integrate LFG control and be graded to facilitate drainage. Stormwater and erosion controls will be integrated to reduce infiltration and protect the integrity of the cap.
🟦	Shoreline Stabilization System
🟦	Includes Sand Filter in the Intertidal Zone
🟫	Thin Layer Sediment Cap

Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

Note
Monitored Natural Recovery (MNR) will be conducted in the Marine Site Unit. The boundaries of MNR will be determined during the design phase.

0 150 300
Scale in Feet

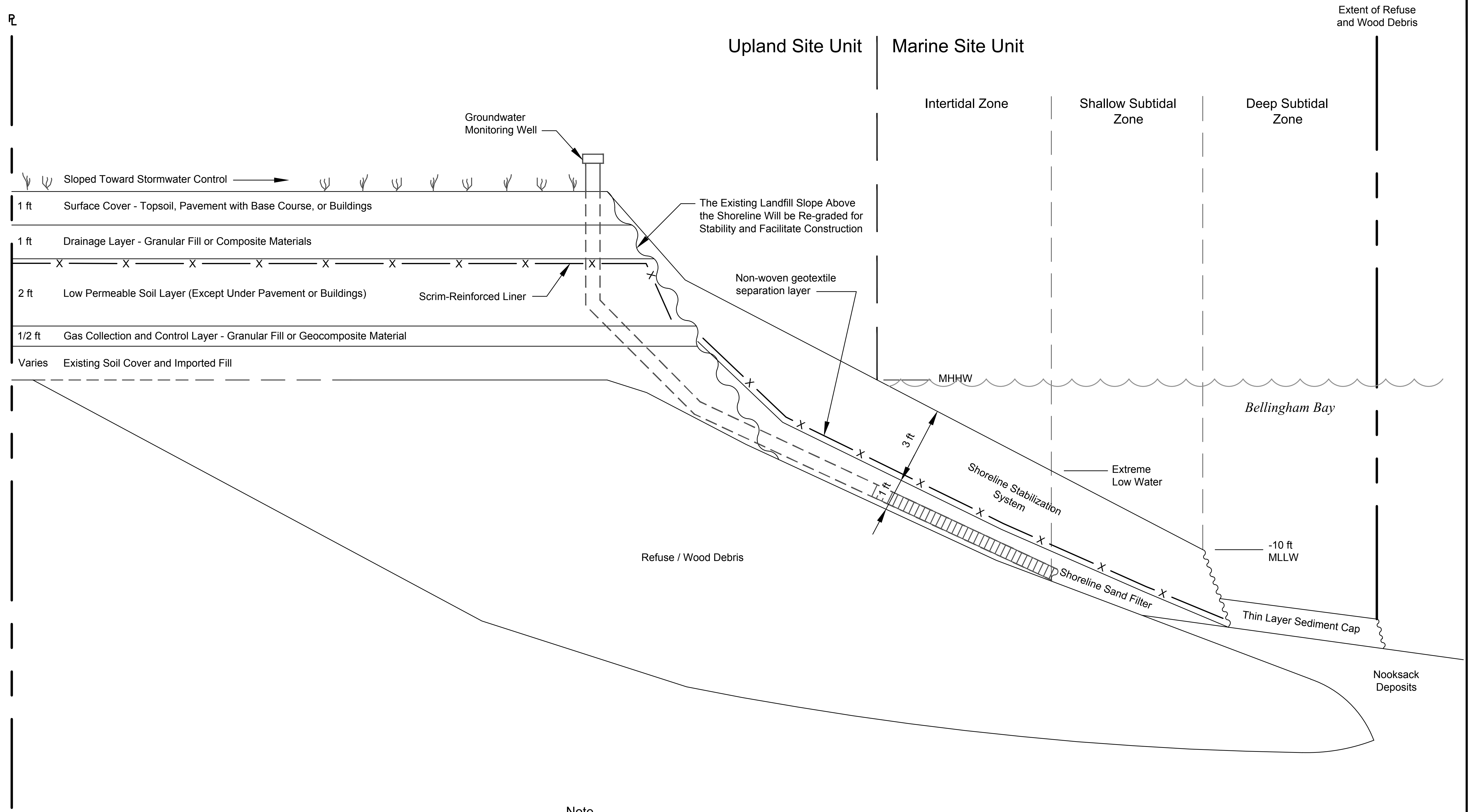
Landau Associates

Cornwall Avenue Landfill
Bellingham, Washington

Alternative 2
Conceptual Site Plan

Figure
9-4

Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 9-04.dwg (A) "Figure 9-4" 8/13/2013



LANDAU ASSOCIATES, INC. | V:\001\020\400\510\RIFS 2013\Fig 9-05.dwg (A) "Figure 9-5" 8/13/2013

Note

1. The profiles presented on this figure provide conceptual-level design details. The final selection of materials, layer thickness, and details for transitioning between zones will be determined during the remedial design process.

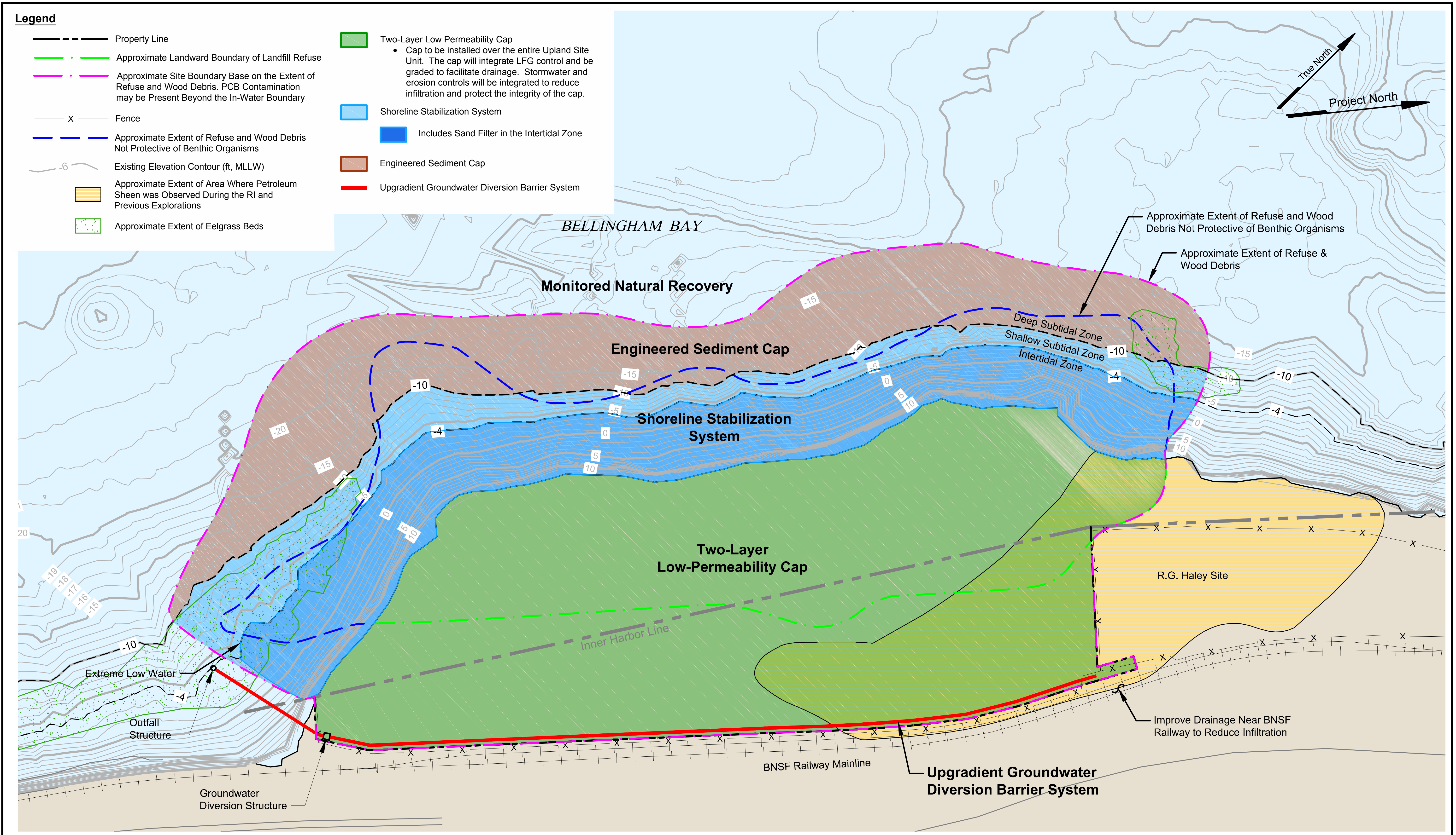
Not to Scale

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Alternative 2
Conceptual Site Profile

Figure
9-5



Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 9-06.dwg (A) "Figure 9-6" 8/13/2013

LANDAU ASSOCIATES

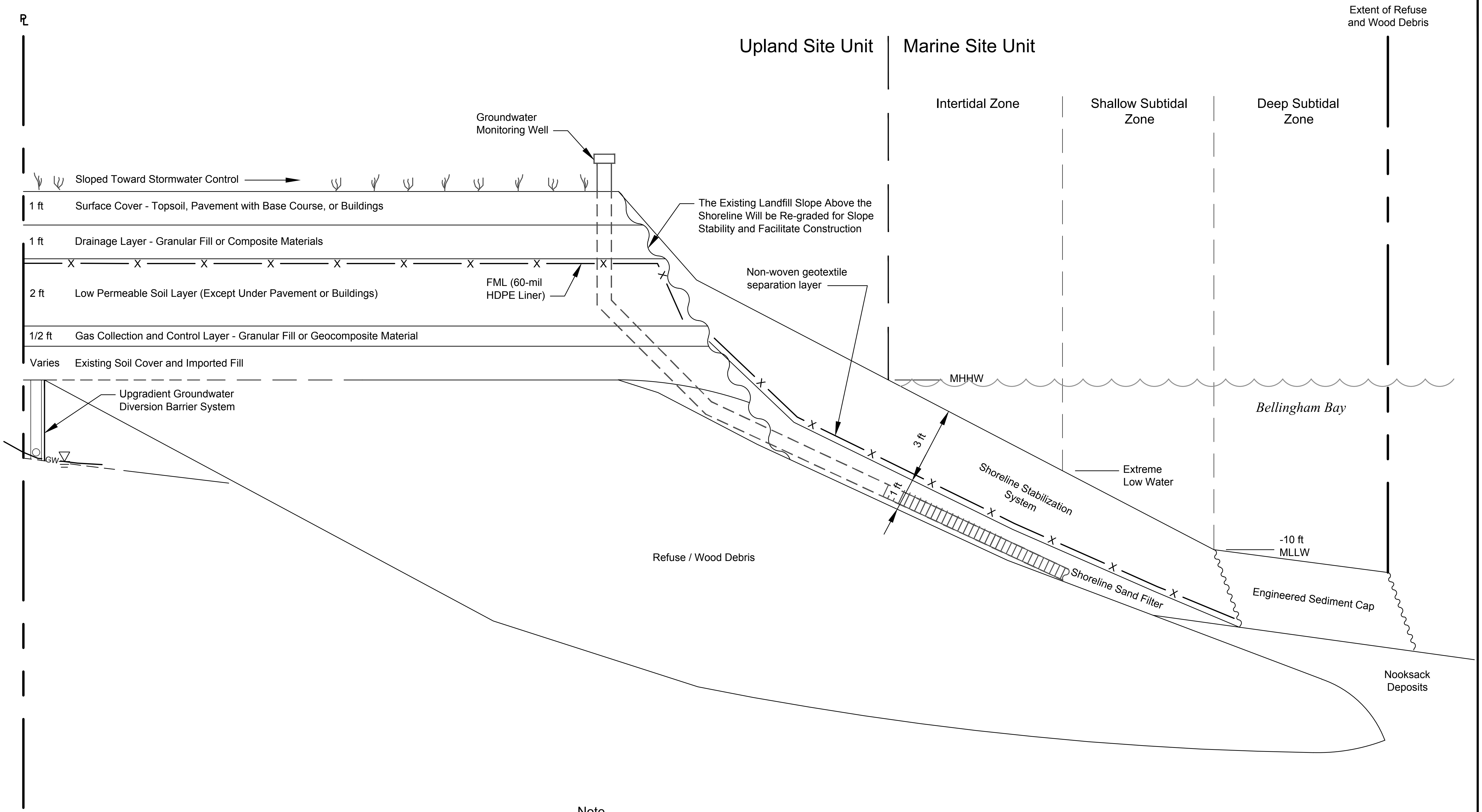
Note
Monitored Natural Recovery (MNR) will be conducted in the Marine Site Unit. The boundaries of MNR will be determined during the design phase.

0 150 300
Scale in Feet

Cornwall Avenue Landfill
Bellingham, Washington

Alternative 3
Conceptual Site Plan

Figure
9-6



Note

1. The profiles presented on this figure provide conceptual-level design details. The final selection of materials, layer thickness, and details for transitioning between zones will be determined during the remedial design process.

Not to Scale

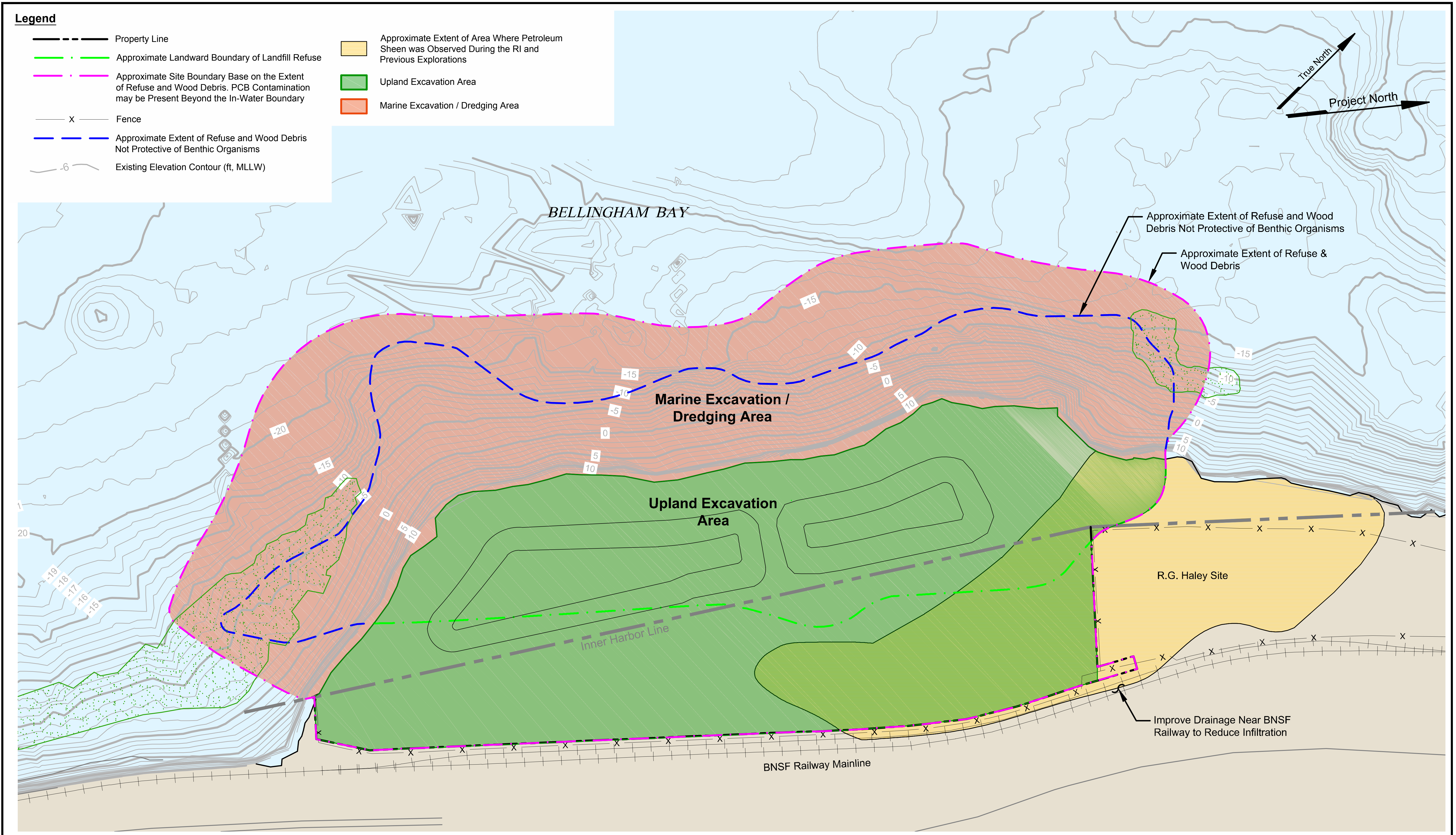
Cornwall Avenue Landfill
Bellingham, Washington

Alternative 3
Conceptual Site Profile

Figure
9-7

LANDAU ASSOCIATES

LANDAU ASSOCIATES, INC. | V:\001\020\400\510\RIFS 2013\Fig 9-07.dwg (A) "Figure 9-7" 8/13/2013



Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

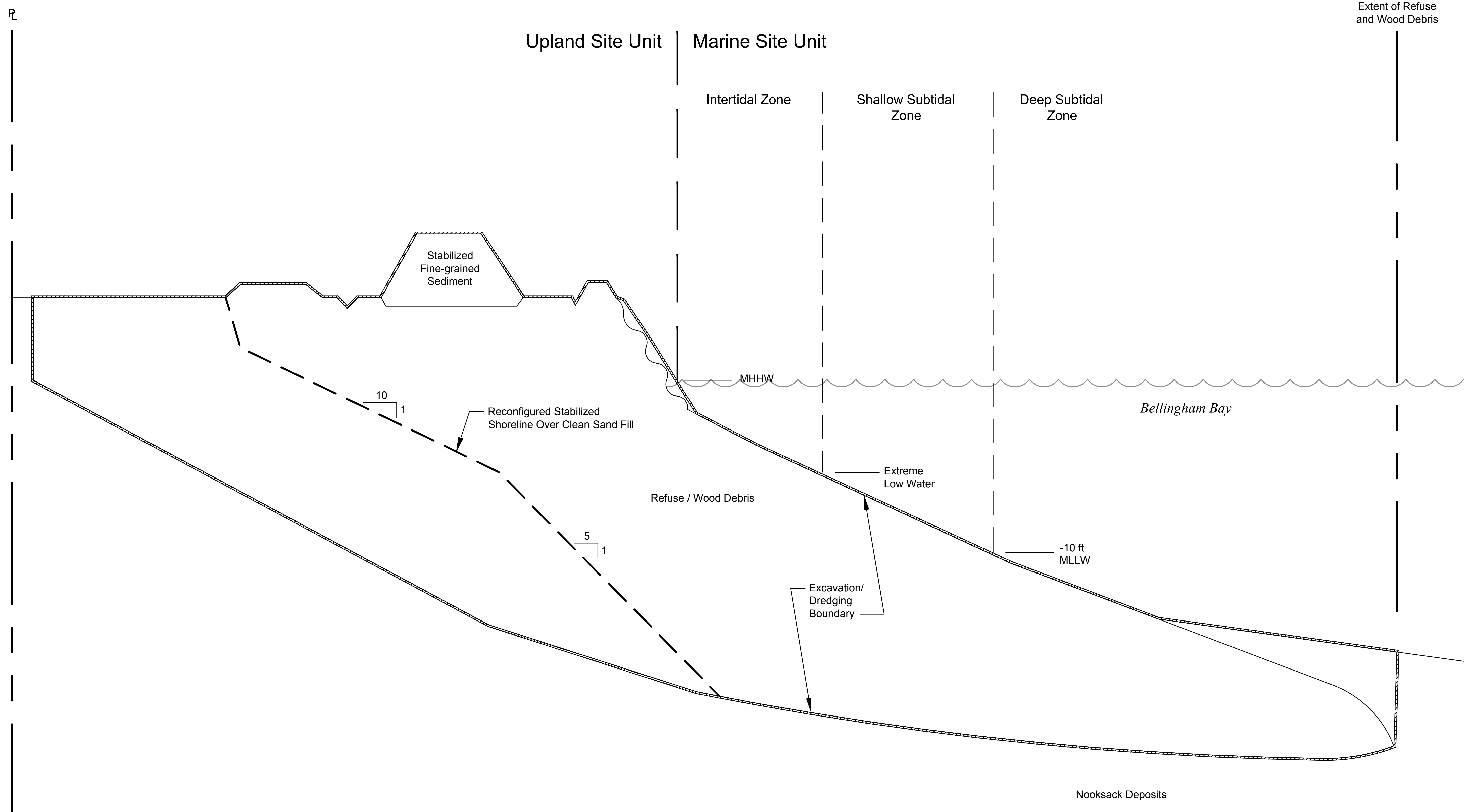
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 9-08.dwg (A) "Figure 9-8" 8/13/2013

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Alternative 4
Conceptual Site Plan

Figure
9-8



Note

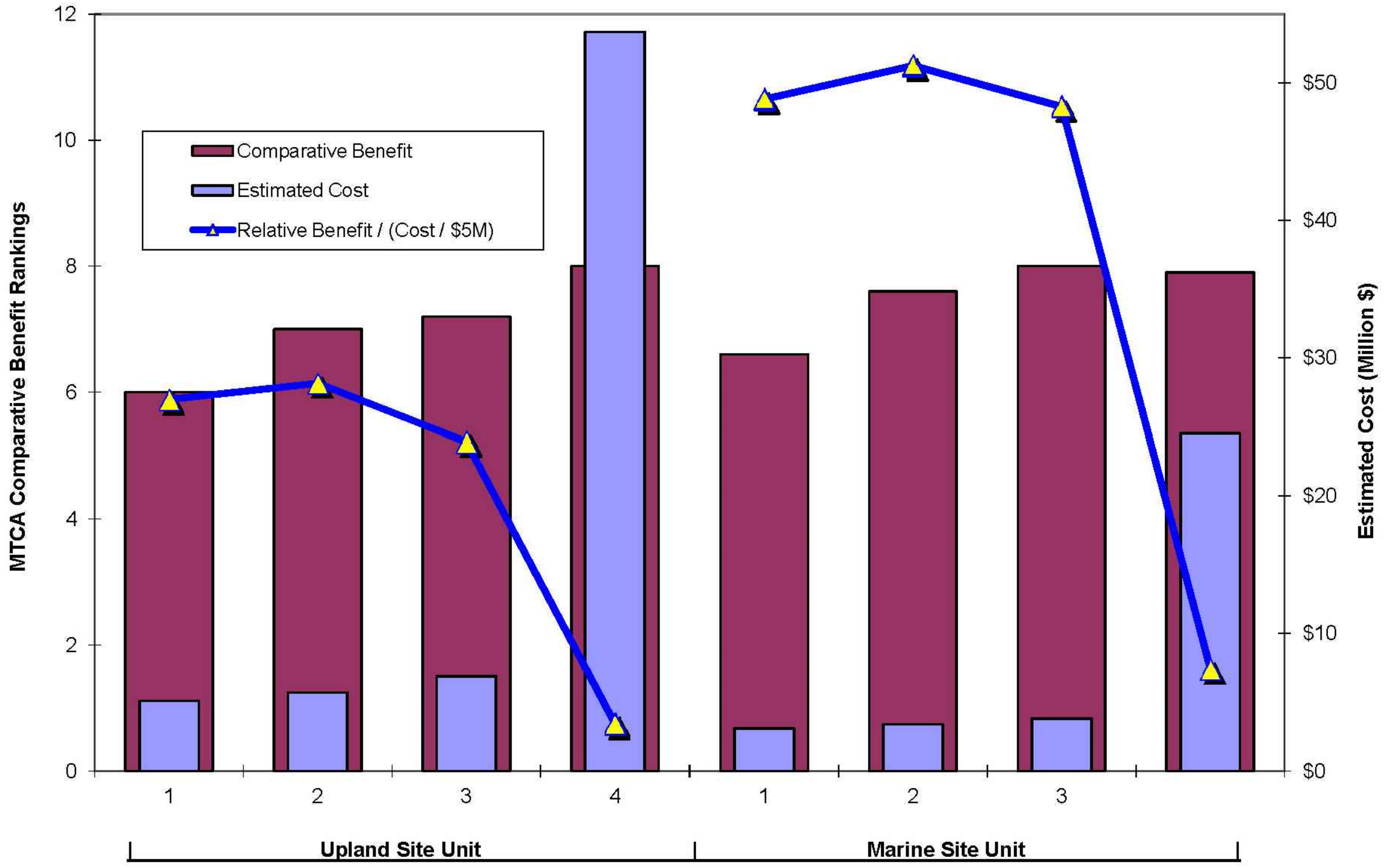
1. The profiles presented on this figure provide conceptual-level design details. The final selection of materials, layer thickness, and details for transitioning between zones will be determined during the remedial design process.

Not to Scale

Cornwall Avenue Landfill Bellingham, Washington	**Alternative 4** **Conceptual Site Profile**	Figure 9-9

LANDAU ASSOCIATES

LANDAU ASSOCIATES, INC. | V:\001\020\400\510\RIFS 2013\Fig 9-09.dwg (A) "Figure 9-9" 8/13/2013



Note

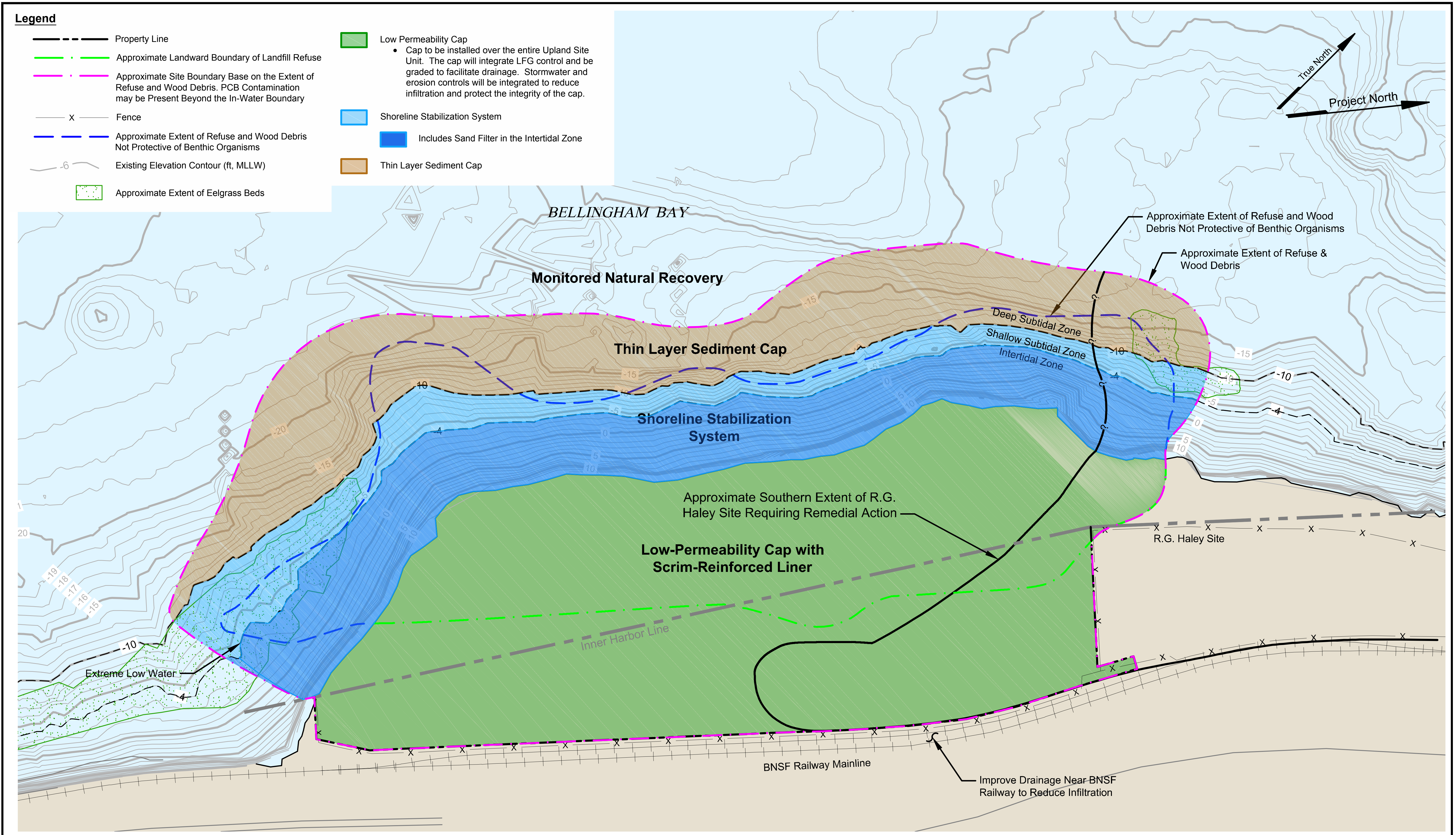
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Disproportionate Cost Analysis Summary

Figure
9-10



Legend

- Property Line
- Approximate Landward Boundary of Landfill Refuse
- Approximate Site Boundary Base on the Extent of Refuse and Wood Debris. PCB Contamination may be Present Beyond the In-Water Boundary
- x Fence
- Approximate Extent of Refuse and Wood Debris Not Protective of Benthic Organisms
- -6 Existing Elevation Contour (ft, MLLW)
- Approximate Extent of Eelgrass Beds
- 🟩 Low Permeability Cap
  - Cap to be installed over the entire Upland Site Unit. The cap will integrate LFG control and be graded to facilitate drainage. Stormwater and erosion controls will be integrated to reduce infiltration and protect the integrity of the cap.
- 🟦 Shoreline Stabilization System
  - 🟦 Includes Sand Filter in the Intertidal Zone
- 🟫 Thin Layer Sediment Cap

Basemap source: Port of Bellingham 1996, Anchor Environmental 2008

0 150 300

Scale in Feet

Note

Monitored Natural Recovery (MNR) will be conducted in the Marine Site Unit. The boundaries of MNR will be determined during the design phase.

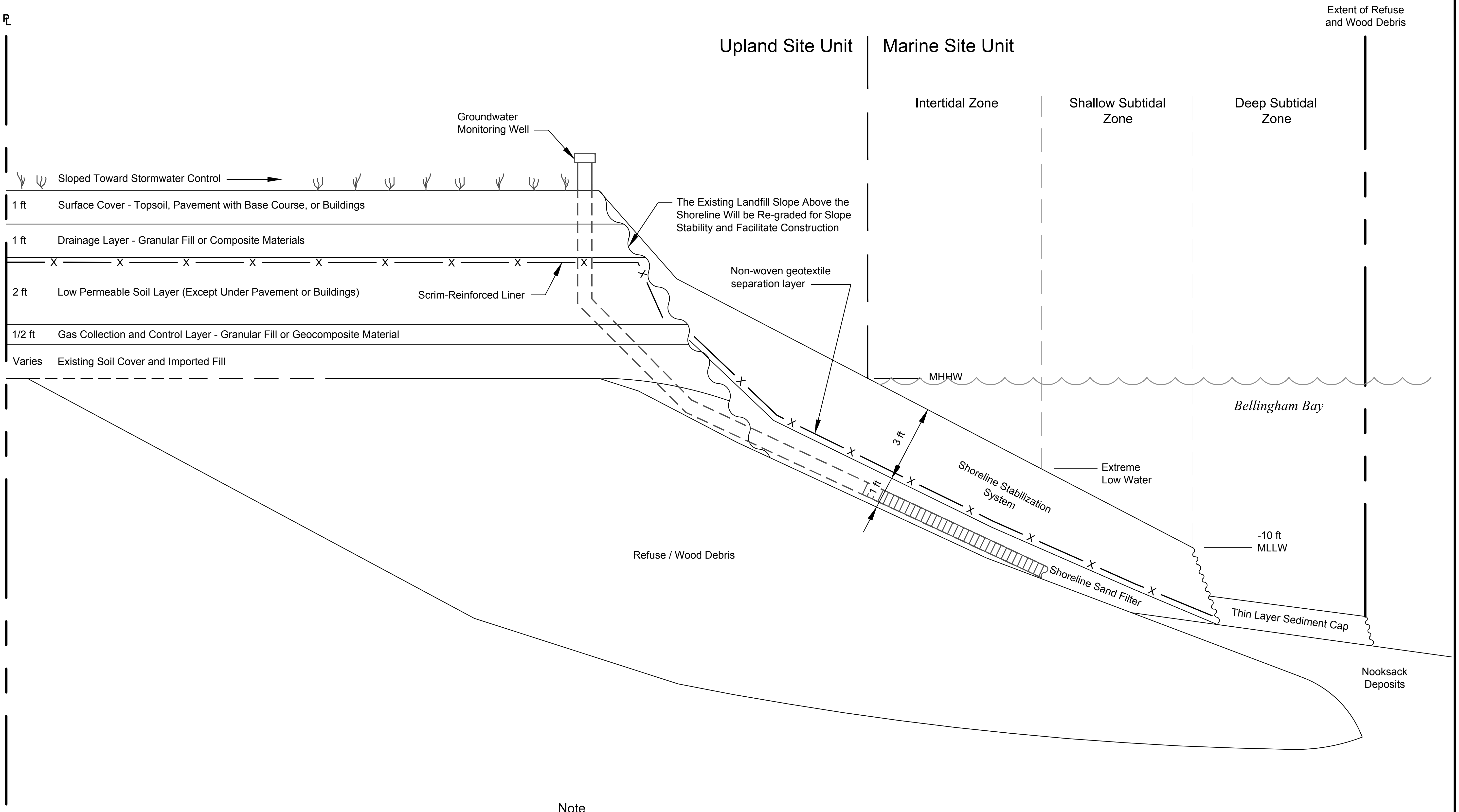
Landau Associates, Inc. | V:\001\020\400\510\RIFS 2013\Fig 10-01.dwg (A) "Figure 10-1" 8/13/2013

LANDAU ASSOCIATES

Port of Bellingham
Bellingham, Washington

Preferred Alternative Conceptual Site Plan

Figure
10-1



LANDAU ASSOCIATES, INC. | V:\001\020\400\510\RIFS 2013\Fig 10-02.dwg (A) "Figure 10-2" 8/13/2013

Note

1. The profiles presented on this figure provide conceptual-level design details. The final selection of materials, layer thickness, and details for transitioning between zones will be determined during the remedial design process.

Not to Scale

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Preferred Alternative
Conceptual Site Profile

Figure
10-2

TABLE 2-1
CHRONOLOGY OF SITE INVESTIGATION ACTIVITIES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Investigation	Year	Scope of Site Explorations
Geotechnical Investigation (Dames & Moore)	1960	3 upland borings 2 in-water borings
Geotechnical Investigation (Purnell & Associates)	1985	14 upland borings 6 upland test pits
Initial Site Investigation (Ecology)	1992	4 groundwater seep samples 2 surface sediment samples
Expanded Site Investigation (Landau Associates)	1996	3 groundwater seep samples 3 surface sediment samples 4 intertidal test pits
Whatcom Waterway RI (Hart Crowser)	1996	4 surface sediment samples in Site vicinity
Focused RI (Landau Associates)	1998	5 groundwater monitoring wells (chemical data collected from 2 wells) 3 groundwater seep sampling devices
Supplemental RI (Landau Associates)	2002	5 new groundwater monitoring wells (chemical data collected from 5 existing wells and 5 new wells) 3 groundwater seep sampling devices (2 rounds of seep sampling) 6 surface sediment samples 4 borings in vicinity of MW-1 14 test pits in vicinity of MW-1 and northeastern corner of Site Video survey of stormwater conveyance Diver subtidal refuse survey
Phase II Environmental Assessment (Aspect Consulting)	2004	6 soil borings (13 soil samples with chemical analysis) 2 new groundwater monitoring wells (chemical data collected from the new wells)
R.G. Haley RI (GeoEngineers)	2004-2005	Installed 2 new nested wells (one shallow and one deep) (chemical data collected for 5 quarters from the nested wells and 2 existing wells)
Sediment Investigation (Ecology/Hart Crowser)	2008	Survey of intertidal and subtidal refuse and wood debris 138 locations photographed using sediment profile imaging techniques and plan view photography Sediment core samples collected at 62 of the locations (no chemical testing)
Boulevard Park Sediment Investigation (City of Bellingham/Hart Crowser)	2008	1 Surface sediment sample and 6 core samples collected in the Site vicinity
2012 Additional Groundwater Investigation (Landau Associates)	2012	Installed 12 new nested wells (one shallow and one deep; 6 locations) (chemical data collected during 2 events in 2012)
R.G. Haley Supplemental RI (GeoEngineers)	2012	3 soil borings (8 soil samples with chemical analysis) 3 new groundwater monitoring wells (chemical data collected from the new wells in 2012)

TABLE 2-2
MONITORING WELL AND SEEP COLLECTION DEVICE GROUND SURFACE AND REFERENCE ELEVATIONS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Location	Northing (a)	Easting (a)	Elevation on Top of PVC Well Casing (b)	Elevation of Ground Surface (b)	Elevation on Top of PVC Well Casing (c)	Elevation of Ground Surface (c)
MW-1	638,746	1,239,936	15.32	15.9	14.15	14.69
MW-2	638,788	1,239,437	16.64	13.4	-	-
MW-3	638,757	1,239,466	16.11	14.2	-	-
MW-4	638,373	1,239,340	14.95	15.1	-	-
MW-5	639,173	1,240,028	16.79	17.3	-	-
MW-6	639,034	1,240,145	17.58	17.8	16.37	16.41
MW-7	639,189	1,239,837	17.5	17.9	-	-
MW-8	639,248	1,239,792	18.7	16.5	-	-
MW-9	638,700	1,239,913	15.32	15.71	14.14	14.46
MW-10	638,927	1,239,694	15.92	16.21	-	-
RIS-1	639,267	1,239,638	1.55	2.29	-	-
RIS-2	638,806	1,239,342	2.24	2.95	-	-
RIS-3	638,306	1,239,202	1.5	2.28	-	-
CL-MW-102	638,880	1,240,037	-	-	14.74	15.04
CL-MW-101	638,937	1,239,888	-	-	13.55	14.1
CL-MW-103	639,110	1,240,003	-	-	14.93	15.31
MW-1	638,746	1,239,936	-	-	14.15	14.69
MW-11D	638,390	1,239,274	-	-	15.85	12.3
MW-11S	638,386	1,239,274	-	-	15.94	12.28
MW-12D	638,576	1,239,268	-	-	17.14	13.38
MW-12S	638,579	1,239,270	-	-	17.13	13.48
MW-13D	638,738	1,239,412	-	-	18.24	14.41
MW-13S	638,740	1,239,414	-	-	18.19	14.62
MW-14D	638,954	1,239,567	-	-	18.9	15.62
MW-14S	638,940	1,239,565	-	-	18.91	15.41
MW-15D	639,092	1,239,644	-	-	19.83	16.4
MW-15S	639,095	1,239,646	-	-	20.01	16.36
MW-16D	639,274	1,239,778	-	-	22.24	18.76
MW-16S	639,271	1,239,775	-	-	22.37	18.73
AF-MW-1	638,398	1,239,425	-	-	13.26	13.49

(a) Horizontal Coordinates shown are NAD 83/98 Washington State Plane Coordinates (North Zone) in US Survey Feet.
(b) Elevation in feet above Mean Lower Low Water (MLLW), surveyed in 1999.
(c) Elevation in feet above MLLW 1983-2001 values, surveyed in 2012.

TABLE 2-3
SURFACE SEDIMENT SAMPLE STATION SUPPLEMENTAL RI COORDINATES AND ELEVATIONS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Sample Location Identification	Northing (a)	Easting (a)	Mudline Elevation (b)
SRI-SED-1	638,370	1,239,050	-0.9
SRI-SED-2	638,812	1,239,157	-6.1
SRI-SED-3	638,868	1,239,095	-11.4
SRI-SED-4	639,112	1,239,394	-5.9
SRI-SED-5	639,158	1,239,338	-7.7
SRI-SED-6	639,249	1,239,493	-7.5

(a) Washington state plane north zone NAD83.
(b) Elevation in ft above MLLW.

TABLE 4-1
MONITORING WELL GROUNDWATER ELEVATIONS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Well	Date	Time	Depth to Water (ft) (a)	Groundwater Elevation (ft MLLW)
MW-1	8/21/2002	14:50	5.32	8.83
MW-1	8/14/2012	11:23	6.44	7.71
MW-1	9/26/2012	9:28	7.05	7.10
MW-2	8/21/2002	14:30	8.22	8.42
MW-3	8/21/2002	14:28	6.95	9.16
MW-4	8/21/2002	15:20	5.33	9.62
MW-5	8/21/2002	13:45	5.20	11.59
MW-6	8/21/2002	13:54	4.44	11.93
MW-6	8/14/2012	11:28	7.59	8.78
MW-6	9/26/2012	9:40	8.23	8.14
MW-7	8/21/2002	14:00	8.54	8.96
MW-8	8/21/2002	14:00	10.45	8.25
MW-9	8/21/2002	14:17	5.47	8.67
MW-9	8/14/2012	11:20	6.59	7.55
MW-9	9/26/2012	9:22	7.21	6.93
MW-10	8/21/2002	14:22	6.43	9.49
AF-MW-1	8/14/2012	11:16	5.92	7.34
AF-MW-1	9/26/2012	9:16	6.53	6.73
CL-MW-101	8/14/2012	11:26	5.50	8.05
CL-MW-101	9/26/2012	9:33	6.09	7.46
CL-MW-102	8/14/2012	11:40	5.96	8.78
CL-MW-102	9/26/2012	9:30	6.41	8.33
CL-MW-103	8/14/2012	11:32	6.21	8.72
Cl-MW-103	9/26/2012	9:38	7.04	7.89
MW-11D	8/14/2012	11:07	9.61	6.24
MW-11D	9/26/2012	9:11	9.94	5.91
MW-11S	8/14/2012	11:10	9.64	6.30
MW-11S	9/26/2012	9:13	9.74	6.20
MW-12D	8/14/2012	11:02	10.79	6.35
MW-12D	9/26/2012	9:07	11.12	6.02
MW-12S	8/14/2012	10:58	11.10	6.03
MW-12S	9/26/2012	9:09	11.39	5.74
MW-13D	8/14/2012	10:54	11.81	6.43
MW-13D	9/26/2012	8:58	12.15	6.09
MW-13S	8/14/2012	10:51	12.39	5.80
MW-13S	9/26/2012	9:01	12.71	5.48
MW-14D	8/14/2012	10:40	11.97	6.93
MW-14D	9/26/2012	8:53	12.47	6.43
MW-14S	8/14/2012	10:45	12.07	6.84
MW-14S	9/26/2012	8:50	12.44	6.47
MW-15D	8/14/2012	10:33	12.96	6.87
MW-15D	9/26/2012	8:47	13.50	6.33
MW-15S	8/14/2012	10:31	13.42	6.59
MW-15S	9/26/2012	8:44	13.85	6.16
MW-16D	8/14/2012	10:22	16.13	6.11
MW-16D	9/26/2012	8:39	16.53	5.71
MW-16S	8/14/2012	10:26	16.34	6.03
MW-16S	9/26/2012	8:41	16.66	5.71

TABLE 4-1
MONITORING WELL GROUNDWATER ELEVATIONS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Well	Date	Time	Depth to Water (ft) (a)	Groundwater Elevation (ft MLLW)
HS-MW-19 (b)	9/26/2012	8:20	8.97	7.56
HS-MW-7 (b)	9/26/2012	8:23	9.41	6.28
HS-MW-4 (b)	9/26/2012	8:16	8.89	7.22
TL-MW-1 (b)	9/26/2012	8:32	8.4	5.77

(a) Depth to water measured from top of casing.
(b) R.G. Haley groundwater monitoring well
ft = Feet
MLLW = Mean Lower Low Water

TABLE 4-2
GROUNDWATER AND SURFACE WATER ELEVATION
TIDAL INFLUENCE DATA - 1998
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

	MW-2			Bellingham Bay			t_1 Time Lag Between Bellingham Bay and MW-2 Based on Minimum Elevation Data (hours)
Date	Maximum Groundwater Elevation (ft, MLLW)	Minimum Groundwater Elevation (ft, MLLW)	Time Between Max. & Min. (hours)	Maximum Water Elevation (ft, MLLW)	Minimum Water Elevation (ft, MLLW)	t_0 Time Between Max. & Min. (hours)	
06/27/98	4.24	4.06	8.17	11.02	0.79	16.67	3.17
06/28/98	4.30	4.05	7.83	10.89	1.36	17.00	3.67
06/29/98	4.23	4.01	16.83	10.93	2.47	16.67	3.83
06/30/98	4.16	3.99	16.67	10.86	3.68	17.00	4.33
07/01/98	4.09	4.00	17.83	10.70	4.83	17.33	3.17
07/02/98	4.16	4.01	6.50	10.35	4.62	8.50	2.00
07/03/98	4.23	3.98	8.00	10.31	3.95	7.50	3.50
07/04/98	4.22	3.95	9.83	10.06	3.34	7.83	4.67
07/05/98	4.16	3.87	9.33	9.79	2.43	7.67	4.00
07/06/98	4.13	3.90	9.33	9.80	1.87	8.67	3.83
07/07/98	4.16	3.92	9.00	9.90	1.22	8.17	3.50
07/08/98	4.20	3.93	10.17	9.97	0.91	7.17	4.83
07/09/98	4.27	3.98	9.50	10.35	0.99	7.83	3.50
07/10/98	4.23	3.93	9.50	10.79	0.62	17.33	3.67
07/11/98	4.08	3.86	14.33	11.11	0.65	17.00	3.83
07/12/98	4.20	4.02	9.00	10.93	0.88	17.00	3.33
07/12/98	4.02		9.00	0.88		17.00	3.33
Average:			10.74			12.46	3.68

ft = feet
MLLW = Mean Lower Low Water

TABLE 4-3
TIDAL INFLUENCE AT DOWNGRADIENT PERIMETER WELLS - 2012
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Monitoring Well	Top of Casing Elevation (a)	Measurement Date	Measurement Time	High/Low Tide	Depth to Water (Ft BGS)	Groundwater Elevation (MLLW)	Groundwater Elevation Change (Ft)	Vertical Gradient (Ft, Average)
MW-11S	15.94	7/30/2012	9:56 AM	Low	9.04	6.90	-0.01	-0.335
		7/30/2012	6:00 PM	High	9.05	6.89		
MW-11D	15.85	7/30/2012	9:58 AM	Low	9.24	6.61	-0.10	
		7/30/2012	6:02 PM	High	9.34	6.51		
MW-12S	17.13	7/30/2012	10:03 AM	Low	10.93	6.20	0.05	0.37
		7/30/2012	6:04 PM	High	10.88	6.25		
MW-12D	17.14	7/30/2012	10:00 AM	Low	10.55	6.59	0.01	
		7/30/2012	6:06 PM	High	10.54	6.60		
MW-13S	18.19	7/30/2012	10:00 AM	Low	12.19	6.00	0.09	0.81
		7/30/2012	6:07 PM	High	12.10	6.09		
MW-13D	18.24	7/30/2012	9:59 AM	Low	11.30	6.94	-0.17	
		7/30/2012	6:08 PM	High	11.47	6.77		
MW-14S	18.91	7/30/2012	9:58 AM	Low	11.69	7.22	0.09	0.18
		7/30/2012	6:10 PM	High	11.60	7.31		
MW-14D	18.90	7/30/2012	9:57 AM	Low	11.45	7.45	-0.01	
		7/30/2012	6:11 PM	High	11.46	7.44		
MW-15S	20.01	7/30/2012	9:52 AM	Low	13.01	7.00	-0.04	0.22
		7/30/2012	6:14 PM	High	13.05	6.96		
MW-15D	19.83	7/30/2012	9:55 AM	Low	12.63	7.20	0.00	
		7/30/2012	6:15 PM	High	12.63	7.20		
MW-16S	22.37	7/30/2012	9:51 AM	Low	15.62	6.75	NC	-0.18 (c)
		7/30/2012	6:17 PM	High	17.74 (b)	4.63		
MW-16D	22.24	7/30/2012	9:50 AM	Low	15.67	6.57	0.11	
		7/30/2012	6:18 PM	High	15.56	6.68		

(a) Elevations based on surveys conducted in 2012 by Wilson Engineering and Pacific Surveying and Engineering.

(b) Depth to water measurement appears to be erroneous for the high-tide reading and is rejected from this evaluation.

(c) Vertical gradient calculated based on low tide readings from the shallow and deep well pair (see note b).

BGS = Below Ground Surface
Ft = Feet
MLLW = Mean Lower Low Water
NC = Not calculated (see note b)

Tide Information		Time	Tidal Elevation (Ft MLLW)
	Low Tide	9:27:00 AM	-1.8
	High Tide	5:23:00 PM	8

TABLE 5-1
SEDIMENT SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN SEDIMENT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Sediment Protective of Benthic Toxicity [2,3]				***Protection of Human Health and Higher Trophic Organisms through Seafood Consumption*** [3]		
		WAC 173-204 Sediment Management Standards (SMS)[b]		WAC 173-204 Dry Weight Equivalents of SMS Criteria[c]		Reference Values for Determination of Site-Specific Cleanup Standard		
ANALYTE (BY GROUP) [a]	CAS No.	SMS SQS	SMS CSL/MCUL	Dry Weight SQS	Dry Weight CSL	Applicable Practical Quantitation Level (PQL)[b]	Natural Background Concentration[c]	Human Health Screening Level (Site Specific Cleanup Level for Bioaccumulative Affects)
Heavy Metals		**mg/kg-dry wt**	**mg/kg-dry wt**	**mg/kg-dry wt**	**mg/kg-dry wt**	**mg/kg-dry wt**	**mg/kg-dry wt**	**mg/kg-dry wt**
Arsenic	7440-38-2	57	93	57	93	0.2	11	11
Cadmium	7440-43-9	5.1	6.7	5.1	6.7			(h)
Chromium (Total)	7440-47-3	260	270	260	270			
Copper	7440-50-8	390	390	390	390			
Lead	7439-92-1	450	530	450	530			(h)
Mercury	7439-97-6	0.41	0.59	0.41	0.59	0.025	0.2	0.41(g)
Silver	7440-22-4	6.1	6.1	6.1	6.1			
Zinc	7440-66-6	410	960	410	960			
Polycyclic Aromatic Hydrocarbons (PAHs)		**mg/kg OC** [d]	**mg/kg OC** [d]	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**
Anthracene	120-12-7	220	1,200	960	960			
Benzo(g,h,i)perylene	191-24-2	31	78	670	720			
Fluoranthene	206-44-0	160	1,200	1,700	2,500			
Phenanthrene	85-01-8	100	480	1,500	1,500			
Pyrene	129-00-0	1,000	1,400	2,600	3,300			
2-Methylnaphthalene	91-57-6	38	64	670	670			
Naphthalene	91-20-3	99	170	2,100	2,100			
Benz(a)anthracene	56-55-3	110	270	1,300	1,600			(h)
Benzo(a)pyrene	50-32-8	99	210	1,600	1,600			(h)
Chrysene	218-01-9	110	460	1,400	2,800			(h)
Indeno(1,2,3-cd)pyrene	193-39-5	34	88	600	690			(h)
Benzofluoranthenes (total)	Total Benzo.	230	450	3,200	3,600			(h)
Total LPAH[e]	Total LPAHs	370	780	5,200	5,200			
Total HPAH[f]	Total HPAH	960	5,300	12,000	17,000			
Other Semi-volatile Organics		**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**
Phenol	108-95-2	420	1,200	420	1,200			
Phthalate Esters		**mg/kg OC** [d]	**mg/kg OC** [d]	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**
Diethyl phthalate	84-66-2	61	110	200	1,200			
Dimethyl phthalate	131-11-3	53	53	71	160			
Di-n-butyl phthalate	84-74-2	220	1,700	1,400	5,100			
Di-n-octyl phthalate	117-84-0	58	4,500	6,200	6,200			
Bis(2-ethylhexyl) phthalate	117-81-7	47	78	1,300	3,100			
Polychlorinated Biphenyls (PCBs)		**mg/kg OC** [d]	**mg/kg OC** [d]	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**	**µg/kg dry wt**
Aroclor 1242						6		6
Aroclor 1248						6		6
Aroclor 1254						6		6
Aroclor 1260						6		6
Total PCBs		12	65	130	1,000	--	--	--

TABLE 5-1
SEDIMENT SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN SEDIMENT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Numerical Criteria Notes:

a Analytes listed are those with promulgated SMS criteria. Consideration of other analytes should be evaluated with Ecology.

b SQS is no affects value. CSL is minor affects value.

d The listed values represent concentrations in parts per million "normalized" on a total organic carbon basis. To normalize to total organic carbon, the dry-weight concentration for each parameter is divided by the decimal fraction representing the percent total organic carbon content of the sediment.

e The total LPAH criterion represents the sum of the following low molecular weight polynuclear aromatic compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

f The total HPAH criterion represents the sum of the following high molecular weight polynuclear aromatic compounds: fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.

g SQS criteria adequately protective of human health based on results from the Whatcom Waterway CAP.

h Bioaccumulative compound. PCB bioaccumlative-based SL used as surrogate for the purposes of the RI/FS.

Process Notes:

2 The SMS numeric criteria as promulgated are based on protection of benthic toxicity. If site-specific bioassay data indicate no adverse affects to benthic organisms, the sediment can be considered to "pass" the applicable sediment quality standards (SQS) of WAC 173-204-320 through 340 even though it may exceed these chemical criteria (WAC 173-204-310(2)). Bioassay testing may be used for any chemical, and may also be required for chemicals that have no CSL or SQS value.

3 Where available information indicates that a potentially significant release of hazardous substances has occurred to sediments, and the released hazardous substances do not have SMS numeric criteria (e.g., petroleum, organotins, dioxin/furans, woodwaste, or solid waste), Ecology should be consulted regarding appropriate evaluation methods.

4 PQL was selected as the screening level for bioaccumulative affects from PCBs. The PQL for PCBs in sediment recommended in Ecology's Sediment Sampling and Analysis Plan Appendix (Ecology 2008) is 6 μg/kg dry weight.

Abbreviations:

CSL	Cleanup screening level.
Ecology	Washington State Department of Ecology.
HPAH	High molecular weight polycyclic aromatic hydrocarbon.
LPAH	Low molecular weight polycyclic aromatic hydrocarbon.
MCUL	Maximum cleanup level.
OC	Organic carbon.
SMS	Sediment Management Standards.
SQS	Sediment quality standards.
WAC	Washington Administrative Code.
wt	Weight.

This table is adapted from the Harris Avenue Site Baywide Screening Level worksheet developed in cooperation with the Washington State Department of Ecology. Some of the notes have been removed as they are not applicable to this table.

TABLE 5-2
GROUNDWATER SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN GROUNDWATER
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		APPLICABLE GROUNDWATER VALUES													
		Groundwater Protective of Surface Water						***Groundwater Protective of Sediment(1)***							
								Partitioning/Distribution Coefficients(b)		*Marine Sediment Quality Standards*					
ANALYTE (BY GROUP)	MTCA Method A or Natural Background *(MTCA -A)*	Surface Water ARAR - Aquatic Life - Marine/Chronic - Ch. 173-201A WAC *(ma-wac)*	Surface Water ARAR - Aquatic Life - Marine/Chronic - Clean Water Act §304 *(ma-cwa)*	Surface Water ARAR - Aquatic Life - Marine/Chronic - National Toxics Rule, 40 CFR 131 *(ma-ntr)*	Surface Water ARAR - Human Health – Marine – Clean Water Act §304 *(hh-cwa)*	Surface Water ARAR - Human Health – Marine – National Toxics Rule, 40 CFR 131 *(hh-ntr)*	Surface Water, Method B, Most-Restrictive, Standard Formula(a) *(sw-b)*	Koc (Soil Organic Carbon-Water Partitioning Coefficient) (L/kg)	Kd (Distribution Coefficient for metals) (L/kg)	WAC 173-204 Marine SQS (mg/kg organic carbon)	WAC 173-204 Marine SQS (mg/kg dry weight)	**Calculated Porewater Concentration Protective of Marine Sediment(c)** *(sed)*	**Applicable Practical Quantitation Level (PQL) for RI Analyses(e)** *(pql)*	**Most Stringent Groundwater Screening Level(f)**	
Total Petroleum Hydrocarbons															
Gasoline Range Hydrocarbons in ug/L	800												250	800	*(MTCA -A)*
Diesel Range Hydrocarbons in ug/L	500												250	500	*(MTCA -A)*
Oil Range Hydrocarbons in ug/L	500												500	500	*(MTCA -A)*
Heavy Metals															
Arsenic in ug/L(d)	5.0	36	36	36	0.14	0.14			*29*		57	2000	0.5	5.0	*(MTCA -A)*
Chromium (Total) in ug/L	50										260		0.5	50	*(MTCA -A)*
Copper in ug/L		3.1	3.1	2.4			2900		*22*		390	18000	0.5	2.4	*(ma-ntr)*
Lead in ug/L	15	8.1	8.1	8.1					*10000*		450	45	0.1	8.1	*(ma-wac)*
Mercury in ug/L	2.0	0.025	0.94	0.025		0.15			*52*		0.41	7.9	0.001	0.025	*(ma-wac)*
Nickel in ug/L		8.2	8.2	8.2	4600	4600			*65*				0.5	8.2	*(ma-wac)*
Selenium in ug/L		71	71	71	4200				*5*				1	71	*(ma-wac)*
Thallium ug/L					0.47	6.3			*71*				0.2	0.47	*(hh-cwa)*
Zinc in ug/L		81	81	81	26000		17000		*62*		410	6600	4	81	*(ma-wac)*
Conventionals and Other Metals															
pH in pH units		7.0< pH <8.5												6.2‡< pH <8.5	*see note*
NH_3 - Ammonia(g) in mg/L		0.035												0.035	*(ma-wac)*
Total Organic Carbon in mg/L															
Cyanide in mg/L		0.0028(h)			16	220							0.005	16	*(hh-cwa)*
Manganese in mg/L					0.1								0.00005	0.1	*(hh-cwa)*
Volatile Organic Compounds															
1,2,4-Trimethylbenzene in ug/L													2		
1,2-Dichlorobenzene in ug/L					1300	17000	4200	*380*		2.3		6.1	0.2	6.1	*(sed)*
1,4-Dichlorobenzene in ug/L					190	2600		*620*		3.1		5	0.2	5	*(sed)*
Acetone in ug/L								*0.58*					20		
Benzene in ug/L	5.0				51	71	23	*62*					0.5	23	*(sw-b)*
Carbon disulfide in ug/L								*46*					0.5		
Chlorobenzene in ug/L					1600	21000	5000	*220*					0.5	1600	*(hh-cwa)*
Ethylbenzene in ug/L					2100	29000	6900	*200*					0.5	2100	*(hh-cwa)*
Isopropylbenzene in ug/L													2		
m,p-Xylenes in ug/L													0.5		
n-Butylbenzene in ug/L													2		
n-Propylbenzene in ug/L													2		
o-Xylene in ug/L								*240*					0.5		
p-Isopropyltoluene (4-Isopropyltoleuene) in ug/L													2		
sec-Butylbenzene in ug/L													2		
Styrene in ug/L								*910*					0.5		
tert-Butylbenzene in ug/L													2		
Toluene in ug/L					15000	200000	19000	*140*					0.5	15000	*(hh-cwa)*
Naphthalene in ug/L	160						4900	*1200*		99		83	0.2	83	*(sed)*
Polycyclic Aromatic Hydrocarbons (PAHs)															
Acenaphthene in ug/L					990		640	*4900*		16		3.3	0.01	3.3	*(sed)*
Acenaphthylene in ug/L										66			0.01		
Anthracene in ug/L					40000	110000	26000	*23000*		220		9.6	0.01	9.6	*(sed)*
Fluoranthene in ug/L					140	370	90	*49000*		160		3.3	0.01	3.3	*(sed)*
Fluorene in ug/L					5300	14000	3500	*7700*		23		3	0.01	3	*(sed)*
Phenanthrene in ug/L								*16690*		100		6	0.01	6	*(sed)*
Pyrene in ug/L					4000	11000	2600	*68000*		1000		15	0.01	15	*(sed)*
1-Methylnaphthalene in ug/L													0.01		
2-Methylnaphthalene in ug/L								*2478*		38		15	0.01	15	*(sed)*
Naphthalene in ug/L							4900	*1200*		99		83	0.01	83	*(sed)*

TABLE 5-2
GROUNDWATER SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN GROUNDWATER
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		APPLICABLE GROUNDWATER VALUES												
		Groundwater Protective of Surface Water						***Groundwater Protective of Sediment(1)***						
								Partitioning/Distribution Coefficients(b)		*Marine Sediment Quality Standards*				
ANALYTE (BY GROUP)	MTCA Method A or Natural Background *(MTCA -A)*	Surface Water ARAR - Aquatic Life - Marine/Chronic - Ch. 173-201A WAC *(ma-wac)*	Surface Water ARAR - Aquatic Life - Marine/Chronic - Clean Water Act §304 *(ma-cwa)*	Surface Water ARAR - Aquatic Life - Marine/Chronic - National Toxics Rule, 40 CFR 131 *(ma-ntr)*	Surface Water ARAR - Human Health – Marine – Clean Water Act §304 *(hh-cwa)*	Surface Water ARAR - Human Health – Marine – National Toxics Rule, 40 CFR 131 *(hh-ntr)*	Surface Water, Method B, Most-Restrictive, Standard Formula(a) *(sw-b)*	Koc (Soil Organic Carbon-Water Partitioning Coefficient) (L/kg)	Kd (Distribution Coefficient for metals) (L/kg)	WAC 173-204 Marine SQS (mg/kg organic carbon)	WAC 173-204 Marine SQS (mg/kg dry weight)	**Calculated Porewater Concentration Protective of Marine Sediment(c)** *(sed)*	**Applicable Practical Quantitation Level (PQL) for RI Analyses(e)** *(pql)*	**Most Stringent Groundwater Screening Level(f)**
Total Naphthalenes in ug/L	160													
Benz(a)anthracene in ug/L					0.018	0.031	0.3	*360000*		110		0.31	0.01	0.018 *(hh-cwa)*
Benzo(a)pyrene in ug/L					0.018	0.031	0.03	*970000*		99		0.1	0.01	0.018 *(hh-cwa)*
Benzo(b)fluoranthene in ug/L					0.018	0.031	0.3	*1200000*					0.01	0.018 *(hh-cwa)*
Benzo(k)fluoranthene in ug/L					0.018	0.031	3	*1200000*					0.01	0.018 *(hh-cwa)*
Chrysene in ug/L					0.018	0.031	30	*400000*		110		0.28	0.01	0.018 *(hh-cwa)*
Indeno(1,2,3-cd)pyrene in ug/L					0.018	0.031	0.3	*3500000*		34		0.0097	0.01	0.01 *(pql)*
Total cPAHs TEQ in ug/L	0.1				0.018	0.031	0.03	*970000*		99		0.1		0.018 *(hh-cwa)*
Other Semi-Volatile Organics														
1,4-Dichlorobenzene in ug/L					190	2600		*620*		3.1		5	1	5 *(sed)*
2,3,4,6-Tetrachlorophenol ug/L													1	
2,4,5-Trichlorophenol in ug/L					3600			*1600*					5	3600 *(hh-cwa)*
2,4,6-Trichlorophenol in ug/L					2.4	6.5	3.9	*380*					3	3 *(pql)*
4-Methylphenol in ug/L											0.67		2	
Bis(2-ethylhexyl) phthalate in ug/L					2.2	5.9	3.6	*110000*		47		0.43	3	3 *(pql)*
Carbazole in ug/L								*3400*						
Dibenzofuran in ug/L										15				
Dimethyl phthalate in ug/L					1100000	2900000		*31.59*		53		1700	1	1700 *(sed)*
m,p-Cresol (2:1 ratio) ug/L														
N-Nitrosodiphenylamine in ug/L					6	16	9.7	*1300*		11		8.5	1	6 *(hh-cwa)*
Pentachlorophenol in ug/L		7.9	7.9	7.9	3	8.2	1.5	*590*			0.36		10	10 *(pql)*
Phenol in ug/L					1700000	4600000	560000	*29*	*0.725*		0.42	580	1	580 *(sed)*
Polychlorinated Biphenyls (PCBs)														
Aroclor 1016 in ug/L				0.03			0.003	*110000*					0.01	0.01 *(pql)*
Aroclor 1221 in ug/L													0.01	
Aroclor 1232 in ug/L													0.01	
Aroclor 1242 in ug/L													0.01	
Aroclor 1248 in ug/L													0.01	
Aroclor 1254 in ug/L				0.03			0.0001						0.01	0.01 *(pql)*
Aroclor 1260 in ug/L				0.03				*820000*					0.01	0.03 *(ma-ntr)*
Total PCBs in ug/L	0.1	0.03	0.03	0.03	0.000064	0.00017		*310000*		12		0.039	0.025	0.025 *(pql)*
Radiochemistry														
Gross Beta (mrem/yr)	4.0													4.0 mrem/yr or 50 pCi/L
Dioxins/Furans														
Total HpCDF in ug/L													0.000025	
Total HxCDD in ug/L													0.000025	
Total HxCDF in ug/L													0.000025	
Total PeCDF in ug/L													0.000025	
Total TCDD in ug/L													0.00001	
1,2,3,4,7,8-HxCDD in ug/L													0.00005	
1,2,3,7,8,9-HxCDD in ug/L													0.00005	
OCDD in ug/L													0.0001	
1,2,3,4,6,7,8-HpCDF in ug/L													0.00005	
1,2,3,4,7,8,9-HpCDF in ug/L													0.00005	
OCDF in ug/L													0.0001	

TABLE 5-2
GROUNDWATER SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN GROUNDWATER
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Numerical Criteria Notes:

Blank cells are intentional.

a In accordance with WAC 173-340-730(3)(b)(iii), if sufficiently protective health-based criteria or standards have not been established under applicable state and federal laws, Method B values have been developed. Method B values are most restrictive of carcinogenic or non-carcinogenic values presented in Ecology's Cleanup Levels and Risk Calculation (CLARC) Database and pulled on May 15, 2012.

b Values from Ecology's CLARC Database May 15, 2012; except as noted.

c Calculated assuming equilibrium partitioning: Cw (porewater) = Sediment Quality Standard (SQS; WAC 173-204-320) / Kd.

d For arsenic, state-wide background arsenic concentration of 5 µg/L from WAC 173-340-900 Table 720-1 may be applicable based on site-specific hydrogeology.

e PQL is the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions, using department approved methods. Values are reported from Columbia Analytical Services, Inc. (Kelso, WA) and Analytical Resources, Inc. (Tukwila, WA).

f Most stringent of values protective of marine surface water, sediment, and vapor intrusion.

g Calculated using samples' total ammonia, pH, and temperature with equation from USEPA Gold Book (USEPA 1986).

h The criteria for cyanide is based on the weak acid dissociable method in the 19th Ed. Standard Methods for the Examination of Water and Wastewater.

‡ pH 6.2 is the lower-end of natural background groundwater pH range, calculated from Whatcom County background data, in accordance with WAC 173-340-709(3).

Process Notes:

1 Groundwater concentrations that are protective of sediments are calculated using an equilibration partitioning method. Site-specific data (e.g., distribution coefficient [Kd], soil organic carbon water partitioning coefficient [Koc], etc.) can be used to calculate if porewater is protective of sediments. In this table, the equilibrium partitioning equation is used with default parameters and is defined to achieve sediment concentrations protective of benthic toxicity. Where sediment Screening Levels are set to protect human health through seafood consumption, protective groundwater concentrations may need to be calculated to protect sediment quality for that pathway.

Abbreviations:

ARAR	Applicable or Relevant and Appropriate Requirement.
Ch	Chapter.
CFR	Code of Federal Regulations.
cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
HpCDF	Heptachlorodibenzofuran.
HxCDD	Hexachlorodibenzo-p-dioxin.
HxCDF	Hexachlorodibenzofuran.
Kd	Distribution coefficient.
Koc	Soil organic carbon water partitioning coefficient.
MTCA	Model Toxics Control Act
OCDD	Octachlorodibenzo-p-dioxin.
OCDF	Octachlorodibenzofuran.
PAH	Polycyclic aromatic hydrocarbon
PeCDF	Pentachlorodibenzofuran.
PQL	Practical Quantitation Limit.
RI	Remedical Investigation
SQS	Sediment quality standards.
TCDD	Tetrachlordibenzo-p-dioxin.
TEQ	Toxic equivalent quantity.
WAC	Washington Administrative Code.

This table is adapted from the Harris Avenue Site Baywide Screening Level worksheet developed in cooperation with the Washington State Department of Ecology.

TABLE 5-3
SOIL SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN SOIL
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		APPLICABLE SOIL VALUES									***Most Stringent Unrestricted Soil Screening Level (mg/kg)(i)*** (This value may vary for saturated versus unsaturated soil if most stringent value is associated with groundwater intrusion.)	
		Soil Protective of Groundwater(2,3)					***Soil Protective of Direct Contact by Humans(d,1)***					
		Constants and Coefficients(a)			*Calculated Values*							
ANALYTE (BY GROUP)	Groundwater Screening Level (refer to Table 5-2)	K_{oc} (Soil Organic Carbon-Water Partitioning Coefficient) (L/kg)	K_d (Distribution Coefficient for metals) (L/kg)	Henrys Law Constant (Hcc; unitless)	**Unsaturated Soil** Concentration Protective of Leachability to Groundwater for **Unrestricted** Land Use (mg/kg)(b) *(gwl-u)*	**Saturated Soil** Concentration Protective of Leachability to Groundwater for **Unrestricted** Land Use (mg/kg)(c) *(gwl-s)*	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)(a,e) *(mA)*	Soil, Method B, Most-Restrictive Standard Formula Value, Direct Contact (ingestion only), Unrestricted Land Use (mg/kg)(a,f) *(mB)*	Natural Background Concentration (mg/kg)(g) *(back)*	Applicable Practical Quantitation Level (PQL) for RI Analyses (mg/kg)(h) *(pql)*	**Unsaturated Soil**	**Saturated Soil**
Total Petroleum Hydrocarbons												
Gasoline Range Hydrocarbons	800						100	¥		5	30 *(mA)*	30 *(mA)*
Diesel Range Hydrocarbons	500						2000	¥		25	2000 *(mA)*	2000 *(mA)*
Oil Range Hydrocarbons	500						2000	¥		100	2000 *(mA)*	2000 *(mA)*
Bunker C							2000	¥			2000 *(mA)*	2000 *(mA)*
Heavy Metals												
Cadmium	8.8			*0*				80	1	0.1	80 *(mB)*	80 *(mB)*
Chromium (Total)	50								48	0.5	48 *(back)*	48 *(back)*
Copper	2.4		*22*	*0*	1.1	0.053		3200	36	0.2	36 *(back)*	36 *(back)*
Lead	8.1		*10000*	*0*	1600	81	1000		24	0.1	1000 *(mA)*	81 *(gwl-s)*
Mercury(k)	0.025		*52*	*0.47*	0.026	0.0013	24		0.07	0.025	0.07 *(back)*	0.07 *(back)*
Nickel	8.2		*65*	*0*	11	0.54		1600	48	0.5	48 *(back)*	48 *(back)*
Zinc	81		*62*	*0*	100	5		24000	85	1	100 *(gwl-u)*	5 *(gwl-s)*
Mercury Speciation												
Mercury (elemental)(k)	0.89											
Volatile Organic Compounds												
Ethylbenzene(k)	2100	*200*		*0.32*	18	1		8000		0.005	18 *(gwl-u)*	1 *(gwl-s)*
Toluene(k)	15000	*140*		*0.27*	110	6.4		6400		0.005	110 *(gwl-u)*	6.4 *(gwl-s)*
Xylenes (total)	1000	*230*		*0.28*	9.1	0.52		16000		0.02	9.1 *(gwl-u)*	0.52 *(gwl-s)*
Polycyclic Aromatic Hydrocarbons (PAHs)												
Acenaphthene	3.3	*4900*		*0.0064*	0.34	0.017		4800		0.005	0.34 *(gwl-u)*	0.017 *(gwl-s)*
Acenaphthylene										0.005		
Anthracene	9.6	*23000*		*0.0027*	4.5	0.22		24000		0.005	4.5 *(gwl-u)*	0.22 *(gwl-s)*
Benzo(g,h,i)perylene										0.005		
Fluoranthene	3.3	*49000*		*0.00066*	3.2	0.16		3200		0.005	3.2 *(gwl-u)*	0.16 *(gwl-s)*
Fluorene	3	*7700*		*0.0026*	0.47	0.024		3200		0.005	0.47 *(gwl-u)*	0.024 *(gwl-s)*
Phenanthrene	6									0.005		
Pyrene	15	*68000*		*0.00045*	20	1		2400		0.005	20 *(gwl-u)*	1 *(gwl-s)*
1-Methylnaphthalene								35		0.005	35 *(mB)*	35 *(mB)*
2-Methylnaphthalene	15							320		0.005	320 *(mB)*	320 *(mB)*
Naphthalene(k)	83	*1200*		*0.02*	2.3	0.12		1600		0.005	2.3 *(gwl-u)*	0.12 *(gwl-s)*
Total Naphthalenes												
Benzo(a)anthracene	0.018	*360000*		*0.00014*	0.13	0.0065		1.4		0.005	0.13 *(gwl-u)*	0.0065 *(gwl-s)*
Benzo(a)pyrene	0.018	*970000*		*0.000046*	0.35	0.017		0.14		0.005	0.14 *(mB)*	0.017 *(gwl-s)*
Benzo(b)fluoranthene	0.018	*1200000*		*0.0046*	0.43	0.022		1.4		0.005	0.43 *(gwl-u)*	0.022 *(gwl-s)*
Benzo(k)fluoranthene	0.018	*1200000*		*0.000034*	0.43	0.022		14		0.005	0.43 *(gwl-u)*	0.022 *(gwl-s)*

TABLE 5-3
SOIL SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN SOIL
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		APPLICABLE SOIL VALUES										
		Soil Protective of Groundwater(2,3)										
		Constants and Coefficients(a)			*Calculated Values*		***Soil Protective of Direct Contact by Humans(d,1)***				***Most Stringent Unrestricted Soil Screening Level (mg/kg)(i)*** (This value may vary for saturated versus unsaturated soil if most stringent value is associated with groundwater intrusion.)	
ANALYTE (BY GROUP)	Groundwater Screening Level (refer to Table 5-2)	K_{oc} (Soil Organic Carbon-Water Partitioning Coefficient) (L/kg)	K_d (Distribution Coefficient for metals) (L/kg)	Henrys Law Constant (Hcc; unitless)	**Unsaturated Soil** Concentration Protective of Leachability to Groundwater for **Unrestricted** Land Use (mg/kg)(b) *(gwl-u)*	**Saturated Soil** Concentration Protective of Leachability to Groundwater for **Unrestricted** Land Use (mg/kg)(c) *(gwl-s)*	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)(a,e) *(mA)*	Soil, Method B, Most-Restrictive Standard Formula Value, Direct Contact (ingestion only), Unrestricted Land Use (mg/kg)(a,f) *(mB)*	Natural Background Concentration (mg/kg)(g) *(back)*	Applicable Practical Quantitation Level (PQL) for RI Analyses (mg/kg)(h) *(pql)*	**Unsaturated Soil**	**Saturated Soil**
Chrysene	0.018	*400000*		*0.0039*	0.14	0.0072		140		0.005	0.14 *(gwl-u)*	0.0072 *(gwl-s)*
Dibenzo(a,h)anthracene	0.01	*1800000*		*0.0000006*	0.36	0.018		0.14		0.005	0.14 *(mB)*	0.018 *(gwl-s)*
Indeno(1,2,3-cd)pyrene	0.01	*3500000*		*0.000066*	0.7	0.035		1.4		0.005	0.7 *(gwl-u)*	0.035 *(gwl-s)*
Total cPAHs TEQ	0.018							0.14		0.00076	0.14 *(mB)*	0.14 *(mB)*
Other Semi-Volatile Organics												
2,4,6-Trichlorophenol	3	*380*		*0.00032*	0.035	0.002		80		0.1	0.1 *(pql)*	0.1 *(pql)*
2,4-Dimethylphenol	850	*210*		*0.000082*	7	0.42		1600		0.05	7 *(gwl-u)*	0.42 *(gwl-s)*
4,6-Dinitro-2-methylphenol										0.2		
Benzyl butyl phthalate	1	*14000*		*0.000052*	0.28	0.014		530		0.02	530 *(mB)*	0.014 *(gwl-s)*
Bis(2-ethylhexyl) phthalate	3	*110000*		*0.0000042*	6.6	0.33		71		0.1	6.6 *(gwl-u)*	0.33 *(gwl-s)*
Carbazole		*3400*		*6.3E-07*						0.02		
Dibenzofuran								80		0.02	80 *(mB)*	80 *(mB)*
Dimethyl phthalate	1700									0.02		
Di-n-butyl phthalate	140	*1600*		*3.9E-08*	5	0.26		8000		0.02	5 *(gwl-u)*	0.26 *(gwl-s)*
N-Nitrosodiphenylamine	6	*1300*		*0.00021*	0.18	0.0095		200		0.02	0.18 *(gwl-u)*	0.02 *(pql)*
Pentachlorophenol	10	*590*		*0.000001*	0.16	0.0088		2.5		0.1	0.16 *(gwl-u)*	0.1 *(pql)*
Dioxins/Furans												
Summed Dioxin/Furan TEQ	0.000031							1.10E-05	0.0000052(j)	6.25E-06	1.10E-05 *(mB)*	1.10E-05 *(mB)*

TABLE 5-3
SOIL SITE SCREENING LEVELS FOR CONSTITUENTS DETECTED IN SOIL
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Numerical Criteria Notes:

Blank cells are intentional.

a Values taken from Ecology's CLARC Database May 15, 2012; except as noted.

b Calculated values from 3-phase model, per MTCA Equation 747-1, with groundwater value (Cw) as most stringent value

c Calculated values from 3-phase model, per MTCA Equation 747-1, with groundwater value (Cw) as most stringent value from groundwater screening level process (Table 1), and Dilution Factor = 1.

d Direct contact criteria applicable for soils to 15-foot depth.

e Because groundwater at Harris Avenue Shipyard is not a practicable source of drinking water in accordance with MTCA, many Method A soil cleanup levels are not applicable. Method A unrestricted cleanup levels used only if they are based on background or ARARs, or there are no corresponding Method B direct contact values. Soil leachability to groundwater is addressed separately. Method A values for diesel- and oil-range TPH based on accumulation of free product, not direct contact.

f Method B values are most restrictive of carcinogenic or non-carcinogenic values presented in Ecology's CLARC Database, pulled on May 15, 2012.

g Values are from Ecology’s Natural Background Soil Metals Concentrations in Washington State (Ecology 1994).

h PQL is the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions, using department

i Most stringent of unrestricted direct contact values and leachability value for respective soil type (unsaturated or saturated). **These values depend on many site-specific factors, so numerical values are not displayed for this non-site-specific example.**

j Value from Dave Bradley's Natural Background for Dioxins/Furans in Washington Soils—Technical Memorandum #8 (Ecology 2010).

k Analyte has the potential to contaminate indoor air to unacceptable levels via the vapor intrusion pathway, per Table B-1 (Appendix B) of Ecology's Guidance for Evaluation of Soil Vapor Intrusion (Ecology 2009). Consult with Ecology, as a site-specific vapor intrusion evaluation may be necessary.

¥ Cleanup level can be calculated using volatile petroleum hydrocarbon (VPH) and extractable petroleum hydrocarbon (EPH) data, per WAC 173-340-700(8)(ii).

Process Notes:

1 Appropriate Screening Levels for the protection of human health through direct contact with soil pathway are based on a site’s land use category (i.e., unrestricted or industrial). The point of compliance is established from the ground surface to 15 feet below ground surface only. This represents a reasonable estimate of the depth of soil that could be excavated during typical site activities (WAC 173-340-740(6)(d)).

2 Soil concentrations that are protective of groundwater are calculated using either of the methods listed in WAC 173-340-747(3). Concentrations may be derived from either saturated or unsaturated soil. The variable parameter three-phase partitioning model requires at least some site-specific data (e.g., distribution coefficient [K_d], soil bulk density, water-filled soil porosity, air filled soil porosity, or dilution factor) to calculate if soil is protective of groundwater. For this table, the fixed parameter three-phase partitioning model is used with default parameters queried from CLARC on May 15, 2012.

3 Under WAC 173-340-747(3)(e), if empirical site-specific groundwater data are available, they may be used to show that measured soil concentrations are protective of groundwater and will not cause an exceedance of the applicable groundwater cleanup level criteria.

Abbreviations:

cPAH	Carcinogenic polycyclic aromatic hydrocarbon.
Kd	Distribution coefficient.
Koc	Soil organic carbon water partitioning coefficient.
PQL	Practical Quantitation Limit.
TEQ	Toxic equivalent quantity.

This table is adapted from the Harris Avenue Site Baywide Screening Level worksheet developed in cooperation with the Washington State Department of Ecology.

TABLE 6-1
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SOIL SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

	Cornwall Avenue Landfil Site Screening Levels		Phase II Environmental Assessment										
Sample Name			AF-MW01-2	AF-MW01-5	AF-MW02-3	AF-MW02-5	AF-MW02-7	AF-SB01-2	AF-SB02-1	AF-SB04-1	AF-SB04-2	AF-SB04-3	AF-SB04-8
Sample Date			7/19/2004	7/19/2004	7/19/2004	7/19/2004	7/19/2004	7/19/2004	7/19/2004	7/22/2004	7/22/2004	7/22/2004	7/22/2004
Sample Top Depth			2.5	10	5	10	15	4	0	0	4	8	8
Sample Bottom Depth	(unsaturated soil)(a)	(saturated soil)(a)	4	11.5	6.5	11.5	16.5	8	4	4	8	12	12
TOTAL METALS (mg/kg)													
Cadmium	80	80	0.2 U	0.4 U	0.2 U	0.3 U	0.7 U	0.3 U	0.6	0.5 U	NA	0.3	0.2 U
Chromium	48	48	37.7	23	50.2	43.1	19	39.5	38	51	NA	34.4	41.9
Copper	36	36	60.8	29.5	31.7	47.3	70.5	31.4	75.2	56.7	NA	48	44.1
Lead	1000	81	29 J	15 J	5 J	19 J	14 J	89 J	84 J	27	NA	42	44
Mercury	0.07	0.07	0.04	0.1 U	0.04 U	0.06 U	0.07 U	0.08 U	0.07	0.18	NA	0.09	0.08
Nickel	48	48	35	36	55	48	19	31	50	31	NA	29	45
Zinc	100	5	62.9	58	43.3	75.5	46	87	237	64	NA	77.5	76.8
VOLATILES (mg/kg)													
Ethylbenzene	18	1	0.026 U	0.092 U	0.41 U	0.031 U	0.038 U	0.032 U	0.028 U	NA	0.82	0.093	NA
Toluene	110	6.4	0.026 U	0.092 U	0.42	0.031 U	0.038 U	0.032 U	0.028 U	NA	0.028 U	0.029 U	NA
Total Xylenes	9.1	0.52	0.039 U	0.136 U	0.39	0.0465 U	0.0565 U	0.0485 U	0.042 U	NA	0.222	0.0815	NA
PAHs (mg/kg)													
1-Methylnaphthalene	35	35	0.018	0.015 U	81	7.1	0.16	NA	0.12	NA	52	120	73
2-Methylnaphthalene	320	320	0.032	0.015 U	150	12	0.26	NA	0.11	NA	96	240	140
Acenaphthene	100	5.1	0.049	0.015 U	4.4	0.42	0.011	NA	0.0094 U	NA	2.6	4.3	2.5
Acenaphthylene	---	---	0.0072 U	0.015 U	0.74	0.1	0.0098 U	NA	0.016	NA	0.66	1.1	0.62
Anthracene	4.5	0.22	0.051	0.015 U	0.87	0.12	0.012	NA	0.024	NA	0.65 J	1.2 J	0.75 J
Benzo(a)anthracene	0.13	0.0065	0.051	0.015 U	NA	0.021 U	0.0098 U	NA	0.18	NA	0.36	0.38	0.22
Benzo(a)pyrene	0.14	0.017	0.022	0.015 U	NA	0.021 U	0.0098 U	NA	0.28	NA	0.32	0.18	0.12
Benzo(b)fluoranthene	0.43	0.022	0.032	0.015 U	NA	0.021 U	0.0098 U	NA	0.19	NA	0.36	0.16	0.1
Benzo(g,h,i)perylene	---	---	0.011	0.015 U	NA	0.021 U	0.0098 U	NA	0.11	NA	0.21	0.07	0.061
Benzo(k)fluoranthene	0.43	0.022	0.025	0.015 U	NA	0.021 U	0.0098 U	NA	0.22	NA	0.29	0.15	0.12
Chrysene	0.14	0.0072	0.052	0.015 U	0.21	0.029	0.0098 U	NA	0.25	NA	0.49	0.58	0.35
Dibenz(a,h)anthracene	0.14	0.018	0.0072 U	0.015 U	NA	0.021 U	0.0098 U	NA	0.036	NA	0.057	0.06 U	0.038 U
Fluoranthene	3.2	0.16	0.28	0.015 U	0.6	0.065	0.013	NA	0.24	NA	0.87	1.5	0.85
Fluorene	0.47	0.024	0.063	0.015 U	4.6	0.49	0.02	NA	0.014	NA	3.7	7.5	3.5
Indeno(1,2,3-cd)pyrene	0.7	0.035	0.0087	0.015 U	NA	0.021 U	0.0098 U	NA	0.1	NA	0.18	0.06 U	0.041
Naphthalene	2.3	0.12	0.0072 U	0.015 U	0.87	0.021 U	0.017	NA	0.063	NA	2	15	9.2
Phenanthrene	---	---	0.31	0.015 U	12	1.1	0.042	NA	0.13	NA	10	20	12
Pyrene	20	1	0.2	0.015 U	1.2	0.12	0.017	NA	0.34	NA	1.5	2.5	1.5
Total Naphthalenes	---	---	0.0536	0.0225 U	NA	19.1	0.437	NA	0.293	NA	150	375	222
Total cPAHs (TEQ)	0.14	0.14	0.0356	0.0136 U	0.173	0.0192	0.00887 U	NA	0.366	NA	0.467	0.27	0.179
SEMIVOLATILES (mg/kg)													
Bis(2-ethylhexyl) phthalate	6.6	0.33	0.1	0.15 U	0.28 U	0.11	0.098 U	NA	0.094 U	NA	0.22	0.1 U	0.079 U
Carbazole	---	---	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U	NA	0.094 U	NA	0.16	0.1 U	0.079 U
Dibenzofuran	80	80	0.072 U	0.15 U	2	0.091 U	0.098 U	NA	0.094 U	NA	0.084 J	0.1 U	0.85
Dimethyl phthalate	---	---	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U	NA	0.094 U	NA	0.68	0.1 U	0.079 U
Di-n-butyl phthalate	5	0.26	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U	NA	0.094 U	NA	0.48	0.1 U	0.079 U
Pentachloropheno	0.16	0.1	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U	NA	0.47 U	NA	0.4 U	0.61 J	0.65 J
N-Nitrosodiphenylamine	0.18	0.02	0.072 U	0.15 U	0.28 U	0.41	0.098 U	NA	0.094 U	NA	0.08 U	0.1 U	0.079 U
2,4,6-Trichlorophenol	0.1	0.1	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U	NA	0.47 U	NA	0.4 U	0.51 U	0.4 U
2,4-Dimethylpheno	7	0.42	0.22 U	0.44 U	0.84 U	0.27 U	0.29 U	NA	0.28 U	NA	0.24 U	0.31 U	0.24 U
4,6-Dinitro-2-Methylpheno	---	---	0.72 U	1.5 U	2.8 U	0.91 U	0.98 U	NA	0.94 U	NA	0.8 U	1 U	0.79 U
Butyl benzyl phthalate	530	27	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U	NA	0.094 U	NA	0.08 U	0.1 U	0.079 U
TOTAL PETROLEUM HYDROCARBONS (mg/kg)													
Gasoline-Range Hydrocarbons	100	100	5.2 U	18 U	500	80	7.5 U	6.5 U	5.6 U	NA	490	170	NA
Bunker C	2000	2000	NA	230 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	2000	2000	10 J	NA	7100	270	160	19 J	200	55	1700	4200	2500
Oil-Range Hydrocarbons	2000	2000	43 J	NA	310	22	76	120 J	150	300	940	1700	1100

TABLE 6-1
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SOIL SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

	Cornwall Avenue Landfill Site Screening Levels		R.G. Haley Investigations 2004-2012														
Sample Name			CL-MW-1D	CL-MW-1D	CL-MW-101	CL-MW-102	CL-MW-103	CL-MW-103	CL-MW-103	CL-SB-101	CL-SB-101	CL-SB-102	CL-SB-102	CL-SB-102	CL-SB-103	CL-SB-103	CL-SB-103
Sample Date			6/17/2004	6/17/2004	6/29/2012	6/29/2012	7/10/2012	7/10/2012	7/10/2012	6/25/2012	6/25/2012	6/25/2012	6/25/2012	6/25/2012	6/25/2012	6/25/2012	6/25/2012
Sample Top Depth			8	12	6	6	5	10	12.5	4.3	6.3	4.3	9.3	13.3	4.3	8	14
Sample Bottom Depth	(unsaturated soil)(a)	(saturated soil)(a)	10	13	7	7	6.5	11.5	14	5	7	5	10	14	5	8.7	14.7
TOTAL METALS (mg/kg)																	
Cadmium	80	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	48	48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36	36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.07	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	48	48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	100	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES (mg/kg)																	
Ethylbenzene	18	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110	6.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	9.1	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (mg/kg)																	
1-Methylnaphthalene	35	35	NA	NA	3.8	22	180	18	2.4	12	2.1	51	450	0.02	1.7	300	0.029
2-Methylnaphthalene	320	320	666	NA	0.86	19	260	25	3.3	13	0.93	83	750	0.037	2.8	520	0.047
Acenaphthene	100	5.1	16.2	NA	0.21	2.8	9.7	1.2	0.11	1.9	0.45	2.8	13	0.0052 U	0.13	16	0.011
Acenaphthylene	---	---	4.65	NA	0.12	0.4	1.9	0.27	0.027	0.41	0.1	0.59	0.26 U	0.0052 U	0.04	3.1	0.014
Anthracene	4.5	0.22	5.55	NA	0.057	0.13 U	0.032 U	0.12	0.0078	0.12 U	0.45	2.2	0.26 U	0.0052 U	0.046	0.54 U	0.026
Benzo(a)anthracene	0.13	0.0065	1.81 U	NA	0.25	0.082	0.27	0.32	0.007	0.046	0.0047 U	0.1	0.37	0.0094	0.016	0.47	0.039
Benzo(a)pyrene	0.14	0.017	1.81 U	NA	0.320	0.033	0.093	0.93	0.015	0.06	0.0047 U	0.063	0.22	0.0061	0.02	0.23	0.037
Benzo(b)fluoranthene	0.43	0.022	1.81 U	NA	0.36	0.046	0.16	0.23	0.012	0.069	0.0047 U	0.098	0.36	0.0073	0.03	0.37	0.041
Benzo(g,h,i)perylene	---	---	1.81 U	NA	0.26	0.019	0.072	0.23	0.01	0.029	0.0047 U	0.045	0.3	0.0052 U	0.017	0.26	0.017
Benzo(k)fluoranthene	0.43	0.022	1.81 U	NA	0.12	0.013	0.057	0.12	0.0054	0.03	0.0047 U	0.031	0.12	0.0052 U	0.011	0.12	0.016
Chrysene	0.14	0.0072	1.81 U	NA	0.30	0.092	0.46	0.49	0.017	0.046	0.0052	0.18	0.75	0.0059	0.022	0.36	0.034
Dibenz(a,h)anthracene	0.14	0.018	1.81 U	NA	0.064	0.0077	0.032 U	0.083	0.0044 U	0.011	0.0047 U	0.012	0.01 U	0.0052 U	0.005 U	0.06	0.0054
Fluoranthene	3.2	0.16	1.82	NA	0.33	0.3	1.3	0.11	0.0081	0.18	0.021	0.49	2.6	0.014	0.041	1.5	0.079
Fluorene	0.47	0.024	21.2	NA	0.110	1.9	11	1.4	0.12	2.1	0.6	3.4	14	0.0052 U	0.16	17	0.018
Indeno(1,2,3-cd)pyrene	0.7	0.035	1.81 U	NA	0.28	0.021	0.043	0.19	0.0053	0.039	0.0047 U	0.048	0.28	0.0052 U	0.02	0.28	0.021
Naphthalene	2.3	0.12	54.6	NA	0.26	1.3	4.2	1.4	0.39	0.13	0.029	5	15	0.0052 U	0.14	7	0.0078
Phenanthrene	---	---	49.3	NA	0.25	5.2	34	2	0.16	8.1	1.9	9.4	54	0.0086	0.41	52	0.044
Pyrene	20	1	4.05	NA	0.37	0.62	3.7	0.66	0.0018	0.35	0.049	1	4.5	0.013	0.066	6.3	0.065
Total Naphthalenes	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total cPAHs (TEQ)	0.14	0.14	1.366	NA	0.4304 T	0.05089 T	0.1522 T	1.0292 T	0.01836 T	0.07996 T	0.003577 T	0.0937 T	0.341 T	0.008609 T	0.02817 T	0.3636 T	0.04958 T
SEMIVOLATILES (mg/kg)																	
Bis(2-ethylhexyl) phthalate	6.6	0.33	NA	NA	0.25 U	0.13 U	13	1.3 U	0.32	0.12 U	0.12 U	0.13 U	0.26 U	0.026 U	0.13 U	0.54 U	0.026 U
Carbazole	---	---	NA	NA	0.25 U	0.13 U	0.8 U	1.3 U	0.11 U	0.12 U	0.12 U	0.13 U	0.26 U	0.026 U	0.13 U	0.54 U	0.026 U
Dibenzofuran	80	80	8.09	NA	0.13 U	0.066 U	0.4 U	0.64 U	0.055 U	0.058 U	0.13	0.063 U	0.13 U	0.013 U	0.063 U	0.27 U	0.013 U
Dimethyl phthalate	---	---	NA	NA	0.25 U	0.13 U	0.8 U	1.3 U	0.11 U	0.12 U	0.12 U	0.13 U	0.26 U	0.026 U	0.13 U	0.54 U	0.026 U
Di-n-butyl phthalate	5	0.26	NA	NA	0.25 U	0.13 U	0.8 U	1.3 U	0.11 U	0.12 U	0.12 U	0.13 U	0.26 U	0.026 U	0.13 U	0.54 U	0.026 U
Pentachloropheno	0.16	0.1	4.76	NA	0.0056	0.076	0.83	0.079	0.011	0.25	0.1	0.19	0.73	0.0012 U	0.26	0.43	0.0012 U
N-Nitrosodiphenylamine	0.18	0.02	22.5	NA	0.13 U	0.066 U	0.4 U	0.64 U	0.055 U	0.058 U	0.059 U	0.063 U	0.13 U	0.013 U	0.063 U	0.27 U	0.013 U
2,4,6-Trichlorophenol	0.1	0.1	1.81 U	NA	0.023 U	0.0025 U	0.0059 U	0.024 U	0.002 U	0.0022 U	0.0022 U	0.0024 U	0.0049 U	0.0024 U	0.0024 U	0.0037	0.0024 U
2,4-Dimethylpheno	7	0.42	NA	NA	0.13 U	0.068	0.4 U	0.64 U	0.055 U	0.058 U	0.059 U	0.063 U	0.13 U	0.013 U	0.063 U	0.27 U	0.013 U
4,6-Dinitro-2-Methylpheno	---	---	NA	NA	1.3 U	0.66 U	26	6.4 U	0.55 U	0.58 U	0.59 U	0.63 U	1.3 U	0.13 U	0.63 U	2.7 U	0.13 U
Butyl benzyl phthalate	530	27	NA	NA	0.13 U	0.066 U	0.4 U	0.65	0.055 U	0.058 U	0.059 U	0.063 U	0.13 U	0.013 U	0.063 U	0.27 U	0.013 U
TOTAL PETROLEUM HYDROCARBONS (mg/kg)																	
Gasoline-Range Hydrocarbons	100	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bunker C	2000	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	2000	2000	NA	1270	100 J	3900	13000	3000 J	820 J	630	440	5100	29000	11	17	31000	27
Oil-Range Hydrocarbons	2000	2000	NA	2910	600	200	1700 J	21000	4700	16 UI	12 U	260 UI	2800 J	41	39	1400 J	43

TABLE 6-1
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SOIL SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

--- = Water Quality Standard or other criteria not established.

mg/kg = milligrams per kilogram

(a) Unsaturated soil is considered to be less than 5.5 ft below ground surface; saturated soil is considered to be greater than 5.5 ft below ground surface.

Box = Exceedance of screening level.

U = Indicates the compound was undetected at the reported concentration.

J = The reported sample detection limit is an estimate.

NA = Not analyzed or results not available.

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Ecology Investigation (Seep Samples)				Expanded Site Investigation (Seep Samples)			Focused RI				
Sample ID:		E-1	E-2	E-3	E-4	S-1	S-2	S-3	MW-1	MW-5	S-1	S-2	S-3
Sample Number:		92 198040	92 198041	92 198043	92 198044	CL-SW-1	CL-SW-2	CL-SW-3					
Sample Date :		5/6/1992	5/6/1992	5/6/1992	5/6/1992	9/24/1996	9/24/1996	9/24/1996	7/13/1998	7/13/1998	7/13/1998	7/13/1998	7/13/1998
Lab ID:	Cornwall Ave LF Site Screening Level (a)					Q243D	Q243E	Q243F	07-066-06	07-066-01	07-066-04	07-066-03	07-066-05
TOTAL METALS (µg/L)													
Arsenic	5.0	11	2.1 P	2.2 P	1.5 U	1	1	1 U	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	9	5 U	6	NA	NA	NA	NA	NA
Copper	2.4	4950	5.1 P	9.7 P	16	2 U	8	105	17	NA	2.3	1.1 U	11
Lead (b)	8.1	220	11.2 N	14.2 N	2.8 PN	2	15	53	6.6	NA	1.9	1.1 U	13
Mercury	0.025	0.209 PB	0.074 PB	0.242 PB	0.05 U	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA
Nickel	8.2	18	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Selenium	71	4 UN	2.2 PN	2 UN	2 UN	1 U	5 U	1 U	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	1	1 U	1 U	NA	NA	NA	NA	NA
Zinc	81	280 E	29 E	230 E	46 E	8	24	135	19	NA	14	3.7	17
DISSOLVED METALS (µg/L)													
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	7.2	NA	3.4	2.0 U	12
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	NA	NA	NA	NA	NA	NA	NA	1.0 U	NA	1.0 U	1.0 U	9.9
Manganese	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	3.0 U	NA	8.6	3.0 U	12
PAHs (µg/L)													
Naphthalene	83	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	2.2	5.3	NA	NA	NA
2-Methylnaphthalene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	41 E	22 E	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	0.42	0.050 U	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	1.6	0.58	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	2.0	0.46	NA	NA	NA
Phenanthrene	6	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	3.5	0.050 U	NA	NA	NA
Anthracene	9.6	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	4.1	0.36	NA	NA	NA
Fluoranthene	3.3	NA	NA	NA	NA	NA	NA	NA	0.050 U	0.050 U	NA	NA	NA
Pyrene	15	NA	NA	NA	NA	NA	NA	NA	0.050 U	0.050 U	NA	NA	NA
Dibenzofuran	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.018	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	0.050 U	0.050 U	NA	NA	NA
Benzo(a)anthracene	0.018	NA	NA	NA	NA	NA	NA	NA	0.050 U	0.050 U	NA	NA	NA
Benzo(b)fluoranthene	0.018	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	0.050 U	0.050 U	NA	NA	NA
Benzo(k)fluoranthene	0.018	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	0.050 U	0.050 U	NA	NA	NA
Chrysene	0.018	NA	NA	NA	NA	NA	NA	NA	0.050 U	0.050 U	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.01	NA	NA	NA	NA	NA	NA	NA	0.050 U	0.050 U	NA	NA	NA
Total cPAHs (TEQ)	0.018	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA
SEMIVOLATILES (µg/L)													
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	3	NA	NA	NA	NA	1.0 U	1.2	1.0 U	NA	NA	NA	NA	NA
Total Phenols	580	2	2	2 U	2 U	2.0 U	2.0 U	2.0 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	1.4 J	1 U	1 U	1 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
4-Methylphenol	---	5.5	1 U	1 U	1 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Pentachlorophenol	10	NA	NA	NA	NA	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA	NA	NA
N-Nitrosodiphenylamine	6	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Dimethlyphthalate	1,700	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Formaldehyde	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	3	NA	NA	NA	NA	5.0 U	5.0 U	5.0 U	NA	NA	NA	NA	NA
2,3,5,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	3,600	NA	NA	NA	NA	5.0 U	5.0 U	5.0 U	NA	NA	NA	NA	NA
m,p-Cresol	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Ecology Investigation (Seep Samples)				Expanded Site Investigation (Seep Samples)			Focused RI				
Sample ID:		E-1	E-2	E-3	E-4	S-1	S-2	S-3	MW-1	MW-5	S-1	S-2	S-3
Sample Number:		92 198040	92 198041	92 198043	92 198044	CL-SW-1	CL-SW-2	CL-SW-3					
Sample Date :		5/6/1992	5/6/1992	5/6/1992	5/6/1992	9/24/1996	9/24/1996	9/24/1996	7/13/1998	7/13/1998	7/13/1998	7/13/1998	7/13/1998
Lab ID:	Cornwall Ave LF Site Screening Level (a)					Q243D	Q243E	Q243F	07-066-06	07-066-01	07-066-04	07-066-03	07-066-05
TOTAL PETROLEUM HYDROCARBONS (µg/L)													
NWTPH-HCID													
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	10000 U	10000 U	10000 U	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	10000 U	10000 U	10000 U	NA	NA	NA	NA	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	25000 U	25000 U	25000 U	NA	NA	NA	NA	NA
TPH (µg/L)													
TPH-418	---	2000	1000 U	1000 U	1000 U	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	2800	650	NA	NA	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	520	500 U	NA	NA	NA
VOLATILES (µg/L)													
Acetone	---	NA	NA	NA	NA	5.0 U	5.0 U	5.0 U	NA	NA	NA	NA	NA
Carbon Disulfide	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Benzene	23	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Toluene	15,000	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Chlorobenzene	1,600	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Ethylbenzene	2,100	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Styrene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
m,p-Xylene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
o-Xylene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	6.1	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Isopropylbenzene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
tert-Butylbenzene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
sec-Butylbenzene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
4-Isopropyltoluene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
n-Butylbenzene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Naphthalene	83	NA	NA	NA	NA	5.0 U	5.0 U	5.0 U	NA	NA	NA	NA	NA
n-Propylbenzene	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
PCBs (µg/L)													
Aroclor 1016	0.01	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Aroclor 1242	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Aroclor 1248	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Aroclor 1254	0.01	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Aroclor 1260	0.03	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Aroclor 1221	---	NA	NA	NA	NA	2.0 U	2.0 U	2.0 U	NA	NA	NA	NA	NA
Aroclor 1232	---	NA	NA	NA	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA
Total PCBs	0.025	NA	NA	NA	NA	2.0 U	2.0 U	2.0 U	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES (µg/L)													
METHOD SW8081B	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HERBICIDES (µg/L)													
METHOD SW8151	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TANNINS & LIGNINS (mg/L)													
Tannins & Lignins	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RADIOCHEMISTRY													
Gross Beta (pCi/L)	50	NA	NA	NA	NA	32.9	218	25.4	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Ecology Investigation (Seep Samples)				Expanded Site Investigation (Seep Samples)			Focused RI				
Sample ID:		E-1	E-2	E-3	E-4	S-1	S-2	S-3	MW-1	MW-5	S-1	S-2	S-3
Sample Number:		92 198040	92 198041	92 198043	92 198044	CL-SW-1	CL-SW-2	CL-SW-3					
Sample Date :		5/6/1992	5/6/1992	5/6/1992	5/6/1992	9/24/1996	9/24/1996	9/24/1996	7/13/1998	7/13/1998	7/13/1998	7/13/1998	7/13/1998
Lab ID:	Cornwall Ave LF Site Screening Level (a)					Q243D	Q243E	Q243F	07-066-06	07-066-01	07-066-04	07-066-03	07-066-05
DIOXINS/FURANS (pg/L)													
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS (mg/L unless indicated otherwise)													
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	490	770	280	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	490	770	280	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	220	35	190	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	NA	NA	NA	NA	2600	25000	2400	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	1500	14000	1200	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	1.1	16	1.0	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	120	76	22	65	NA	12	57	14
Calcium	---	NA	NA	NA	NA	77.1	202	47.0	NA	NA	NA	NA	NA
Iron	---	52.4 E	6.6 E	16.7 E	6.4 E	23.0	1.53	8.74	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	59.2	469	45.2	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	0.494	0.084	0.281	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	29.0	196	19.8	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	407	4320	351	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	0.37	19	0.10 U	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	0.15	0.37	0.20	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	500	7200	620	NA	NA	NA	NA	NA
Total Cyanide	16	0.01	0.004	0.002	0.006	0.004 U	0.071	0.004 U	0.004 UJ	NA	0.004 UJ	0.004 UJ	0.004 UJ
N-Nitrate (mg-N/L)	---	NA	NA	NA	NA	0.010 U	0.011	0.010 U	NA	NA	NA	NA	NA
N-Nitrite (mg-N/L)	---	NA	NA	NA	NA	0.010	0.010 U	0.010	NA	NA	NA	NA	NA
Nitrate + Nitrite (mg-N/L)	---	NA	NA	NA	NA	0.016	0.011	0.010 U	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	0.008 U	0.33	0.012	NA	NA	NA	NA	NA
Sulfate	---	NA	NA	NA	NA	44	670	46	NA	NA	NA	NA	NA
Sulfite	---	NA	NA	NA	NA	0.1 U	4.9	0.1 U	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	NA	NA	NA	NA	46	3 U	300	10	NA	190	80	230
Sulfur	---	2 J	NA	NA	2,500 J	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NH_3-Ammonia (mg NH_3/L) (c)	0.035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	---	3,500 J	10 J	1,100 J	5.2	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS													
pH	6.2< pH <8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (C)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (uS)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved oxygen (mg/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (mg/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Supplemental RI															
Sample ID:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	RIS-1	RIS-1	RIS-2	RIS-2	RIS-3	RIS-3
Sample Number:																	
Sample Date :		7/17/2002	7/16/2002	7/16/2002	7/17/2002	7/16/2002	7/16/2002	7/17/2002	7/16/2002	7/17/2002	7/17/2002	7/10/2002	8/8/2002	7/10/2002	8/8/2002	7/10/2002	8/8/2002
Lab ID:	Cornwall Ave LF Site Screening Level (a)	EO60A	EO60B	EO60C	EO60D	EO60E	EO60F	EO60G	EO60H	EO60I	EO60J	EN82A	EQ21A	EN82B	EQ21B	EN82C	EQ21C
TOTAL METALS (µg/L)																	
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	5	2 U	7	2 U	5
Lead (b)	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	2	1 U	2
Mercury	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U	10 U	6 U	10 U	6 U	10 U
DISSOLVED METALS (µg/L)																	
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	4 U	2 U	5	2 U	4 U
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1	2 U	1 U	2 U	2
Manganese	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U	10 U	8	10 U	6 U	10 U
PAHs (µg/L)																	
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	9.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	3.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total cPAHs (TEQ)	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SEMIVOLATILES (µg/L)																	
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phenols	580	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethlyphthalate	1,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,5,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	3,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Cresol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Supplemental RI															
Sample ID:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	RIS-1	RIS-1	RIS-2	RIS-2	RIS-3	RIS-3
Sample Number:																	
Sample Date :		7/17/2002	7/16/2002	7/16/2002	7/17/2002	7/16/2002	7/16/2002	7/17/2002	7/16/2002	7/17/2002	7/17/2002	7/10/2002	8/8/2002	7/10/2002	8/8/2002	7/10/2002	8/8/2002
Lab ID:	Cornwall Ave LF Site Screening Level (a)	EO60A	EO60B	EO60C	EO60D	EO60E	EO60F	EO60G	EO60H	EO60I	EO60J	EN82A	EQ21A	EN82B	EQ21B	EN82C	EQ21C
TOTAL PETROLEUM HYDROCARBONS (µg/L)																	
NWTPH-HCID																	
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH (µg/L)																	
TPH-418	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	250 U	NA	250 U	NA	250 U	830	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	NA	NA
Oil-Range Hydrocarbons	500	500 U	NA	500 U	NA	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	NA	NA
VOLATILES (µg/L)																	
Acetone	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	23	1.0 U	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
Toluene	15,000	1.0 U	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
Chlorobenzene	1,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	2,100	1.0 U	NA	1.0 U	NA	1.4	1.7	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
Styrene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	---	1.0 U	NA	1.0 U	NA	1.0 U	1.8	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
o-Xylene	---	1.0 U	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	6.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (µg/L)																	
Aroclor 1016	0.01	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	NA	0.050 U	0.050 U	0.050 U	0.050 U	0.077 U	0.050 U	0.082 U	0.050 U	0.050 U	0.050 U
Aroclor 1242	---	0.050 U	0.12 U	0.16 U	0.050 U	0.050 U	NA	0.050 U	0.12 U	0.050 U	0.080 U	0.050 U	0.14	0.050 U	0.16	0.050 U	0.050 U
Aroclor 1248	---	0.050 U	0.050 U	0.050 U	0.050 U	0.13 U	NA	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1254	0.01	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	NA	0.053	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1260	0.03	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	NA	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1221	---	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U	0.10 U	0.10 U	0.10 U	0.19 U	0.10 U	0.20 U	0.10 U	0.10 U	0.10 U
Aroclor 1232	---	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	NA	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.062 U	0.050 U
Total PCBs	0.025	0.10 U	0.12 U	0.16 U	0.10 U	0.13 U	NA	0.053	0.12 U	0.10 U	0.10 U	0.19 U	0.14	0.20 U	0.16	0.10 U	0.10 U
ORGANOCHLORINE PESTICIDES (µg/L)																	
METHOD SW8081B	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HERBICIDES (µg/L)																	
METHOD SW8151	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TANNINS & LIGNINS (mg/L)																	
Tannins & Lignins	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RADIOCHEMISTRY																	
Gross Beta (pCi/L)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		Supplemental RI															
Sample ID:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	RIS-1	RIS-1	RIS-2	RIS-2	RIS-3	RIS-3
Sample Number:																	
Sample Date :		7/17/2002	7/16/2002	7/16/2002	7/17/2002	7/16/2002	7/16/2002	7/17/2002	7/16/2002	7/17/2002	7/17/2002	7/10/2002	8/8/2002	7/10/2002	8/8/2002	7/10/2002	8/8/2002
Lab ID:	Cornwall Ave LF Site Screening Level (a)	EO60A	EO60B	EO60C	EO60D	EO60E	EO60F	EO60G	EO60H	EO60I	EO60J	EN82A	EQ21A	EN82B	EQ21B	EN82C	EQ21C
DIOXINS/FURANS (pg/L)																	
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS (mg/L unless indicated otherwise)																	
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.4	2.4	12	39	26	2.1
Calcium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.025 UJ	0.005 U	0.005 U	0.005 U	0.008	0.005 U
N-Nitrate (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfite	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	1 U	14	14	820	19000	1 U	1 U	2 U	1	41	1 U	1 U	1 U	1 U	1 U	1 U
Sulfur	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.8	6.6	5.0	6.3	4.2	5.2
N-Ammonia (mg N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.3	6.9	6.4	6.3	1.3	1.1
NH_3-Ammonia (mg NH_3/L) (c)	0.035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.036	0.060	0.015	0.018	0.059	0.053
Total organic carbon	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8	4.6	3.4	4.4	2.1	1.5 U
Carbon disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS																	
pH	6.2< pH <8.5	7.37	6.72	6.65	6.63	6.52	6.40	6.93	6.45	6.88	6.58	7.21	7.49	6.82	6.94	8.05	8.15
Temperature (C)	---	13.5	11.6	13.3	10.2	14.3	14.4	13.5	14.6	14.2	11.9	14.6	15.4	18.5	17.2	20.8	18.5
Conductivity (uS)	---	245	489	584	199	330	145	524	591	235	533	26700	28525	24000	24400	23825	29300
Dissolved oxygen (mg/L)	---	0.1 U	0.1 U	0.1 U	0.1 U	0.36	0.23	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Turbidity (NTU)	---	25	12	12	5	2	16	50	62	551	13	1 U	1 U	1 U	1 U	1 U	1 U
ORP (mV)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (mg/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2004 Phase II Investigation		2004 R.G Haley RI Investigation										
Sample ID:		AF-MW-01	AF-MW-02	CL-MW-1	CL-MW-1H					CL-MW-1S				
Sample Number:				(MW-1)										
Sample Date :		7/26/2004	7/26/2004	6/24/2004	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/15/2005	6/22/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005
Lab ID:	Cornwall Ave LF Site Screening Level (a)													
TOTAL METALS (µg/L)														
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead (b)	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (µg/L)														
Arsenic	5.0	0.7	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	2660	7940	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	100	1050	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/L)														
Naphthalene	83	0.10 U	1.6	NA	2.68	NA	1.16	0.01 U	2.44	47.1 JD	NA	3.87	1.91 D	0.1 DU
2-Methylnaphthalene	---	0.10 U	97	NA	3.63	NA	1.37	1.42	9.78	770 JD	NA	205	364 D	552 D
1-Methylnaphthalene	---	0.51	120	NA	NA	NA	NA	NA	NA	4.23 J	NA	NA	NA	NA
Acenaphthylene	---	0.10 U	0.10 U	NA	1.38	NA	0.1 U	0.01 U	0.01 U	NA	NA	0.1 U	2.68	0.1 U
Acenaphthene	990	0.14	4	NA	6.94	NA	6.41	6.85	5.46 E	16.2 JD	NA	4.55	13.3 D	40.2
Fluorene	3	0.10 U	2.9	NA	7.08	NA	5.54	3.42	7.58	19.7 JD	NA	4.61	12.3 D	18.3 D
Phenanthrene	6	0.10 U	2.8	NA	0.959	NA	1.36	0.689	0.883	41.5 JD	NA	5.31	16.3 D	40 D
Anthracene	9.6	0.10 U	0.10 U	NA	0.268	NA	0.92	0.01 U	0.01 U	0.1 UJ	NA	0.1 U	0.1 U	0.1 U
Fluoranthene	3.3	0.10 U	0.10 U	NA	0.26	NA	0.417	0.263	0.313	1.59 J	NA	0.1 U	0.1 U	0.1 U
Pyrene	15	0.10 U	0.12	NA	0.582	NA	0.713	0.687	0.476	3.01 J	NA	0.1 U	1.63	6.54
Dibenzofuran	---	1.0 U	1.0 U	NA	3.2	NA	2.03	0.816	1.71	3.18 J	NA	0.1 U	4.76	0.1 U
Benzo(a)pyrene	0.018	0.10 U	0.10 U	NA	0.0112	NA	0.1 U	0.0122	0.01 U	0.1 UJ	NA	0.1 U	0.1 U	0.1 U
Benzo(a)anthracene	0.018	0.10 U	0.10 U	NA	0.0187	NA	0.1 U	0.0315	0.01 U	0.293 J	NA	0.1 U	0.1 U	0.1 U
Benzo(b)fluoranthene	0.018	0.10 U	0.10 U	NA	0.0156	NA	0.1 U	0.0174	0.0296	0.1 UJ	NA	0.1 U	0.1 U	0.1 U
Benzo(k)fluoranthene	0.018	0.10 U	0.10 U	NA	0.0133	NA	0.1 U	0.0138	0.0547	0.1 UJ	NA	0.1 U	0.1 U	0.1 U
Chrysene	0.018	0.10 U	0.10 U	NA	0.072	NA	0.141	0.076	0.01 U	0.623 J	NA	0.1 U	0.1 U	0.1 U
Indeno(1,2,3-cd)pyrene	0.01	0.10 U	0.10 U	NA	0.01 U	NA	0.1 U	0.01 U	0.01 U	0.1 U	NA	0.1 U	0.398	0.1 U
Total cPAHs (TEQ)	0.018	ND	ND	NA	0.00259	NA	0.00141	0.00391	NA	0.00623	NA	ND	0.04	ND
SEMIVOLATILES (µg/L)														
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phenols	580	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	10	NA	NA	NA	1.64 J	NA	0.5 UJ	1.67 J	0.05 U	3.1 J	NA	0.5 UJ	0.5 U	0.5 U
N-Nitrosodiphenylamine	6	NA	NA	NA	1.74	NA	0.2 UJ	0.02 U	0.02 U	0.2 UJD	NA	0.2 UJ	4.17 J	0.2 DU
Dimethlyphthalate	1,700	1.0 U	4.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	---	89 JB	6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	0.5 U	NA	5 U	0.5 U	0.5 U	5 UJ	NA	5 U	5 U	5 U
2,4,6-Trichlorophenol	3	5.0 U	5.0 U	NA	0.0835	NA	0.5 U	0.05 U	0.05 U	0.5 UJ	NA	0.5 U	0.5 U	0.5 U
2,3,5,6-Tetrachlorophenol	---	NA	NA	NA	0.5 U	NA	5 U	0.5 U	0.5 U	5 UJ	NA	5 U	5 U	NA
2,4,5-Trichlorophenol	3,600	5.0 U	5.0 U	NA	0.05 U	NA	0.5 U	0.05 U	0.05 U	1 UJ	NA	0.5 U	0.5 U	NA
m,p-Cresol	---	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2004 Phase II Investigation		2004 R.G Haley RI Investigation										
Sample ID:		AF-MW-01	AF-MW-02	CL-MW-1	CL-MW-1H					CL-MW-1S				
Sample Number:				(MW-1)										
Sample Date :		7/26/2004	7/26/2004	6/24/2004	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/15/2005	6/22/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005
Lab ID:	Cornwall Ave LF Site Screening Level (a)													
TOTAL PETROLEUM HYDROCARBONS (µg/L)														
NWTPH-HCID														
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH (µg/L)														
TPH-418	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	250 U	770 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	250 U	760 J	250 U	2020	1290	3130	3120	1860	1720	21200	27300	41500	250 U
Oil-Range Hydrocarbons	500	NA	NA	500 U	500 U	500 U	500 U	500 U	500 U	1160	22500	24000	104000	500 U
VOLATILES (µg/L)														
Acetone	---	5.0 U	5.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	---	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	23	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	15,000	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	1,600	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	2,100	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	---	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	---	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	---	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	6.1	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	---	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	---	1.0 U	6.6 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	---	1.0 U	1.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	---	1.0 U	4.4 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	---	3.4	1.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	---	1.0 U	3.0 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	83	5.0 U	5.0 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	---	1.0 U	5.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (µg/L)														
Aroclor 1016	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES (µg/L)														
METHOD SW8081B	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HERBICIDES (µg/L)														
METHOD SW8151	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TANNINS & LIGNINS (mg/L)														
Tannins & Lignins	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RADIOCHEMISTRY														
Gross Beta (pCi/L)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2004 Phase II Investigation		2004 R.G Haley RI Investigation										
Sample ID:		AF-MW-01	AF-MW-02	CL-MW-1	CL-MW-1H					CL-MW-1S				
Sample Number:				(MW-1)										
Sample Date :		7/26/2004	7/26/2004	6/24/2004	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/15/2005	6/22/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005
Lab ID:	Cornwall Ave LF Site Screening Level (a)													
DIOXINS/FURANS (pg/L)														
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS (mg/L unless indicated otherwise)														
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	4320	1047	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrate (mg-N/L)	---	0.010 U	0.010 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrite (mg-N/L)	---	0.010 U	0.010 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite (mg-N/L)	---	0.010 U	0.010 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	---	7.4	19.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfite	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	4.4	41.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NH_3-Ammonia (mg NH_3/L) (c)	0.035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	---	NA	NA	48.4	9.24	NA	NA	NA	NA	32.2	NA	NA	NA	NA
Carbon disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS														
pH	6.2< pH <8.5	6.7	6.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (C)	---	15.18	16.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (uS)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved oxygen (mg/L)	---	1.04	1.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	9.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	---	-95.6	-95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (mg/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2004 R.G Haley RI Investigation														
Sample ID:		CL-MW-1D					MW-6					MW-7				
Sample Number:																
Sample Date :		6/22/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005
Lab ID:	Cornwall Ave LF Site Screening Level (a)															
TOTAL METALS (µg/L)																
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead (b)	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (µg/L)																
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/L)																
Naphthalene	83	NA	NA	NA	NA	NA	12.5 D	NA	3.95	9.66 D	904 D	0.405	NA	0.546	0.537	0.809 D
2-Methylnaphthalene	---	NA	NA	NA	NA	NA	37 D	NA	7.80	32.2 D	10,400 D	32.8 D	NA	8.39	30.9 D	8.19 D
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	---	NA	NA	NA	NA	NA	1.1	NA	0.1 U	1.1	5 U	0.0698	NA	0.1 U	0.127	0.2 U
Acenaphthene	990	NA	NA	NA	NA	NA	7.74 D	NA	3.03	6.19 D	731 D	0.62	NA	0.383	0.938	0.605 D
Fluorene	3	NA	NA	NA	NA	NA	7.17 D	NA	3.08	5.67 D	805 D	0.0165	NA	0.385	0.551	0.886
Phenanthrene	6	NA	NA	NA	NA	NA	5.33 D	NA	1.97	5.32 D	2390 D	0.253	NA	0.3	0.442	0.283 D
Anthracene	9.6	NA	NA	NA	NA	NA	0.419	NA	0.1 U	0.01 U	5 U	0.01 U	NA	0.1 U	0.057	0.2 U
Fluoranthene	3.3	NA	NA	NA	NA	NA	0.0627	NA	0.1 U	0.0681	78.7	0.0442	NA	0.1 U	0.0603	0.0788
Pyrene	15	NA	NA	NA	NA	NA	0.198	NA	0.1 U	0.191	239	0.0375	NA	0.1 U	0.0415	0.2 U
Dibenzofuran	---	NA	NA	NA	NA	NA	1.92	NA	0.1 U	1.85	339	0.146	NA	0.107	0.181	0.2 U
Benzo(a)pyrene	0.018	NA	NA	NA	NA	NA	0.01 U	NA	0.1 U	0.01 U	5 U	0.01 U	NA	0.1 U	0.01 U	0.2 U
Benzo(a)anthracene	0.018	NA	NA	NA	NA	NA	0.01 U	NA	0.1 U	0.01 U	15.3	0.01 U	NA	0.1 U	0.01 U	0.2 U
Benzo(b)fluoranthene	0.018	NA	NA	NA	NA	NA	0.01 U	NA	0.1 U	0.01 U	5 U	0.01 U	NA	0.1 U	0.01 U	0.2 U
Benzo(k)fluoranthene	0.018	NA	NA	NA	NA	NA	0.01 U	NA	0.1 U	0.01 U	5 U	0.01 U	NA	0.1 U	0.01 U	0.2 U
Chrysene	0.018	NA	NA	NA	NA	NA	0.01 U	NA	0.1 U	0.01 U	27.4	0.01 U	NA	0.1 U	0.01 U	0.2 U
Indeno(1,2,3-cd)pyrene	0.01	NA	NA	NA	NA	NA	0.01 U	NA	0.1 U	0.01 U	5 U	0.01 U	NA	0.1 U	0.01 U	0.01 U
Total cPAHs (TEQ)	0.018	NA	NA	NA	NA	NA	ND	ND	ND	ND	1.8	ND	ND	ND	ND	ND
SEMIVOLATILES (µg/L)																
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phenols	580	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	10	NA	NA	NA	NA	NA	78.5 J	NA	0.5 UJ	7.37	25 U	0.05 U	NA	0.5 UJ	0.59	0.05 UJ
N-Nitrosodiphenylamine	6	NA	NA	NA	NA	NA	0.02 U	NA	0.2 UJ	1.06	10 DU	0.407	NA	0.41 J	0.457	0.469 D
Dimethylphthalate	1,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	NA	NA	0.5 U	NA	5 U	1.04	250 U	0.5 U	NA	5 U	0.5 U	10 U
2,4,6-Trichlorophenol	3	NA	NA	NA	NA	NA	0.721	NA	0.5 U	NA	25 U	0.05 U	NA	0.5 U	0.0526	1 U
2,3,5,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	1.87	NA	5 U	10 U	250 U	0.5 U	NA	5 U	0.5 U	10 U
2,4,5-Trichlorophenol	3,600	NA	NA	NA	NA	NA	0.192	NA	0.5 U	1.18	25 U	0.05 U	NA	0.5 U	0.05 U	1 U
m,p-Cresol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2004 R.G Haley RI Investigation														
Sample ID:		CL-MW-1D					MW-6					MW-7				
Sample Number:																
Sample Date :		6/22/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005
Lab ID:	Cornwall Ave LF Site Screening Level (a)															
TOTAL PETROLEUM HYDROCARBONS (µg/L)																
NWTPH-HCID																
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH (µg/L)																
TPH-418	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	1680	1870	2080	1370	250 U	287	1510	1290	974	202000	279	409	341	250 U	250 U
Oil-Range Hydrocarbons	500	581	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	50000 U	500 U	500 U	500 U	500 U	500 U
VOLATILES (µg/L)																
Acetone	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	1,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	2,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	6.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (µg/L)																
Aroclor 1016	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES (µg/L)																
METHOD SW8081B	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HERBICIDES (µg/L)																
METHOD SW8151	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TANNINS & LIGNINS (mg/L)																
Tannins & Lignins	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RADIOCHEMISTRY																
Gross Beta (pCi/L)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

	Cornwall Ave LF Site Screening Level (a)	2004 R.G Haley RI Investigation														
Sample ID:		CL-MW-1D					MW-6					MW-7				
Sample Number:																
Sample Date :		6/22/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005	6/24/2004	9/24/2004	12/9/2004	3/31/2005	9/14/2005
Lab ID:																
DIOXINS/FURANS (pg/L)																
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS (mg/L unless indicated otherwise)																
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrate (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfite	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NH_3-Ammonia (mg NH_3/L) (c)	0.035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	---	16.1	NA	NA	NA	NA	12.1	NA	NA	NA	NA	31.8	NA	NA	NA	NA
Carbon disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS																
pH	6.2< pH <8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (C)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (uS)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved oxygen (mg/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (mg/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 Supplemental RI Groundwater Investigation												
Sample ID:		MW-11S	MW-11S	MW-11D	MW-11D	MW-12S	MW-12S	MW-12D	MW-12D	MW-13S	MW-13S	MW-13D	MW-13D	MW-13D (a)
Sample Number:														
Sample Date :		7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/30/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)	VE38E/ VE43F	VK65I/ VK75I	VE38C/ VE3C	VK65K/ VK75K	VE38D/ VE43D	VK65H/ VK75H	VE38B/ VE43B	VK65J/ VK75J	VE22E/ VE24E	VK65G/ VK75G	VE22G/ VE24G	VK65L/ VK75L/ VL48G	VK65O
TOTAL METALS (µg/L)														
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead (b)	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (µg/L)														
Arsenic	5.0	1.3	0.5 U	0.4	0.5 U	0.6	0.5 U	0.5 U	0.5 U	0.6	0.5 U	0.9	0.5 U	NA
Copper	2.4	2.6	0.9	0.7	0.5	1 U	0.5 U	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	1	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA
Manganese	100	1430	858	84	72	680	600	163	205	704	724	257	244	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	26	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	NA
PAHs (µg/L)														
Naphthalene	83	0.027	0.10 U	0.01 U	0.10 U	0.062	0.10 U	0.046	0.10 U	0.14	3.0	0.31	0.24	0.27
2-Methylnaphthalene	---	0.052	0.10 U	0.01 U	0.10 U	0.025	0.10 U	0.034	0.10 U	0.12	0.25	0.48	0.32	0.33
1-Methylnaphthalene	---	0.082	0.10 U	0.01 U	0.10 U	0.082	0.14	0.053	0.16	0.27	0.32	0.66	0.54	0.56
Acenaphthylene	---	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.011	0.10 U	0.10 U
Acenaphthene	990	0.042	0.10 U	0.01 U	0.10 U	0.078	0.10 U	0.025	0.10 U	0.16	0.17	0.091	0.14	0.11
Fluorene	3	0.036	0.10 U	0.01 U	0.10 U	0.069	0.10 U	0.023	0.10 U	0.12	0.11	0.16	0.12	0.13
Phenanthrene	6	0.065	0.10 U	0.01 U	0.10 U	0.062	0.10 U	0.04	0.10 U	0.11	0.12	0.18	0.16	0.18
Anthracene	9.6	0.01	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.015	0.10 U	0.018	0.10 U	0.10 U
Fluoranthene	3.3	0.01 U	0.10 U	0.01 U	0.10 U	0.029	0.10 U	0.01 U	0.10 U	0.02	0.10 U	0.028	0.10 U	0.10 U
Pyrene	15	0.01 U	0.10 U	0.01 U	0.10 U	0.019	0.10 U	0.01 U	0.10 U	0.018	0.10 U	0.025	0.10 U	0.10 U
Dibenzofuran	---	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.024	0.10 U	0.10 U
Benzo(a)pyrene	0.018	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U
Benzo(a)anthracene	0.018	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U
Benzo(b)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.018	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U
Indeno(1,2,3-cd)pyrene	0.01	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U
Total cPAHs (TEQ)	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEMIVOLATILES (µg/L)														
Naphthalene	83	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	3.0	1 U	1.0 U	1.0 U
2-Methylnaphthalene	15	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
1-Methylnaphthalene	---	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
Acenaphthene	990	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
Fluorene	3	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
Phenanthrene	---	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
bis(2-Ethylhexyl)phthalate	3	1.2	3.0 U	1.7	3.0 U	1.8	3.0 U	1.4	3.0 U	2.5	3.0 U	2.1	3.0 U	3.0 U
Total Phenols	580	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
4-Methylphenol	---	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	2.0 U
Pentachlorophenol	10	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	10 U
N-Nitrosodiphenylamine	6	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
Dimethlyphthalate	1,700	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U
Formaldehyde	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	3	5 U	3.0 U	5 U	3.0 U	5 U	3.0 U	5 U	3.0 U	5 U	3.0 U	5 U	3.0 U	3.0 U
2,3,5,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	3,600	5 U	5.0 U	5 U	5.0 U	5 U	5.0 U	5 U	5.0 U	5 U	5.0 U	5 U	5.0 U	5.0 U
m,p-Cresol	---	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	1 U	2.0 U	2.0 U
2,3,4,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 Supplemental RI Groundwater Investigation												
Sample ID:		MW-11S	MW-11S	MW-11D	MW-11D	MW-12S	MW-12S	MW-12D	MW-12D	MW-13S	MW-13S	MW-13D	MW-13D	MW-13D (a)
Sample Number:														
Sample Date :		7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/30/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)	VE38E/ VE43F	VK65I/ VK75I	VE38C/ VE3C	VK65K/ VK75K	VE38D/ VE43D	VK65H/ VK75H	VE38B/ VE43B	VK65J/ VK75J	VE22E/ VE24E	VK65G/ VK75G	VE22G/ VE24G	VK65L/ VK75L/ VL48G	VK65O
TOTAL PETROLEUM HYDROCARBONS (μg/L)														
NWTPH-HCID														
Gasoline-Range Hydrocarbons	800	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	> 250	NA
Diesel-Range Hydrocarbons	500	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	> 500	NA
Oil-Range Hydrocarbons	500	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	> 500	NA
TPH (μg/L)														
TPH-418	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	330	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 U	NA
VOLATILES (µg/L)														
Acetone	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA
Carbon Disulfide	---	0.2 U	0.20 U	0.2 U	0.76	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	NA
Benzene	23	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20	NA
Toluene	15,000	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2	0.20 U	NA
Chlorobenzene	1,600	0.2 U	0.20 U	0.2 U	0.20 U	2.6	3.4	0.44	1.2	1.6	1.3	0.3	0.73	NA
Ethylbenzene	2,100	0.2 U	0.20 U	0.2 U	0.20 U	0.46	3.1	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	NA
Styrene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.82	0.26	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	NA
m,p-Xylene	---	0.4 U	0.40 U	0.4 U	0.40 U	0.42	0.68	0.4 U	0.40 U	0.4 U	0.40 U	0.4 U	0.40 U	NA
o-Xylene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.31	0.43	0.2 U	0.20 U	0.25	0.26	0.31	0.37	NA
1,2-Dichlorobenzene	6.1	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2	0.20 U	0.2 U	0.20 U	NA
1,4-Dichlorobenzene	5	0.2 U	0.20 U	0.2 U	0.20 U	0.86	1.1	0.2 U	0.20 U	0.73	0.90	0.24	0.39	NA
1,2,4-Trimethylbenzene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	NA
Isopropylbenzene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.29	0.2 U	0.20 U	0.2 U	0.20 U	0.4	0.58	NA
tert-Butylbenzene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.22	NA
sec-Butylbenzene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.25	0.35	0.2 U	0.20 U	0.35	0.40	0.66	0.86	NA
4-Isopropyltoluene	---	0.86	0.35	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	NA
n-Butylbenzene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.25 U	0.21	0.33 U	0.41	NA
Naphthalene	83	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5	19	0.66	0.71	NA
n-Propylbenzene	---	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U	NA
PCBs (µg/L)														
Aroclor 1016	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES (µg/L)														
METHOD SW8081B	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HERBICIDES (µg/L)														
METHOD SW8151	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TANNINS & LIGNINS (mg/L)														
Tannins & Lignins	---	1.90	1.580	29.90	37.90	7.830	1.010	9.540	12.20	1.070	0.953	1.120	6.450	NA
RADIOCHEMISTRY														
Gross Beta (pCi/L)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 Supplemental RI Groundwater Investigation												
Sample ID:		MW-11S	MW-11S	MW-11D	MW-11D	MW-12S	MW-12S	MW-12D	MW-12D	MW-13S	MW-13S	MW-13D	MW-13D	MW-13D (a)
Sample Number:														
Sample Date :		7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/31/2012	09/24/2012	7/30/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)	VE38E/ VE43F	VK65I/ VK75I	VE38C/ VE3C	VK65K/ VK75K	VE38D/ VE43D	VK65H/ VK75H	VE38B/ VE43B	VK65J/ VK75J	VE22E/ VE24E	VK65G/ VK75G	VE22G/ VE24G	VK65L/ VK75L/ VL48G	VK65O
DIOXINS/FURANS (pg/L)														
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS (mg/L unless indicated otherwise)														
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	16	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 UJ	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	NA
N-Nitrate (mg-N/L)	---	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5	NA
N-Nitrite (mg-N/L)	---	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA
Nitrate + Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	---	1.2	2.8	3	9.6	0.7	0.1	6.6	37.6	0.8	2.5	1.2	34.8	NA
Sulfite	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg N/L)	---	4.52	4.79	4.23	4.19	18	17.7	12	12.4	17.6	15.8	19.7	22.5	NA
NH_3-Ammonia (mg NH_3/L) (c)	0.035	0.146	0.005	0.132	0.001	0.048	0.089	0.005	0.286	0.230	0.118	0.105	0.062	NA
Total organic carbon	---	22.4	20.3	21.5	33.8	13.9	14.7	26.5	25.1	11.2	11.7	11.8	13.7	NA
Carbon disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	0.087	0.059	0.868	105	0.321	0.050 U	0.834	5.97	0.118	0.050 U	0.201	0.902	NA
Chemical Oxygen Demand	---	61.6	57.9	236	277	43.4	46.4	108	101	31.6	37.8	33.2	50.9	NA
Biological Oxygen Demand	---	14.5	16.0	85.4	25.0	15.1	12.0 U	15.7	27.0	18.7 J	12.0 U	13.9 J	24.0	NA
FIELD PARAMETERS														
pH	6.2< pH <8.5	8.08	6.62	8.08	6.03	7.04	7.32	6.26	8.01	7.68	7.46	7.32	7.44	NA
Temperature (C)	---	15.27	14.17	14.81	12.64	13.52	13.36	13.63	12.80	15.20	14.41	14.24	12.42	NA
Conductivity (uS)	---	2332	472	1670	2719	2694	2208	3273	2608	2406	1608	3168	2124	NA
Dissolved oxygen (mg/L)	---	0.60	0.31	1.17	5.46	1.90	0.53	1.24	0.97	0.21	0.71	0.14	0.85	NA
Turbidity (NTU)	---	2.78	11.11	3.16	5.34	4.52	0.64	12.84	5.82	9.15	1.65	13.18	84.78	NA
ORP (mV)	---	-194.3	-81.4	-311.4	-317.8	-184.3	-115.3	-266.3	-242.8	-89.4	-11.59	-84	-153.8	NA
Ferrous Iron (mg/L)	---	NA	2.4	NA	0.6	NA	1.5	NA	3.0	NA	2.6	NA	1.8	NA

TABLE 6-2

ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

	Cornwall Ave LF Site Screening Level (a)	2012 Additional Groundwater Investigation														
Sample ID:		MW-14S	MW-14S	MW-14D	MW-DUP	MW-14D	MW-15S	MW-15S	MW-15S (a)	MW-15D	MW-15D	MW-DUP	MW-16S	MW-16S	MW-16D	MW-16D
Sample Number:					Dup of MW-14D							Dup of MW-15D				
Sample Date :		7/30/2012	09/24/2012	7/30/2012	7/30/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012	7/30/2012	09/24/2012	7/31/2012	09/24/2012
Lab ID:		VE22D/ VE24D	VK65F/ VK75F/ VL48F	VE22F/ VE24F	VE22H/ VE24H	VK65C/ VK75C/ VL48C	VE22C/ VE24C	VK65D/ VK75D/ VL48D	VL65N	VE22A/ VE24A	VK65A/ VK75A/ VL48A	VK65M/ VK75M/ VL48H	VE22B/ VE24B	VK65E/ VK75E/ VL48E	VE38A/ VE43A/ VE90A	VK65B/ VK75B/ VL48B
TOTAL METALS (µg/L)																
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead (b)	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (µg/L)																
Arsenic	5.0	0.8	0.8	0.7	0.5 U	2	0.7	0.9	NA	0.8	0.5 U	0.5 U	0.8	0.5	1 U	0.7
Copper	2.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	0.1 U
Manganese	100	584	498	1440	1430	1340	529	375	NA	182	189	172	380	328	540	391
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	81	4 U	4 U	4 U	4 U	4 U	4 U	4 U	NA	4 U	4 U	4 U	5	27	40 J	50
PAHs (µg/L)																
Naphthalene	83	0.084	0.10 U	0.12	0.12	0.28	3.9	3.7	3.4	0.17	0.11	0.12	0.14	0.10 U	0.032	0.10 U
2-Methylnaphthalene	---	0.32	0.25	0.13	0.13	0.12	3.3	1.5	1.4	0.21	0.17	0.14	0.016	0.10 U	0.026	0.10 U
1-Methylnaphthalene	---	0.56	0.64	0.21	0.22	0.23	2.5	1.6	1.4	0.4	0.32	0.32	0.049	0.10 U	0.36	0.16
Acenaphthylene	---	0.01 U	0.10 U	0.01 U	0.01 U	0.10 U	0.038	0.10 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U
Acenaphthene	990	0.18	0.30	0.18	0.2	0.17	1.4	0.76	0.64	0.1	0.11	0.13	0.19	0.29	0.29	0.52
Fluorene	3	0.14	0.15	0.12	0.14	0.12	1.4	0.58	0.53	0.1	0.10 U	0.10 U	0.07	0.10 U	0.082	0.13
Phenanthrene	6	0.12	0.17	0.14	0.16	0.13	1.5	0.63	0.58	0.11	0.10	0.10 U	0.017	0.10 U	0.11	0.11
Anthracene	9.6	0.01 U	0.10 U	0.014	0.018	0.10 U	0.14	0.10 U	0.10 U	0.011	0.10 U	0.10 U	0.01 U	0.10 U	0.013	0.10 U
Fluoranthene	3.3	0.024	0.10 U	0.026	0.03	0.10 U	0.18	0.10 U	0.10 U	0.017	0.10 U	0.10 U	0.01 U	0.10 U	0.053	0.10 U
Pyrene	15	0.03	0.10 U	0.02	0.024	0.10 U	0.11	0.10 U	0.10 U	0.015	0.10 U	0.10 U	0.01 U	0.10 U	0.039	0.10 U
Dibenzofuran	---	0.01 U	0.10 U	0.019	0.021	0.10 U	0.54	0.23	0.20	0.016	0.10 U	0.10 U	0.01 U	0.10 U	0.012	0.10 U
Benzo(a)pyrene	0.018	0.01 U	0.10 U	0.01 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U
Benzo(a)anthracene	0.018	0.01 U	0.10 U	0.01 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U
Benzo(b)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.018	0.01 U	0.10 U	0.01 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U
Indeno(1,2,3-cd)pyrene	0.01	0.01 U	0.10 U	0.01 U	0.01 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.10 U	0.01 U	0.10 U	0.01 U	0.10 U
Total cPAHs (TEQ)	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEMIVOLATILES (µg/L)																
Naphthalene	83	1 U	1.0 U	1 U	1 U	1.0 U	3.4	4.0	5.2	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
2-Methylnaphthalene	15	1 U	1.0 U	1 U	1 U	1.0 U	2.5	1.4	1.8	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
1-Methylnaphthalene	---	1 U	1.0 U	1 U	1 U	1.0 U	2.8	1.8	2.4	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
Acenaphthene	990	1 U	1.0 U	1 U	1 U	1.0 U	1.2	1.0 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
Fluorene	3	1 U	1.0 U	1 U	1 U	1.0 U	1.1	1.0 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
Phenanthrene	---	1 U	1.0 U	1 U	1 U	1.0 U	1.4	1.0 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
bis(2-Ethylhexyl)phthalate	3	2.2	3.0 U	2.2	1.9	3.0 U	3	3.0 U	3.0 U	2.5	3.0 U	3.0 U	2.4	3.0 U	1.3	3.0 U
Total Phenols	580	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	1 U	1.0	1 U	1 U	1.0 U	1.4	1.0 U	1.2	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
4-Methylphenol	---	1 U	2.0 U	1 U	1 U	2.0 U	1 U	2.0 U	2.0 U	1 U	2.0 U	2.0 U	1 U	2.0 U	1 U	2.0 U
Pentachlorophenol	10	5 U	10 U	5 U	5 U	10 U	5 U	10 U	10 U	5 U	10 U	10 U	5 U	10 U	5 U	10 U
N-Nitrosodiphenylamine	6	1 U	1.0 U	1 U	1 U	1.0	1 U	1.0 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
Dimethlyphthalate	1,700	1 U	1.0 U	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U
Formaldehyde	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	3	5 U	3.0 U	5 U	5 U	3.0 U	5 U	3.0 U	3.0 U	5 U	3.0 U	3.0 U	5 U	3.0 U	5 U	3.0 U
2,3,5,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	3,600	5 U	5.0 U	5 U	5 U	5.0 U	5 U	5.0 U	5.0 U	5 U	5.0 U	5.0 U	5 U	5.0 U	5 U	5.0 U
m,p-Cresol	---	1 U	2.0 U	1 U	1 U	2.0 U	1 U	2.0 U	2.0 U	1 U	2.0 U	2.0 U	1 U	2.0 U	1 U	2.0 U
2,3,4,6-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	---	1 U	1.0 U	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 Additional Groundwater Investigation														
Sample ID:		MW-14S	MW-14S	MW-14D	MW-DUP	MW-14D	MW-15S	MW-15S	MW-15S (a)	MW-15D	MW-15D	MW-DUP	MW-16S	MW-16S	MW-16D	MW-16D
Sample Number:					Dup of MW-14D							Dup of MW-15D				
Sample Date :		7/30/2012	09/24/2012	7/30/2012	7/30/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012	7/30/2012	09/24/2012	7/31/2012	09/24/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)	VE22D/ VE24D	VK65F/ VK75F/ VL48F	VE22F/ VE24F	VE22H/ VE24H	VK65C/ VK75C/ VL48C	VE22C/ VE24C	VK65D/ VK75D/ VL48D	VL65N	VE22A/ VE24A	VK65A/ VK75A/ VL48A	VK65M/ VK75M/ VL48H	VE22B/ VE24B	VK65E/ VK75E/ VL48E	VE38A/ VE43A/ VE90A	VK65B/ VK75B/ VL48B
TOTAL PETROLEUM HYDROCARBONS (µg/L)																
NWTPH-HCID																
Gasoline-Range Hydrocarbons	800	250 U	250 U	250 U	250 U	250 U	250 U	250 U	NA	250 U	250 U	250 U	250 U	250 U	250 U	250 U
Diesel-Range Hydrocarbons	500	> 500	> 500	500 U	500 U	> 500	> 500	> 500	NA	> 500	> 500	> 500	> 500	> 500	> 500	> 500
Oil-Range Hydrocarbons	500	500 U	500 U	500 U	500 U	> 500	500 U	500 U	NA	500 U	500 U	500 U	500 U	500 U	500 U	500 U
TPH (µg/L)																
TPH-418	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	100 U	100 UJ	NA	NA	100 UJ	200	100 UJ	NA	100 U	100 UJ	100 U	100 U	100 UJ	100 U	100 UJ
Oil-Range Hydrocarbons	500	200 U	200 UJ	NA	NA	200 UJ	200 U	200 UJ	NA	200 U	200 UJ	200 U	200 U	200 UJ	200 U	200 UJ
VOLATILES (µg/L)																
Acetone	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Carbon Disulfide	---	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U	0.20 U	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
Benzene	23	0.22	0.22	0.2 U	0.2 U	0.20 U	0.51	0.44	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
Toluene	15,000	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U	0.38	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
Chlorobenzene	1,600	4.2	4.6	3.6	3.4	4.2	10	6.7	NA	0.64	0.67 J	1.0 J	0.2 U	0.60	0.2 U	0.69
Ethylbenzene	2,100	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U	0.49	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
Styrene	---	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U	0.20 U	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
m,p-Xylene	---	0.4 U	0.40 U	1.1	1.1	0.96	0.4 U	0.40 U	NA	0.4 U	0.40 U	0.40 U	0.4 U	0.40 U	0.4 U	0.40 U
o-Xylene	---	0.23	0.29	0.5	0.52	0.60	0.28	0.32	NA	0.2 U	0.20	0.24	0.2 U	0.20 U	0.2 U	0.20 U
1,2-Dichlorobenzene	6.1	0.24	0.28	0.2 U	0.2 U	0.20 U	0.32	0.36	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
1,4-Dichlorobenzene	5	1.9	2.2	0.38	0.38	0.41	3.2	2.1	NA	0.36	0.32	0.49	0.2 U	0.23	0.2 U	0.20 U
1,2,4-Trimethylbenzene	---	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U	0.26	0.39	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
Isopropylbenzene	---	0.23	0.28	0.2 U	0.2 U	0.20 U	0.69	0.70	NA	0.41	0.42	0.59	0.2 U	0.20 U	0.2 U	0.20 U
tert-Butylbenzene	---	0.22	0.25	0.2 U	0.2 U	0.20 U	0.22	0.23	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
sec-Butylbenzene	---	0.96	1.1	0.42	0.46	0.39	1.1	0.99	NA	0.83	0.74 J	1.2 J	0.2 U	0.20 U	0.2 U	0.20 U
4-Isopropyltoluene	---	0.2 U	0.20 U	0.2 U	0.2 U	0.36	0.2 U	0.38	NA	1.4	1.7 J	2.8 J	0.2 U	0.20 U	0.2 U	0.20 U
n-Butylbenzene	---	0.38 U	0.49	0.2 U	0.2 U	0.20 U	0.5 U	0.44	NA	0.26	0.26	0.41	0.2 U	0.20 U	0.2 U	0.20 U
Naphthalene	83	0.5 U	0.50 U	0.5 U	0.5 U	0.93	7.6	12	NA	0.5 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U
n-Propylbenzene	---	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U	0.20 U	NA	0.2 U	0.20 U	0.20 U	0.2 U	0.20 U	0.2 U	0.20 U
PCBs (µg/L)																
Aroclor 1016	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES (µg/L)																
METHOD SW8081B	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HERBICIDES (µg/L)																
METHOD SW8151	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TANNINS & LIGNINS (mg/L)																
Tannins & Lignins	---	1.190	3.140	1.240	NA	3.830	1.950	1.540	NA	1.460	1.350	1.380	1.460	1.310	1.220	1.310
RADIOCHEMISTRY																
Gross Beta (pCi/L)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

	Cornwall Ave LF Site Screening Level (a)	2012 Additional Groundwater Investigation														
Sample ID:		MW-14S	MW-14S	MW-14D	MW-DUP	MW-14D	MW-15S	MW-15S	MW-15S (a)	MW-15D	MW-15D	MW-DUP	MW-16S	MW-16S	MW-16D	MW-16D
Sample Number:					Dup of MW-14D							Dup of MW-15D				
Sample Date :		7/30/2012	09/24/2012	7/30/2012	7/30/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012	7/30/2012	09/24/2012	09/24/2012	7/30/2012	09/24/2012	7/31/2012	09/24/2012
Lab ID:		VE22D/ VE24D	VK65F/ VK75F/ VL48F	VE22F/ VE24F	VE22H/ VE24H	VK65C/ VK75C/ VL48C	VE22C/ VE24C	VK65D/ VK75D/ VL48D	VL65N	VE22A/ VE24A	VK65A/ VK75A/ VL48A	VK65M/ VK75M/ VL48H	VE22B/ VE24B	VK65E/ VK75E/ VL48E	VE38A/ VE43A/ VE90A	VK65B/ VK75B/ VL48B
DIOXINS/FURANS (pg/L)																
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS **(mg/L unless indicated otherwise)**																
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	16	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	NA	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrate (mg-N/L)	---	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
N-Nitrite (mg-N/L)	---	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.1 U
Nitrate + Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	---	1.6	3.0	0.8 J	1.2 J	1.5	1.1	0.9	NA	2	1.8 J	1.9 J	3.2	3.2	3.0 J	1.4
Sulfite	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg N/L)	---	21.3	21.9	13.4	14.2	14.1	22.2	28.7	NA	29.7	29.2	29.2	16.9	18.8	14.2	19.2
NH_3-Ammonia (mg NH_3/L) (c)	0.035	0.015	0.026	0.007	0.008	$\boxed{0.054}$	0.013	0.025	NA	0.013	0.012	0.012	$\boxed{0.636}$	$\boxed{0.080}$	0.010	$\boxed{0.115}$
Total organic carbon	---	16.1	14.7	13.2	12.3	15.8	16.2	17.0	NA	13.8	14.9	14.9	20.9	18.2	17.1	19.3
Carbon disulfide	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	0.084	0.050 U	0.132	0.123	0.447	0.091	0.054	NA	0.153	0.050 U	0.050 U	0.076	0.050 U	0.187	0.050 U
Chemical Oxygen Demand	---	183	46.7	42.7	43.7	63.6	50.5	53.7	NA	42.4	44.5	49.3	59	53.1	52.2	60.8
Biological Oxygen Demand	---	19.6 J	17.0	17.9 J	15.2 J	24.0	14.9 J	20.0 U	NA	19.5 J	15.0	21.0	12.9 J	12.0 U	7.5	20.0 U
FIELD PARAMETERS																
pH	6.2< pH <8.5	6.43	6.59	6.35	6.35	7.22	6.37	6.52	NA	6.22	6.25	6.25	8.19	7.25	6.50	7.43
Temperature (C)	---	14.64	16.60	13.63	13.63	12.93	14.24	14.69	NA	14.43	13.09	13.09	13.97	13.37	12.46	12.36
Conductivity (uS)	---	3128	4147	3822	3822	3135	2196	2877	NA	2250	2883	2883	4127	2309	5094	2611
Dissolved oxygen (mg/L)	---	0.36	0.34	0.25	0.25	0.69	0.32	0.33	NA	0.32	0.48	0.48	0.19	0.75	0.45	0.70
Turbidity (NTU)	---	6.96	2.41	7.17	7.17	46.04	7.46	32.42	NA	4.32	4.64	4.64	4.44	4.07	6.95	5.30
ORP (mV)	---	-90.2	-85.6	-76.5	-76.5	-99.9	-106.9	-83.8	NA	-96.3	-66.5	-66.5	-90.1	-88.4	-131.5	-98.0
Ferrous Iron (mg/L)	---	NA	3.2	NA	NA	2.8	NA	2.0	NA	NA	2.4	2.4	NA	1.3	NA	2.2

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 R.G. Haley Site Investigation						
Sample ID:		CL-MW-1	CL-MW-101	CL-MW-102	CL-MW-103	CL-MW-1H	CL-MW-6	CL-MW-9
Sample Number:		(MW-1)					(MW-6)	(MW-9)
Sample Date :		5/9/2012	7/18/2012	7/18/2012	7/18/2012	5/9/2012	5/9/2012	5/9/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)							
TOTAL METALS (µg/L)								
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA
Lead (b)	8.1	NA	NA	NA	NA	NA	NA	NA
Mercury	0.025	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA
Selenium	71	NA	NA	NA	NA	NA	NA	NA
Thallium	0.47	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (µg/L)								
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA
Lead	8.1	NA	NA	NA	NA	NA	NA	NA
Manganese	100	NA	NA	NA	NA	NA	NA	NA
Nickel	8.2	NA	NA	NA	NA	NA	NA	NA
Zinc	81	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/L)								
Naphthalene	83	0.026 U	1.1	4.9	12	1.9	1.2	0.013 U
2-Methylnaphthalene	---	0.011 U	1.8	12	190	0.0095 U	180	0.033 U
1-Methylnaphthalene	---	0.12 U	95	31	170	43	240	0.042 U
Acenaphthylene	---	0.0095 U	0.66	0.24	0.76	1.3	2.3	0.0096 U
Acenaphthene	990	0.14	4.4	1.6	5	9.4	14	0.015
Fluorene	3	0.098	3.1	1.1	4.3	9.4	14	0.0096 U
Phenanthrene	6	0.022	2.3	1.1	3.6	5.3	15	0.018
Anthracene	9.6	0.011	0.085	0.088	0.15	5	0.67	0.025
Fluoranthene	3.3	0.013	0.085	0.048 U	0.048 U	0.13	0.14	0.0096 U
Pyrene	15	0.02	0.055	0.051	0.11	0.3	0.39	0.0096 U
Dibenzofuran	---	0.95 U	0.95 U	0.95 U	1.7	3.3	6.1	0.96 U
Benzo(a)pyrene	0.018	0.0095 U	0.0095 U	0.048 U	0.048 U	0.0095 U	0.048 U	0.0096 U
Benzo(a)anthracene	0.018	0.031	0.01	0.048 U	0.048 U	0.016	0.048	0.0096 U
Benzo(b)fluoranthene	0.018	0.0095 U	0.0095 U	0.048 U	0.048 U	0.0095 U	0.048 U	0.0096 U
Benzo(k)fluoranthene	0.018	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.018	0.0095 U	0.0095 U	0.048 U	0.048 U	0.017	0.048 U	0.0096 U
Indeno(1,2,3-cd)pyrene	0.01	0.0095 U	0.0095 U	0.048 U	0.048 U	0.0095 U	0.048 U	0.0096 U
Total cPAHs (TEQ)	0.018	0.0031	0.001	ND	ND	0.00177	0.0048	ND
SEMIVOLATILES (µg/L)								
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	15	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	990	NA	NA	NA	NA	NA	NA	NA
Fluorene	3	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	---	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	3	0.98	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.96 U
Total Phenols	580	0.95 U	1.3	0.95 U	0.95 U	0.95 U	0.95 U	0.96 U
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	---	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	10	0.0092 U	0.011	0.037	0.7	0.75	100	0.014
N-Nitrosodiphenylamine	6	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.96 U
Dimethlyphthalate	1,700	NA	NA	NA	NA	NA	NA	NA
Formaldehyde	---	NA	NA	NA	NA	NA	NA	NA
2,3,4,5-Tetrachlorophenol	---	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	3	0.018 U	0.018 U	0.018 U	0.018 U	0.039	0.6	0.018 U
2,3,5,6-Tetrachlorophenol	---	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	10	0.96 U
2,4,5-Trichlorophenol	3,600	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.96 U
m,p-Cresol	---	0.95 U	43	0.95 U	0.95 U	0.95 U	0.95 U	0.96 U
2,3,4,6-Tetrachlorophenol	---	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	22	0.96 U
Carbazole	---	0.95 U	0.95 U	0.95 U	1.6	0.95 U	0.95 U	0.96 U

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 R.G. Haley Site Investigation						
Sample ID:		CL-MW-1	CL-MW-101	CL-MW-102	CL-MW-103	CL-MW-1H	CL-MW-6	CL-MW-9
Sample Number:		(MW-1)					(MW-6)	(MW-9)
Sample Date :		5/9/2012	7/18/2012	7/18/2012	7/18/2012	5/9/2012	5/9/2012	5/9/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)							
TOTAL PETROLEUM HYDROCARBONS (µg/L)								
NWTPH-HCID								
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA
Oil-Range Hydrocarbons	500	NA	NA	NA	NA	NA	NA	NA
TPH (µg/L)								
TPH-418	---	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Hydrocarbons	800	NA	NA	NA	NA	NA	NA	NA
Diesel-Range Hydrocarbons	500	270 U	1200 J	740 J	1700 J	1800	3800	260 U
Oil-Range Hydrocarbons	500	440 U	410 U	410 U	500	410 U	410 U	410 U
VOLATILES (µg/L)								
Acetone	---	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	---	NA	NA	NA	NA	NA	NA	NA
Benzene	23	NA	NA	NA	NA	NA	NA	NA
Toluene	15,000	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	1,600	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	2,100	NA	NA	NA	NA	NA	NA	NA
Styrene	---	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	---	NA	NA	NA	NA	NA	NA	NA
o-Xylene	---	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	6.1	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	---	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	---	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	---	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	---	NA	NA	NA	NA	NA	NA	NA
Naphthalene	83	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	---	NA	NA	NA	NA	NA	NA	NA
PCBs (µg/L)								
Aroclor 1016	0.01	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	---	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	---	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	0.01	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	0.03	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	---	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	---	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.025	NA	NA	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES (µg/L)								
METHOD SW8081B	---	NA	NA	NA	NA	NA	NA	NA
HERBICIDES (µg/L)								
METHOD SW8151	---	NA	NA	NA	NA	NA	NA	NA
TANNINS & LIGNINS (mg/L)								
Tannins & Lignins	---	NA	NA	NA	NA	NA	NA	NA
RADIOCHEMISTRY								
Gross Beta (pCi/L)	50	NA	NA	NA	NA	NA	NA	NA

TABLE 6-2
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AND SEEP WATER SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		2012 R.G. Haley Site Investigation						
Sample ID:		CL-MW-1	CL-MW-101	CL-MW-102	CL-MW-103	CL-MW-1H	CL-MW-6	CL-MW-9
Sample Number:		(MW-1)					(MW-6)	(MW-9)
Sample Date :		5/9/2012	7/18/2012	7/18/2012	7/18/2012	5/9/2012	5/9/2012	5/9/2012
Lab ID:	Cornwall Ave LF Site Screening Level (a)							
DIOXINS/FURANS (pg/L)								
1,2,3,7,8,9-HxCDD	---	NA	1.94 J	NA	NA	NA	NA	NA
Total PeCDF	---	NA	2.14	NA	NA	NA	NA	NA
OCDD	---	NA	2450	NA	NA	NA	NA	NA
Total HxCDD	---	NA	4.94	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	120	NA	NA	NA	NA	NA
Total HpCDD	---	NA	289	NA	NA	NA	NA	NA
Total HpCDF	---	NA	31.7	NA	NA	NA	NA	NA
OCDF	---	NA	61.9 J	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	0.808 J	NA	NA	NA	NA	NA
Total TCDD	---	NA	0.302	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	---	NA	0.93 J	NA	NA	NA	NA	NA
Total HxCDF	---	NA	8.06	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	8.26 J	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	---	NA	3.99864 JT	NA	NA	NA	NA	NA
CONVENTIONALS								
(mg/L unless indicated otherwise)								
Alkalinity (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/L CaCO3)	---	NA	NA	NA	NA	NA	NA	NA
Color (Pt-Co)	---	NA	NA	NA	NA	NA	NA	NA
Conductivity (umhos/cm)	---	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	---	NA	NA	NA	NA	NA	NA	NA
Salinity (g/kg)	---	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	NA	NA	NA	NA	NA	NA	NA
Calcium	---	NA	NA	NA	NA	NA	NA	NA
Iron	---	NA	NA	NA	NA	NA	NA	NA
Magnesium	---	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA
Potassium	---	NA	NA	NA	NA	NA	NA	NA
Sodium	---	NA	NA	NA	NA	NA	NA	NA
Bromide	---	NA	NA	NA	NA	NA	NA	NA
Fluoride	---	NA	NA	NA	NA	NA	NA	NA
Chloride	---	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	16	NA	NA	NA	NA	NA	NA	NA
N-Nitrate (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA
N-Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA
Nitrate + Nitrite (mg-N/L)	---	NA	NA	NA	NA	NA	NA	NA
Ortho-Phosphorous (mg-P/L)	---	NA	NA	NA	NA	NA	NA	NA
Sulfate	---	NA	NA	NA	NA	NA	NA	NA
Sulfite	---	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform (CFU/100 mL)	14	NA	NA	NA	NA	NA	NA	NA
Sulfur	---	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	---	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg N/L)	---	NA	NA	NA	NA	NA	NA	NA
NH_3-Ammonia (mg NH_3/L) (c)	0.035	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	---	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	---	NA	NA	NA	NA	NA	NA	NA
Sulfide	---	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA
Biological Oxygen Demand	---	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS								
pH	6.2< pH <8.5	NA	NA	NA	NA	NA	NA	NA
Temperature (C)	---	NA	NA	NA	NA	NA	NA	NA
Conductivity (uS)	---	NA	NA	NA	NA	NA	NA	NA
Dissolved oxygen (mg/L)	---	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	---	25.00	7.20	8.20	23.20	2.00	9.00	8.30
ORP (mV)	---	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (mg/L)	---	NA	NA	NA	NA	NA	NA	NA

Box indicates exceedance of site screening level.
µg/L = micrograms per liter
mg/L = milligrams per liter
pg/L = picograms per liter
ND = Not detected
NA = Not analyzed or result not available
-- = Water Quality Standard or other criteria not established.
B = Analyte was also found in the analytical method blank indicating the sample may have been contaminated.
E = Reported result is an estimate because of the presence of interference.
J = The analyte was positively identified. The associated numerical result is an estimate.
N = For metals analytes, the spike sample recovery is not within control limits.
P = The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
U = The analyte was not detected at or above the value shown
UJ = The analyte was not detected in the sample; the reported sample reporting lim is an estimate.
(a) Screening level based on the lower of state and federal chronic aquatic water quality criteria, MTCA Method B surface water criteria, or federal human health criteria for consumption of organisms, except as noted otherwise; see Table 5-2 for complete listing of water quality criteria.
(b) Two analytical results were reported by the laboratory for lead in Ecology samples collected in 1992. The higher results are presented in this table
(c) NH_3-Ammonia calculated using samples' total ammonia, pH, and temperature with equation from Emerson et al 1975.

TABLE 6-3
SUMMARY OF UNDERWATER SURVEY
SUPPLEMENTAL RI
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Transect and Data Point	Depth (ft, MLLW)	Substrate	Refuse Cover (%)	Wood Present
Transect T1				
T1-1	-12.8	mud	0	
T1-2	-6.8	mud	0	
T1-3	-4.8	mud/sand	0	scattered bark
T1-4	-0.8	sand	0	
Transect T2				
T2-1	-13.7	mud	0	
T2-2	-4.7	sand/mud	0	bark >20%
T2-3	-4.7	sand/mud	0	
T2-4	-3.7	sand	0	
T2-5	-0.7	sand/gravel	0	
Transect T3				
T3-1	-18.4	mud	0	
T3-2	-14.4	mud	10	
T3-3	-4.4	mud	0	chip >20%
T3-4	-3.4	sand	0	wood <20%
T3-5	-2.4	sand	50	boards >50%
Transect T4				
T4-1	-17.8	mud	0	
T4-2	-16.8	mud/debris	50	
T4-3	-13.8	glass	75	
Transect T5				
T5-1	-17.1	mud	0	scattered logs
T5-2	-12.1	mud/debris	50	
T5-3	-11.1	mud/debris	75	
Transect T6				
T6-1	-16.0	mud	0	sparse logs
T6-2	-16.0	mud	0	logs 20-50%
T6-3	-8.0	mud with refuse	50	
Transect T7				
T7-1	-15.6	mud	0	logs 20-50%
T7-2	-13.6	mud	0	logs >50%
T7-3	-11.6	mud/debris	50	
T7-4	-8.6	mud/landfill	75	
Transect T8				
T8-1	-14.7	mud	0	scattered logs
T8-2	-8.7	mud with cobble	50	
Transect T9				
T9-1	-15.3	mud	0	
T9-2	-9.3	mud with refuse	50	
Transect T10				
T10-1	-13.8	mud	0	
T10-2	-0.8	sand	0	
T10-3	0.8	cobbles with refuse	50	
T10-4	4.2	cobbles with refuse	50	

ft = feet
MLLW = Mean Lower Low Water

TABLE 6-4
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SURFACE SEDIMENT SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

				Ecology Investigation		Expanded Site Investigation			Whatcom Waterway RI/FS				Supplemental RI					
Sample ID:			Human Health Screening Level	E-2	E-4	S-1	S-2	S-3	HC-SS-19 (a)	HC-SS-20 (a)	HC-SS-21 (a)	HC-SS-28 (a)	SRI-SED-1	SRI-SED-2	SRI-SED-3	SRI-SED-4	SRI-SED-5	SRI-SED-6
Sample Number:				92 198042	92 198045	CL-MS-1	CL-MS-2	CL-MS-3										
Sample Date				5/6/1992	5/6/1992	9/24/1996	9/24/1996	9/24/1996					6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002
Lab ID:	SQS (b)	CSL (c)				Q243A	Q243B	Q243C					EL51A	EL51B	EL51C	EL51D	EL51E	EL51F
TOTAL METALS (mg/kg-dry)																		
Antimony	---	---	---	NA	NA	0.5 J	3.3 J	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	57	93	11	3.08 N	1.74 N	5.7	4.6	5.1	11	11	11	10	NA	NA	NA	NA	NA	NA
Cadmium	5.1	6.7	---	4.2 N	1 UN	0.7 J	0.3 U	0.7 J	1.4 U	1.4 U	1.4 U	1.7	NA	NA	NA	NA	NA	NA
Chromium	260	270	---	152 N	82.4 N	25.9 J	35.0 J	34.3 J	67	72	66	84	NA	NA	NA	NA	NA	NA
Copper	390	390	---	756 E	378 E	84.9 J	398 J	57.3 J	52	61	56	83	88.3	68.9	63.2	104	69.9	126
Iron	---	---	---	75,300	23,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	450	530	---	431	887	115 J	649 J	248 J	15	22	19	43	51	30	22	56	33	57
Mercury	0.41	0.59	0.41	0.34	0.071	0.1 J	0.136 J	0.098 J	0.62	0.44	1.2	0.47	NA	NA	0.4	NA	0.7	NA
Nickel	---	---	---	87.3	26.8	18 J	25 J	26 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	---	---	---	0.39 N	0.2 UN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	---	2.7 PN	1.5 UN	12 J	0.5 J	0.9 J	1.4 U	1.4 U	1.4 U	1.5 U	0.9	0.8 U	0.7 U	0.8	0.8 U	0.8 U
Zinc	410	960	---	2,140 E	313 E	189 J	242 J	220 J	95	110	100	160	156	142	126	215	151	175
ORGANICS (µg/kg-dry)																		
Methylene chloride	---	---	---	4.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenols	420	1,200	---	190	60	19 U	19 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	---	---	---	25	8 U	1.9 U	1.9 U	2.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	---	---	---	31 N	8 U	1.9 U	1.9 U	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecanoic acid	---	---	---	1,500 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS (mg/kg-dry)																		
Diesel-range Hydrocarbons	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil-range Hydrocarbons	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANICS (µg/kg-dry)																		
LPAH (d)																		
Naphthalene	2,100	2,100	---	NA	NA	19 U	19 U	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,500	1,500	---	44 J	68 U	110	19 U	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	960	960	---	NA	NA	25	19 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	670	670	---	NA	NA	30	19 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total LPAH (e,f)	5,200	5,200	---	NA	NA	135	19 U	62	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HPAH (g)																		
Fluoranthene	1,700	2,500	---	99	68 U	120	29	54	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	2,600	3,300	---	96	68 U	180	30	69	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	1,300	1,600	---	53 J	68 U	73	19 U	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	1,400	2,800	---	66 J	68 U	86	23	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b,k)fluoranthene	3,200	3,600	---	120	68 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes (h)	3,200	3,600	---	NA	NA	104	19 U	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	1,600	1,600	---	NA	NA	64	19 U	25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	600	690	---	NA	NA	35	19 U	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	670	720	---	NA	NA	50	19 U	21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HPAH (f,i)	12,000	17,000	---	NA	NA	712	82	267	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (µg/kg-dry)																		
Aroclor 1242/1016	---	---	---	160	80 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016	---	---	---	NA	NA	19 U	19 U	19 U	NA	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1242	---	---	6	NA	NA	19 U	27	620	NA	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1248	---	---	6	ND	ND	27 U	23 U	250 U	NA	NA	NA	NA	130	32 U	31 U	75	46 U	150 U
Aroclor 1254	---	---	6	160	80 U	22	20	66	NA	NA	NA	NA	130	31 J	28	84	46	110
Aroclor 1260	---	---	6	ND	ND	19 U	28	30	NA	NA	NA	NA	42 U	20 U	20 U	32 U	21 U	32 U
Aroclor 1221	---	---	---	ND	ND	39 U	38 U	280 U	NA	NA	NA	NA	39 U	39 U	39 U	40 U	39 U	39 U
Aroclor 1232	---	---	---	ND	ND	19 U	19 U	19 U	NA	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U
Total PCBs (j)	130	1,000	---	320	80 U	22	75	716	NA	NA	NA	NA	260	31	28	159	46	110
OTHER (µg/kg-dry)																		
Dimethylphthalate	71	160	---	NA	NA	920	19 U	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	200	1,200	---	NA	NA	19 U	19 U	57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	1,300	3,100	---	1,300	42 J	90	1000	220	NA	NA	NA	NA	220	160	160	390	290	300
Di-n-Octyl phthalate	6,200	6,200	---	NA	NA	19 U	140	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	1,400	5,100	---	67 J	39 J	19 U	19 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS																		
Total Solids (percent)	---	---	---	NA	NA	77.2	75.6	64.9	NA	NA	NA	NA	38.9	36.9	39.5	38.6	37.8	40.1
Total Volatile Solids (mg/kg)	---	---	---	NA	NA	97000	36000	87000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	---	---	---	0.52 E	0.07 E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	---	---	---	NA	NA	1.0	0.72	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg-N/kg)	---	---	---	NA	NA	7.0 J	3.9 J	3.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	---	---	---	NA	NA	1.0	11	1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (percent)	---	---	---			2.0	1.3	4.3	2.6	3.4	3.7	3.8	3.1	3.1	2.9	3.6	3.7	4.2

TABLE 6-4
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SURFACE SEDIMENT SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

				Boulevard Park 2008 Sampling						
Sample ID:			Human Health Screening Level	BLVD-SS-09	BLVD-SC-09-0-2'	BLVD-SC-09-2-3'	BLVD-SC-09-3-4'	BLVD-SC-09-4-6'	BLVD-SC-09-6-8'	BLVD-SC-09-8.5-9.7'
Sample Number:										
Sample Date				9/19/2008	9/23/2008	9/23/2008	9/23/2008	9/23/2008	9/23/2008	9/23/2008
Lab ID:	SQS (b)	CSL (c)								
TOTAL METALS (mg/kg-dry)										
Antimony	---	---	---	NA	NA	NA	NA	NA	NA	NA
Arsenic	57	93	11	20	10	20 U	10	10 U	10 U	NA
Cadmium	5.1	6.7	---	1.1	1.2	1.8	2.6	2.5	1.7	NA
Chromium	260	270	---	70	74	86	110	89	65	NA
Copper	390	390	---	66.3	74.4	121	126	94.8	71.3	NA
Iron	---	---	---	NA	NA	NA	NA	NA	NA	NA
Lead	450	530	---	27	52	143	142	120	42	NA
Mercury	0.41	0.59	0.41	0.4	0.8	1.7	3.8	1.5	0.77	0.4 J
Nickel	---	---	---	97	NA	NA	NA	NA	NA	NA
Selenium	---	---	---	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	---	0.7 U	0.8 U	1 U	0.9	1.5	0.6 U	NA
Zinc	410	960	---	124	148	280	328	353	151	NA
ORGANICS (µg/kg-dry)										
Methylene chloride	---	---	---	NA	NA	NA	NA	NA	NA	NA
Phenols	420	1,200	---	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	---	---	---	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	---	---	---	NA	NA	NA	NA	NA	NA	NA
Hexadecanoic acid	---	---	---	NA	NA	NA	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS (mg/kg-dry)										
Diesel-range Hydrocarbons	---	---	---	14 U	45	80	110	210	60	NA
Motor Oil-range Hydrocarbons	---	---	---	28 U	110	270	210	640	170	NA
ORGANICS (µg/kg-dry)										
LPAH (d)										
Naphthalene	2,100	2,100	---	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,500	1,500	---	NA	NA	NA	NA	NA	NA	NA
Anthracene	960	960	---	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	670	670	---	NA	NA	NA	NA	NA	NA	NA
Total LPAH (e,f)	5,200	5,200	---	NA	NA	NA	NA	NA	NA	NA
HPAH (g)										
Fluoranthene	1,700	2,500	---	NA	NA	NA	NA	NA	NA	NA
Pyrene	2,600	3,300	---	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	1,300	1,600	---	NA	NA	NA	NA	NA	NA	NA
Chrysene	1,400	2,800	---	NA	NA	NA	NA	NA	NA	NA
Benzo(b,k)fluoranthene	3,200	3,600	---	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes (h)	3,200	3,600	---	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	1,600	1,600	---	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	600	690	---	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	670	720	---	NA	NA	NA	NA	NA	NA	NA
Total HPAH (f,i)	12,000	17,000	---	NA	NA	NA	NA	NA	NA	NA
PCBs (µg/kg-dry)										
Aroclor 1242/1016	---	---	---	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016	---	---	---	71	20 U	59 U	98 U	NA	NA	NA
Aroclor 1242	---	---	6	19 U	20 U	59 U	98 U	NA	NA	NA
Aroclor 1248	---	---	6	19 U	55	250	290	NA	NA	NA
Aroclor 1254	---	---	6	19 U	49	270	410	NA	NA	NA
Aroclor 1260	---	---	6	66	20 U	59 U	98 U	NA	NA	NA
Aroclor 1221	---	---	---	19 U	20 U	59 U	98 U	NA	NA	NA
Aroclor 1232	---	---	---	19 U	20 U	59 U	98 U	NA	NA	NA
Total PCBs (j)	130	1,000	---	137	104	520	700	NA	NA	NA
OTHER (µg/kg-dry)										
Dimethylphthalate	71	160	---	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	200	1,200	---	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	1,300	3,100	---	NA	NA	NA	NA	NA	NA	NA
Di-n-Octyl phthalate	6,200	6,200	---	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	1,400	5,100	---	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS										
Total Solids (percent)	---	---	---	37.2	NA	NA	NA	NA	NA	NA
Total Volatile Solids (mg/kg)	---	---	---	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	---	---	---	NA	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	---	---	---	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg-N/kg)	---	---	---	13.5	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	---	---	---	543	NA	NA	NA	NA	NA	NA
Total Organic Carbon (percent)	---	---	---	3.26	NA	NA	NA	NA	NA	NA

Boxed value indicates an exceedance of the SQS.
Boxed and shaded value indicates an exceedance of the CSL and SQS.
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram
NA = Not analyzed or results not available.
ND = Not detected.
--- = SQS or CSL criteria not established.
E = Reported result is an estimate because of the presence of interference.
J = Analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N = For metals analytes the spike sample recovery is not within control limits.
P = The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
U = The analyte was not detected at or above the reported result.
(a) This information has not been validated and does not represent final data. Data provided by Hart Crowser for Georgia-Pacific West, Inc. O metals analyses were provided for these samples.
(b) Sediment Quality Standard Dry Weight Equivalent Lowest Apparent Effects Threshold (LAET) criteria (Chapter 173-204 WAC).
(c) Cleanup Screening Level Dry Weight Equivalent Lowest Apparent Effects Threshold (LAET) criteria (Chapter 173-204 WAC).
(d) Low molecular weight polycyclic aromatic hydrocarbons.
(e) The State Sediment Management Standards LPAH criterion represents the sum of the following "low molecular weight polycyclic aromatic hydrocarbon" compounds: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, and Anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(f) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods are applied:
  (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(g) High molecular weight polycyclic aromatic hydrocarbons.
(h) The total benzofluoranthenes criterion for the State Standards represents the sum of the concentrations of the "B", "J", and "K" isomers.
(i) The SMS HPAH criterion represents the sum of the following "high molecular weight polycyclic aromatic hydrocarbon" compounds: Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, and Benzo(g,h,i)perylene.
(j) For the purposes of this RI, a PCB detection is assumed to be a PQL SL exceedance. PQL for PCBs in sediment is based on Ecology's Sediment Sampling and Analysis Plan Appendix (Ecology 2008) is 0.006 mg/kg dry weight (6 µg/kg).

TABLE 6-5
CARBON NORMALIZED ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SURFACE SEDIMENT SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

				Ecology Investigation		Expanded Site Investigation			Whatcom Waterway RI/FS				Supplemental RI					
Sample ID:				E-2	E-4	S-1	S-2	S-3	HC-SS-19 (a)	HC-SS-20 (a)	HC-SS-21 (a)	HC-SS-28 (a)	SRI-SED-1	SRI-SED-2	SRI-SED-3	SRI-SED-4	SRI-SED-5	SRI-SED-6
Sample Number:				92 198042	92 198045	CL-MS-1	CL-MS-2	CL-MS-3										
Sample Date				5/6/1992	5/6/1992	9/24/1996	9/24/1996	9/24/1996					6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002
Lab ID:	SQS (b)	CSL (c)	Human Health Screening Level			Q243A	Q243B	Q243C					EL51A	EL51B	EL51C	EL51D	EL51E	EL51F
TOTAL METALS (mg/kg-dry)																		
Antimony	---	---	---	NA	NA	0.5 J	3.3 J	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	57	93	11	3.08 N	1.74 N	5.7	4.6	5.1	11	11	11	10	NA	NA	NA	NA	NA	NA
Cadmium	5.1	6.7	---	4.2 N	1 UN	0.7 J	0.3 U	0.7 J	1.4 U	1.4 U	1.4 U	1.7	NA	NA	NA	NA	NA	NA
Chromium	260	270	---	152 N	82.4 N	25.9 J	35.0 J	34.3 J	67	72	66	84	NA	NA	NA	NA	NA	NA
Copper	390	390	---	756 E	378 E	84.9 J	398 J	57.3 J	52	61	56	83	88.3	68.9	63.2	104	69.9	126
Iron	---	---	---	75,300	23,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	450	530	---	431	887	115 J	649 J	248 J	15	22	19	43	51	30	22	56	33	57
Mercury	0.41	0.59	0.41	0.34	0.071	0.1 J	0.136 J	0.098 J	0.62	0.44	1.2	0.47	NA	NA	0.4	NA	0.7	NA
Nickel	---	---	---	87.3	26.8	18 J	25 J	26 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	---	---	---	0.39 N	0.2 UN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	---	2.7 PN	1.5 UN	12 J	0.5 J	0.9 J	1.4 U	1.4 U	1.4 U	1.5 U	0.9	0.8 U	0.7 U	0.8	0.8 U	0.8 U
Zinc	410	960	---	2,140 E	313 E	189 J	242 J	220 J	95	110	100	160	156	142	126	215	151	175
ORGANICS (µg/kg-dry)																		
Methylene chloride	---	---	---	4.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenols	420	1,200	---	190	60	19 U	19 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	---	---	---	25	8 U	1.9 U	1.9 U	2.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	---	---	---	31 N	8 U	1.9 U	1.9 U	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexadecanoic acid	---	---	---	1,500 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS (mg/kg-dry)																		
Diesel-range Hydrocarbons	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil-range Hydrocarbons	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANICS (mg/kg TOC) (d)																		
LPAH (e)																		
Naphthalene	99	170	---	NA	NA	1.0 U	1.5 U	0.93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	480	---	3.38 J	1.58 U	5.5	1.5 U	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	220	1,200	---	NA	NA	1.3	1.5 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	38	64	---	NA	NA	1.5	1.5 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total LPAH (f,g)	370	780	---	NA	NA	6.8	1.5	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HPAH (h)																		
Fluoranthene	160	1,200	---	7.62	1.58 U	6.0	2.2	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	1,000	1,400	---	7.38	1.58 U	9.0	2.3	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	110	270	---	4.08 J	1.58 U	3.7	1.5 U	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	110	460	---	5.08 J	1.58 U	4.3	1.8	0.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b,k)fluoranthene	230	450	---	9.23	1.58 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes (i)	230	450	---	NA	NA	5.2	1.5 U	0.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	99	210	---	NA	NA	3.2	1.5 U	0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	34	88	---	NA	NA	1.8	1.5 U	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	31	78	---	NA	NA	2.5	1.5 U	0.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total HPAH (g,j)	960	5,300	---	NA	NA	36	6.3	6.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg TOC) (d)																		
Aroclor 1242/1016	---	---	---	16	8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016	---	---	---	NA	NA	0.95 U	1.5 U	0.44 U	NA	NA	NA	NA	0.65 U	0.65 U	0.69 U	0.56 U	0.54 U	0.48 U
Aroclor 1242	---	---	0.21	NA	NA	0.95 U	2.1	14	NA	NA	NA	NA	0.65 U	0.65 U	0.69 U	0.56 U	0.54 U	0.48 U
Aroclor 1248	---	---	0.21	ND	ND	1.35 U	1.8 U	5.8 U	NA	NA	NA	NA	4.19	1.03 U	1.07 U	2.08	1.24 U	3.57 U
Aroclor 1254	---	---	0.21	16	8 U	1.1	1.5	1.5	NA	NA	NA	NA	4.19	1.00 J	0.97	2.33	1.24	2.62
Aroclor 1260	---	---	0.21	ND	ND	0.95 U	2.2	0.70	NA	NA	NA	NA	1.35 U	0.65 U	0.69 U	0.89 U	0.57 U	0.76 U
Aroclor 1221	---	---	---	ND	ND	1.95 U	2.9 U	6.5 U	NA	NA	NA	NA	1.26 U	1.26 U	1.34 U	1.11 U	1.05 U	0.93 U
Aroclor 1232	---	---	---	ND	ND	0.95 U	1.5 U	0.44 U	NA	NA	NA	NA	0.65 U	0.65 U	0.69 U	0.56 U	0.54 U	0.48 U
Total PCBs (l)	12	65	---	32	16 U	1.1	5.8	16.2	NA	NA	NA	NA	8.39	1.00	0.97	4.42	1.24	2.62
OTHER (mg/kg TOC) (d)																		
Dimethylphthalate	53	53	---	NA	NA	46	1.5 U	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	61	110	---	NA	NA	1.0 U	1.5 U	0.63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	47	78	---	100	0.98 J	4.5	77	5.1	NA	NA	NA	NA	7.1	5.2	5.5	10.8	7.8	7.1
Di-n-Octyl phthalate	58	4,500	---	NA	NA	1.0 U	11	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	220	1,700	---	5.15 J	0.91 J	1.0 U	1.5 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS																		
Total Solids (percent)	---	---	---	NA	NA	77.2	75.6	64.9	NA	NA	NA	NA	38.9	36.9	39.5	38.6	37.8	40.1
Total Volatile Solids (mg/kg)	---	---	---	NA	NA	97000	36000	87000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	---	---	---	0.52 E	0.07 E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	---	---	---	NA	NA	1.0	0.72	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg-N/kg)	---	---	---	NA	NA	7.0 J	3.9 J	3.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	---	---	---	NA	NA	1.0	11	1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (percent)	---	---	---	1.3	2.15	2.0	1.3	4.3 (m)	2.6	3.4	3.7	3.8	3.1	3.1	2.9	3.6 (m)	3.7 (m)	4.2 (m)

TABLE 6-5
CARBON NORMALIZED ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SURFACE SEDIMENT SAMPLES
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

				Boulevard Park 2008 Sampling						
Sample ID: Sample Number: Sample Date Lab ID:	SQS (b)	CSL (c)	Human Health Screening Level	BLVD-SS-09 9/19/2008	BLVD-SC-09-0-2' 9/23/2008	BLVD-SC-09-2-3' 9/23/2008	BLVD-SC-09-3-4' 9/23/2008	BLVD-SC-09-4-6' 9/23/2008	BLVD-SC-09-6-8' 9/23/2008	BLVD-SC-09-8.5-9.7' 9/23/2008
TOTAL METALS (mg/kg-dry)										
Antimony	---	---	---	NA	NA	NA	NA	NA	NA	NA
Arsenic	57	93	11	20	10	20 U	10	10 U	10 U	NA
Cadmium	5.1	6.7	---	1.1	1.2	1.8	2.6	2.5	1.7	NA
Chromium	260	270	---	70	74	86	110	89	65	NA
Copper	390	390	---	66.3	74.4	121	126	94.8	71.3	NA
Iron	---	---	---	NA	NA	NA	NA	NA	NA	NA
Lead	450	530	---	27	52	143	142	120	42	NA
Mercury	0.41	0.59	0.41	0.4	0.8	1.7	3.8	1.5	0.77	0.4 J
Nickel	---	---	---	97	NA	NA	NA	NA	NA	NA
Selenium	---	---	---	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	---	0.7 U	0.8 U	1 U	0.9	1.5	0.6 U	NA
Zinc	410	960	---	124	148	280	328	353	151	NA
ORGANICS (µg/kg-dry)										
Methylene chloride	---	---	---	NA	NA	NA	NA	NA	NA	NA
Phenols	420	1,200	---	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	---	---	---	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	---	---	---	NA	NA	NA	NA	NA	NA	NA
Hexadecanoic acid	---	---	---	NA	NA	NA	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS (mg/kg-dry)										
Diesel-range Hydrocarbons	---	---	---	14 U	45	80	110	210	60	NA
Motor Oil-range Hydrocarbons	---	---	---	28 U	110	270	210	640	170	NA
ORGANICS (mg/kg TOC) (d)										
LPAH (e)										
Naphthalene	99	170	---	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	480	---	NA	NA	NA	NA	NA	NA	NA
Anthracene	220	1,200	---	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	38	64	---	NA	NA	NA	NA	NA	NA	NA
Total LPAH (f,g)	370	780	---	NA	NA	NA	NA	NA	NA	NA
HPAH (h)										
Fluoranthene	160	1,200	---	NA	NA	NA	NA	NA	NA	NA
Pyrene	1,000	1,400	---	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	110	270	---	NA	NA	NA	NA	NA	NA	NA
Chrysene	110	460	---	NA	NA	NA	NA	NA	NA	NA
Benzo(b,k)fluoranthene	230	450	---	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes (i)	230	450	---	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	99	210	---	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	34	88	---	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	31	78	---	NA	NA	NA	NA	NA	NA	NA
Total HPAH (g,j)	960	5,300	---	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg TOC) (d)										
Aroclor 1242/1016	---	---	---	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016	---	---	---	2.32	1.81 U	3.01 U	NA	NA	NA	NA
Aroclor 1242	---	---	0.21	0.61 U	1.81 U	3.01 U	NA	NA	NA	NA
Aroclor 1248	---	---	0.21	0.61 U	7.67	8.90	NA	NA	NA	NA
Aroclor 1254	---	---	0.21	0.61 U	8.28	12.58	NA	NA	NA	NA
Aroclor 1260	---	---	0.21	2.15	1.81 U	3.01 U	NA	NA	NA	NA
Aroclor 1221	---	---	---	0.61 U	1.81 U	3.01 U	NA	NA	NA	NA
Aroclor 1232	---	---	---	0.61 U	1.81 U	3.01 U	NA	NA	NA	NA
Total PCBs (l)	12	65	---	4.47	3.2 (k)	15.9 (k)	21.47 (k)	NA	NA	NA
OTHER (mg/kg TOC) (d)										
Dimethylphthalate	53	53	---	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	61	110	---	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	47	78	---	NA	NA	NA	NA	NA	NA	NA
Di-n-Octyl phthalate	58	4,500	---	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	220	1,700	---	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS										
Total Solids (percent)	---	---	---	37.2	NA	NA	NA	NA	NA	NA
Total Volatile Solids (mg/kg)	---	---	---	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	---	---	---	NA	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	---	---	---	NA	NA	NA	NA	NA	NA	NA
N-Ammonia (mg-N/kg)	---	---	---	13.5	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	---	---	---	543	NA	NA	NA	NA	NA	NA
Total Organic Carbon (percent)	---	---	---	3.26	NA	NA	NA	NA	NA	NA

Boxed value indicates an exceedance of the SQS.
Boxed and shaded value indicates an exceedance of the CSL and SQS.
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram
NA = Not analyzed or results not available.
ND = Not detected.
-- = SQS or CSL criteria not established.
E = Reported result is an estimate because of the presence of interference.
J = Analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N = For metals analytes the spike sample recovery is not within control limits.
P = The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
U = The analyte was not detected at or above the reported result.

(a) This information has not been validated and does not represent final data. Data provided by Hart Crowser for Georgia-Pacific West, Inc. Only metals analyses were provided for these samples.

(b) Sediment Quality Standard chemical criteria (Chapter 173-204 WAC); applies to samples with total organic carbon concentrations of 0.5% to 3.5%.

(c) Cleanup Screening Level chemical criteria (Chapter 173-204 WAC); applies to samples with total organic carbon concentrations of 0.5% to 3.5%.

(d) Data are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.

(e) Low molecular weight polycyclic aromatic hydrocarbons.

(f) The State Sediment Management Standards LPAH criterion represents the sum of the following "low molecular weight polycyclic aromatic hydrocarbon" compounds: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, and Anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.

(g) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods are applied:
   (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
   (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.

(h) High molecular weight polycyclic aromatic hydrocarbons.

(i) The total benzofluoranthenes criterion for the State Standards represents the sum of the concentrations of the "B", "J", and "K" isomers.

(j) The SMS HPAH criterion represents the sum of the following "high molecular weight polycyclic aromatic hydrocarbon" compounds: Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, and Benzo(g,h,i)perylene.

(k) Carbon normalized based on 3.26% total organic carbon from surface sediment sample.

(l) PCB SL based on the PQL requires the carbon normalization of the PQL value to determine the numerical value, which varies from sample to sample. For the purposes of this RI, a PCB detection is assumed to be a PQL SL exceedance. PQL for PCBs in sediment is based on Ecology's Sediment Sampling and Analysis Plan Appendix (Ecology 2008) is 6 mg/kg dry weight, and has been adjusted by the average total organic carbon value for this site of approximately 2.8%, resulting in the carbon-normalized PQL of 0.21 mg/kg.

(m) Sample results containing total organic carbon concentrations <0.5% or >3.5% should be compared to the dry weight equivalent screening levels shown in Table 6-4.

TABLE 6-6
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SOIL AT THE R.G. HALEY SITE NEAR THE OVERLAP AREA
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Sample Name	Cornwall Avenue Landfill		HS-DP-1	HS-DP-1	HS-DP-1	HS-MW-3	HS-MW-7	HS-MW-10	HS-MW-11DA	HS-MW-11DA	HS-MW-11DA	HS-MW-19	HS-MW-19	HS-MW-19	TL-B-3	TL-B-4
Sample Date	Site Screening		6/15/2004	6/15/2004	6/15/2004	4/4/2000	4/5/2000	6/16/2004	6/16/2004	6/16/2004	6/16/2004	7/10/2012	7/10/2012	7/10/2012	4/5/2000	4/5/2000
Sample Top Depth	Levels		4	8	12	6.5	9	12	4	8	12	1.5	10	12.5	9	6.5
Sample Bottom Depth	(unsaturated soil)	(saturated soil)	6	10	14	6.5	9	13	8	12	16	2.5	11.5	14	9	6.5
TOTAL METALS (mg/kg)																
Method SW6020																
Arsenic	---	---	4.35	7.39	7.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	48	48	36.7	41.4	68.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.1	0.2	30.8	1030	65	NA	NA	NA	NA	NA	NA	NA	82 J	NA	NA	NA
EPH (mg/kg)																
Method NWEPH																
C12-C16 Aromatics	---	---	NA	NA	NA	NA	NA	240 U	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	---	---	NA	NA	NA	NA	NA	1670	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	---	---	NA	NA	NA	NA	NA	1300	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	---	---	NA	NA	NA	NA	NA	9390	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	---	---	NA	NA	NA	NA	NA	9340	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (mg/kg)																
Method SW8270/SW8270SIM																
1-Methylnaphthalene	35	35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29	0.97	NA	NA
2-Methylnaphthalene	320	320	NA	442	275	NA	NA	17.6 J	133	129	5.76	NA	39	1.1	NA	NA
Acenaphthene	100	5.1	NA	14.7	0.827	1.16	1.85	0.653	3.24	4.07	0.169	NA	2.4	0.086	24.9	0.25 U
Acenaphthylene	---	---	NA	0.33 U	0.33 U	0.05 U	0.05 U	0.135	0.896	1.1	0.0332 U	NA	0.69	0.02	9.41	0.25 U
Anthracene	4.5	0.22	NA	3.05	0.33 U	0.928	1.77	0.828	1.12	1	0.0484	NA	0.56	0.012	15.6	0.25 U
Benzo(a)anthracene	0.13	0.0065	NA	0.599	0.33 U	0.05 U	0.05 U	1.24	0.33 U	0.748 U	0.0332 U	NA	0.034	0.03	0.631	0.25 U
Benzo(a)pyrene	0.14	0.017	NA	0.33 U	0.33 U	0.05 U	0.05 U	0.549	0.33 U	0.748 U	0.0396	NA	0.031 U	0.0091	0.379	0.25 U
Benzo(b)fluoranthene	0.43	0.022	NA	0.33 U	0.33 U	0.05 U	0.05 U	0.525	0.33 U	0.748 U	0.0332 U	NA	0.036	0.013	0.442	0.25 U
Benzo(ghi)perylene	---	---	NA	0.33 U	0.33 U	0.0509	0.05 U	0.398	0.33 U	0.748 U	0.0332 U	NA	0.042	0.021	0.274	0.25 U
Benzo(k)fluoranthene	0.43	0.022	NA	0.33 U	0.33 U	0.05 U	0.05 U	0.7	0.33 U	0.748 U	0.0332 U	NA	0.031 U	0.0074 U	0.25 U	0.25 U
Chrysene	0.14	0.0072	NA	0.857	0.33 U	0.05 U	0.071	1.32	0.33 U	0.748 U	0.0682	NA	0.052	0.016	0.968	0.25 U
Dibenzo(a,h)anthracene	0.14	0.018	NA	0.33 U	0.33 U	0.05 U	0.05 U	0.509	0.33 U	0.748 U	0.0332 U	NA	0.031 U	0.0074 U	0.25 U	0.25 U
Fluoranthene	3.2	0.16	NA	2.21	0.33 U	0.247	0.246	0.127	0.428	0.748 U	0.0418	NA	0.15	0.014	2.8	0.25 U
Fluorene	0.47	0.024	NA	19.6	1.12	0.166	2.83	0.677	4.11	5.23	0.213	NA	2.8	0.11	33.3	0.25 U
Indeno(1,2,3-cd)pyrene	0.7	0.035	NA	0.33 U	0.33 U	0.05 U	0.05 U	0.31	0.33 U	0.748 U	0.0332 U	NA	0.031 U	0.0081	0.25 U	0.25 U
Naphthalene	2.3	0.12	NA	48.7	0.794	3.81	2.34	5.49	7.87	6.4	0.389	NA	0.87	0.11	116	0.25 U
Phenanthrene	---	---	NA	43.8	2.36	4.73	8.04	0.804	9.64	13.1	0.444	NA	5.3	0.13	82	0.317
Pyrene	20	1	NA	4.81	0.33 U	0.411	0.489	0.963 J	1.01	1.34	0.0528	NA	0.37	0.034	5.6	0.25 U
Total cPAH TEQ (ND=0.5RL)	0.14	0.14	NA	0.29947	0.24915	0.03775	0.03821	0.8906	0.24915	0.56474	0.048582	NA	0.02767 T	0.01511 T	0.53348	0.18875
SEMIVOLATILES (mg/kg)																
Method SW8270/SW8270SIM																
Bis(2-Ethylhexyl) Phthalate	6.6	0.33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.84	0.21	NA	NA
Dibenzofuran	80	80	NA	0.33 U	0.33 U	NA	NA	3.97 U	1.62	0.748 U	1.1 U	NA	0.38 U	0.093 U	NA	NA
Pentachlorophenol	0.16	0.1	NA	2.99	0.844	5.69	0.209	1.7 J	1.03	1.39	0.166 U	NA	0.15	0.016	2.82	0.5 U
N-Nitrosodiphenylamine	0.18	0.02	NA	0.33 U	0.33 U	NA	NA	3.97 U	4.76	4.44	1.1 U	NA	0.38 U	0.093 U	NA	NA
2,4,6-Trichlorophenol	80	80	NA	0.33 U	0.33 U	0.5 U	0.05 U	3.97 U	0.33 U	0.748 U	1.1 U	NA	0.0029 U	0.0035 U	2.5 U	0.5 U
TOTAL PETROLEUM HYDROCARBONS (mg/kg)																
NWTPH-Dx																
Diesel-Range Hydrocarbons	2000	2000	NA	4220	180	1060	1430	2640	986	905	61.2	NA	1600	180 J	27000	137
Oil-Range Hydrocarbons	2000	2000	NA	189	44	231	39.8	5390	246	140	83.1 U	NA	610	770	2530 U	440
DIOXINS/FURANS (ng/kg)																
Method SW8290																
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	11 (a)	11 (a)	NA	NA	NA	290.38 T	NA	NA	NA	NA	NA	98550.65 JT	NA	NA	NA	NA
CONVENTIONALS																
Dry Weight (PSEP-PS; %)	---	---	84.5	57.8	50.8	85.1	79.8	41.6	84.6	44.1	30.1	NA	NA	NA	79.2	84.2
Total Organic Carbon (%; SW9060)	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg; SW9060)	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 6-6
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SOIL AT THE R.G. HALEY SITE NEAR THE OVERLAP AREA
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Sample Name	Cornwall Avenue Landfill Site Screening Levels		TL-B-5	TL-HA-1	TL-HA-2	TL-MW-10	TL-MW-10	TL-MW-10	TL-MW-10	TL-MW-10	TL-MW-13	TL-MW-13	TL-MW-13	TL-MW-13	TL-MW-13
Sample Date			4/5/2000	6/14/2004	6/14/2004	6/16/2004	6/16/2004	6/16/2004	6/16/2004	6/16/2004	7/3/2012	7/3/2012	7/3/2012	7/3/2012	7/3/2012
Sample Top Depth			5	0	0	5.5	8	12	16	20	11	18	23	33	43
Sample Bottom Depth	(unsaturated soil)	(saturated soil)	5	1	1	8	12	13	18	22	12	19	24	34	44
TOTAL METALS (mg/kg)															
Method SW6020															
Arsenic	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	48	48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.1	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EPH (mg/kg)															
Method NWEPH															
C12-C16 Aromatics	---	---	NA	NA	NA	NA	NA	1980	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	---	---	NA	NA	NA	NA	NA	5210	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	---	---	NA	NA	NA	NA	NA	16800	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (mg/kg)															
Method SW8270/SW8270SIM															
1-Methylnaphthalene	35	35	NA	NA	NA	NA	NA	NA	NA	NA	870	0.13	5.9	0.012	0.092
2-Methylnaphthalene	320	320	NA	0.0277	0.136	NA	NA	74.5	NA	NA	1200	0.18	7.5	0.021	0.15
Acenaphthene	100	5.1	0.5 U	0.01 U	0.01 U	NA	NA	18 J	NA	NA	53	0.02	0.63	0.0049 U	0.013
Acenaphthylene	---	---	0.5 U	0.01 U	0.01 U	NA	NA	4.87 J	NA	NA	20 U	0.014	0.21	0.0049 U	0.0052 U
Anthracene	4.5	0.22	0.5 U	0.01 U	0.0165	NA	NA	25.1 J	NA	NA	20 U	0.012	0.21	0.0049 U	0.0052 U
Benzo(a)anthracene	0.13	0.0065	0.5 U	0.01 U	0.042	NA	NA	4.87	NA	NA	1.4	0.02	0.088	0.0049 U	0.0052 U
Benzo(a)pyrene	0.14	0.017	0.5 U	0.01 U	0.033	NA	NA	0.637 J	NA	NA	0.7	0.018	0.083	0.0049 U	0.0052 U
Benzo(b)fluoranthene	0.43	0.022	0.5 U	0.01 U	0.0248	NA	NA	0.813 J	NA	NA	1.1	0.025	0.1	0.0049 U	0.0052 U
Benzo(ghi)perylene	---	---	0.5 U	0.01 U	0.0143	NA	NA	1.06 U	NA	NA	0.53	0.016	0.068	0.0049 U	0.0052 U
Benzo(k)fluoranthene	0.43	0.022	0.5 U	0.01 U	0.033	NA	NA	1.09 J	NA	NA	0.35	0.0084 U	0.041 U	0.0049 U	0.0052 U
Chrysene	0.14	0.0072	0.5 U	0.0106	0.042	NA	NA	4.68 J	NA	NA	2.1	0.018	0.081	0.0049 U	0.0052 U
Dibenzo(a,h)anthracene	0.14	0.018	0.5 U	0.01 U	0.01 U	NA	NA	0.196 J	NA	NA	0.091	0.0084 U	0.041 U	0.0049 U	0.0052 U
Fluoranthene	3.2	0.16	0.5 U	0.01 U	0.0773	NA	NA	2.43	NA	NA	20 U	0.038	0.22	0.0049 U	0.0052 U
Fluorene	0.47	0.024	0.5 U	0.01 U	0.01 U	NA	NA	17.7 J	NA	NA	60	0.02	0.6	0.0049 U	0.014
Indeno(1,2,3-cd)pyrene	0.7	0.035	0.5 U	0.01 U	0.0165	NA	NA	0.194 J	NA	NA	0.32	0.0096	0.043	0.0049 U	0.0052 U
Naphthalene	2.3	0.12	0.5 U	0.01 U	0.0593	NA	NA	8.25 J	NA	NA	78	0.028	0.35	0.0049 U	0.0093
Phenanthrene	---	---	0.5 U	0.01 U	0.0495	NA	NA	38.2	NA	NA	140	0.043	1.5	0.0049 U	0.023
Pyrene	20	1	0.5 U	0.0114	0.0736	NA	NA	6	NA	NA	20 U	0.034	0.32	0.0049 U	0.0052 U
Total cPAH TEQ (ND=0.5RL)	0.14	0.14	0.3775	0.007606	0.04555	NA	NA	1.4	NA	NA	1.047 T	0.02448 T	0.111 T	0.0036995 UT	0.003926 UT
SEMIVOLATILES (mg/kg)															
Method SW8270/SW8270SIM															
Bis(2-Ethylhexyl) Phthalate	6.6	0.33	NA	NA	NA	NA	NA	NA	NA	NA	20 U	0.073	0.4	0.024 U	0.071
Dibenzofuran	80	80	NA	0.33 U	0.33 U	NA	NA	1.51	NA	NA	10 U	0.021 U	0.1 U	0.012 U	0.013 U
Pentachlorophenol	0.16	0.1	1.73	1.03	0.707	NA	NA	5.48	NA	NA	0.29	0.011	0.019	0.0012 U	0.0012 U
N-Nitrosodiphenylamine	0.18	0.02	NA	0.33 U	0.33 U	NA	NA	1.06 U	NA	NA	10 U	0.021 U	0.1 U	0.012 U	0.013 U
2,4,6-Trichlorophenol	80	80	0.5 U	0.33 U	0.33 U	NA	NA	1.06 U	NA	NA	0.0046	0.0039 U	0.0038 U	0.0023 U	0.0024 U
TOTAL PETROLEUM HYDROCARBONS (mg/kg)															
NWTPH-Dx															
Diesel-Range Hydrocarbons	2000	2000	139	10 U	18	1550	2490	17400	27.2	NA	41000	26	710	2.4 U	4.5
Oil-Range Hydrocarbons	2000	2000	378	25 U	25 U	125 U	648	24300	25 U	NA	2300	45	290	9.8 U	10 U
DIOXINS/FURANS (ng/kg)															
Method SW8290															
Total Dioxin/Furan TEQ (ND=0.5DL) - Human/Mammal	11 (a)	11 (a)	NA	704.175 T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS															
Dry Weight (PSEP-PS; %)	---	---	88.7	92.4	88.8	74.7	62.1	31	78	29.2	NA	NA	NA	NA	NA
Total Organic Carbon (%; SW9060)	---	---	NA	NA	NA	NA	NA	NA	NA	34.1	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg; SW9060)	---	---	NA	NA	NA	NA	NA	NA	NA	341000	NA	NA	NA	NA	NA

TABLE 6-6
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN SOIL AT THE R.G. HALEY SITE NEAR THE OVERLAP AREA
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Boxed cells indicate an exceedance of a screening level.
mg/kg = milligrams per kilogram (ppm).
ng/kg = nanogram per kilogram (pptr)
U = Indicates the compound was undetected at the reported concentration.
J = The reported sample detection limit is an estimate.
NA = Not analyzed or results not available.
TEQ = Toxicity equivalent.
(a) TEQ for dioxins/furans is presented in Table 5-3 in units of mg/kg. (1.10E-05 mg/kg = 11 µg/kg)

TABLE 6-7
2007 A-LAYER SEDIMENT SAMPLE AND 2012 INTERIM PLACEMENT MATERIAL ANALYTICAL RESULTS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		DMMU POB 1		DMMU POB 2		DMMU POB 3		CA-LF-IPA1-0201112A	CA-LF-IPA1-021512B	CA-LF-IPA1-021512C	CA-LF-IPA2-022412D	CA-LF-IPA2-022412E
	Soil Screening Levels	Gate3-CMP1 KQ93A/KR14A 3/8/2007	Gate3-Core1 KQ93B 3/8/2007	Gate3-CMP2 KQ93C/KR14B 3/8/2007	Gate3-Core5 KQ93D 3/8/2007	Gate3-CMP3 KQ93F/KR14C 3/9/2007	Gate3-Core9 KQ93E 3/9/2007	IPA 1, Sample 1 2/1/2012	IPA 1, Sample 2 2/15/2012	IPA 1, Sample 3 2/15/2012	IPA 2, Sample 1 2/24/2012	IPA 2, Sample 2 2/24/2012
TOTAL METALS												
EPA Methods 6010B/7470A/7740 (mg/kg)												
Cadmium	80	0.4	NA	0.4	NA	0.4	NA	NA	NA	NA	NA	NA
Chromium	48	73.9	NA	75.1	NA	74.5	NA	NA	NA	NA	NA	NA
Copper	36	57.0	NA	53.7	NA	62.4	NA	NA	NA	NA	NA	NA
Lead	1,000	11	NA	9	NA	10	NA	NA	NA	NA	NA	NA
Mercury	0.07	0.20	NA	0.11	NA	0.15	NA	NA	NA	NA	NA	NA
Nickel	48	116	NA	123	NA	118	NA	NA	NA	NA	NA	NA
Selenium	---	0.6	NA	0.3 U	NA	0.5	NA	NA	NA	NA	NA	NA
Zinc	100	105	NA	104	NA	116	NA	NA	NA	NA	NA	NA
PAHs Method 8270 (mg/kg)												
Phenanthrene	---	0.082	NA	0.062 U	NA	0.086	NA	NA	NA	NA	NA	NA
Fluoranthene	3.2	0.510	NA	0.110	NA	0.270	NA	NA	NA	NA	NA	NA
Pyrene	20	0.630	NA	0.087	NA	0.200	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.13	0.160	NA	0.062 U	NA	0.062 U	NA	NA	NA	NA	NA	NA
Chrysene	0.14	0.200	NA	0.062 U	NA	0.120	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.43	0.140	NA	0.062 U	NA	0.063	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.43	0.110	NA	0.062 U	NA	0.100	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.14	0.076	NA	0.062 U	NA	0.062 U	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.14	0.0098	NA	0.0062 U	NA	0.0068	NA	NA	NA	NA	NA	NA
cPAH TEQ	0.14	0.120	NA	ND	NA	0.180	NA	NA	NA	NA	NA	NA
SEMIVOLATILES												
EPA Method 8270B (mg/kg)												
bis(2-Ethylhexyl)phthalate	6.6	0.061 U	NA	0.062 U	NA	0.078	NA	NA	NA	NA	NA	NA

TABLE 6-7
2007 A-LAYER SEDIMENT SAMPLE AND 2012 INTERIM PLACEMENT MATERIAL ANALYTICAL RESULTS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

		DMMU POB 1		**DMMU POB 2**		**DMMU POB 3**		**CA-LF-IPA1-0201112A**	**CA-LF-IPA1-021512B**	**CA-LF-IPA1-021512C**	**CA-LF-IPA2-022412D**	**CA-LF-IPA2-022412E**
	Soil Screening Levels	Gate3-CMP1 KQ93A/KR14A 3/8/2007	Gate3-Core1 KQ93B 3/8/2007	Gate3-CMP2 KQ93C/KR14B 3/8/2007	Gate3-Core5 KQ93D 3/8/2007	Gate3-CMP3 KQ93F/KR14C 3/9/2007	Gate3-Core9 KQ93E 3/9/2007	IPA 1, Sample 1 2/1/2012	IPA 1, Sample 2 2/15/2012	IPA 1, Sample 3 2/15/2012	IPA 2, Sample 1 2/24/2012	IPA 2, Sample 2 2/24/2012
CONVENTIONAL CHEMISTRY PARAMETERS (mg/kg, unless noted)												
Total Solids (%, Method 160.3)	---	56.00	NA	56.80	NA	54.10	NA	NA	NA	NA	NA	NA
Total Volatile Solids (%, Method 160.4)	---	5.55	NA	5.43	NA	5.74	NA	NA	NA	NA	NA	NA
Preserved Total Solids (%, Method 160.3)	---	NA	53.10	NA	53.60	NA	52.70	NA	NA	NA	NA	NA
Total Organic Carbon (%, PLUMB81TC)	---	1.65	NA	1.27	NA	1.12	NA	NA	NA	NA	NA	NA
Ammonia (NH3) as Nitrogen (N) (Method 350.1)	---	24.0 J	NA	24.2 J	NA	16.0	NA	NA	NA	NA	NA	NA
Sulfide (Method 376.2)	---	NA	1,980	NA	1,850	NA	1,350	NA	NA	NA	NA	NA
CHLORINATED DIOXINS (ng/kg) Method 8290/1613B												
2,3,7,8-TCDD	---	0.270	NA	0.178	NA	0.385	NA	0.269 UJ	0.312 UJ	0.405 UJ	0.248 UJ	0.201 UJ
1,2,3,7,8-PeCDD	---	1.60	NA	0.882	NA	3.85	NA	1.83	3.87	3.43 UJ	2.42	1.67
1,2,3,4,7,8-HxCDD	---	3.90	NA	2.65	NA	10.6	NA	3.24	5.72	6.24 J	4.17	2.84
1,2,3,6,7,8-HxCDD	---	14.7	NA	8.31	NA	42.1	NA	13.2	31.7	24.6	17.4	13.2
1,2,3,7,8,9-HxCDD	---	8.05	NA	4.36	NA	23.3	NA	7.23	15.3	15.6	9.94	7.02
1,2,3,4,6,7,8-HpCDD	---	349	NA	205	NA	954	NA	355	735	695	459	348
OCDD	---	2,390	NA	1,910	NA	6,670	NA	3220	6330	6550	4280	3380
Total TCDD	---	51.2	NA	50.4	NA	58.0	NA	22.5	22.8	24.9	23.6	15.2
Total PeCDD	---	41.4	NA	36.8	NA	56.2	NA	27.9	34.6	38.8	31.6	22.6
Total HxCDD	---	212	NA	128	NA	370	NA	120	1660	258	166	114
Total HpCDD	---	1,040	NA	599	NA	2,320	NA	836	223	1810	1190	922
CHLORINATED FURANS (ng/kg) Method 8290/1613B												
2,3,7,8-TCDF	---	2.04	NA	1.52	NA	2.79	NA	1.51	2.17	1.70	1.53	1.16
1,2,3,7,8-PeCDF	---	1.05	NA	0.581	NA	2.92	NA	0.828 UJ	2.36	1.07 J	0.813 J	0.634 J
2,3,4,7,8-PeCDF	---	1.13	NA	0.493	NA	1.85	NA	1.08	2.24	1.04 UJ	0.900 UJ	0.670 UJ
1,2,3,4,7,8-HxCDF	---	3.45	NA	1.99	NA	7.47	NA	3.32	6.31	4.75 J	3.22	2.49
1,2,3,6,7,8-HxCDF	---	1.50	NA	0.951	NA	3.91	NA	1.42 J	2.85	1.95 UJ	1.72 J	1.27 UJ
2,3,4,6,7,8-HxCDF	---	2.39	NA	1.38	NA	5.54	NA	2.19	4.40	3.33 UJ	1.06 UJ	1.06 J
1,2,3,7,8,9-HxCDF	---	1.30	NA	0.757	NA	3.13	NA	1.23 UJ	3.21	1.70 J	1.37 J	0.921 J
1,2,3,4,6,7,8-HpCDF	---	34.8	NA	17.1	NA	87.3	NA	35.7	76.4	80.4	42.3	35.5
1,2,3,4,7,8,9-HpCDF	---	2.08	NA	1.27	NA	3.68	NA	2.12 U	3.68	3.63 UJ	2.38	2.05
OCDF	---	98.0	NA	49.6	NA	181	NA	83.9	142	230	103	94.1
Total TCDF	---	14.7 J	NA	9.49 J	NA	18.4 J	NA	6.31	9.23	6.37	8.93	4.23
Total PeCDF	---	30.5 J	NA	15.2 J	NA	80.2 J	NA	21.8	58.8	30.4	24.7	19.5
Total HxCDF	---	87.3 J	NA	47.0	NA	248 J	NA	68.0	173	114	77.1	60.8
Total HpCDF	---	131	NA	67.4	NA	291	NA	118	256	260	139	120
TEQ (ND=1/2 DL) (a)	11 (c)	10.6	NA	6.2	NA	27.3	NA	10.5	22.0	17.6	13.0	9.72
TEQ (ND=0) (b)	11 (c)	10.6	NA	6.2	NA	27.3	NA	10.3	21.9	15.3	12.7	9.46

TABLE 6-7
2007 A-LAYER SEDIMENT SAMPLE AND 2012 INTERIM PLACEMENT MATERIAL ANALYTICAL RESULTS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

µg/kg = micrograms per kilogram (ppb).
mg/kg = milligrams per kilogram (ppm).
µg/L = micrograms per liter (ppb).
ng/kg = nanogram per kilogram (pptr)
--- = Indicates no criteria established for this compound.
Boxed cells indicate an exceedance of a screening level.
U = Indicates the compound was not detected at the given reporting limit.
UJ = Indicates the compound was not detected; the given reporting limit is an estimate.
J = Indicates the compound was detected; the given concentration is an estimate.
ND = Not detected.
TEQ = Toxicity equivalent.
(a) TEQ calculated using 2005 World Health Organization (WHO) toxicity equivalency factors (TEFs) and one half the detection limit for non-detects.
(b) TEQ calculated using 2005 World Health Organization (WHO) toxicity equivalency factors (TEFs) and zero for non-detects.
(c) TEQ for dioxins/furans is presented in Table 5-3 in units of mg/kg. (1.10E-05 mg/kg = 11 ng/kg)

TABLE 6-8
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AT THE R.G. HALEY SITE NEAR THE OVERLAP AREA
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Sample ID: Sample Date :	2012 Cornwall Ave LF Site Screening Level	HS-MW-2 4/14/2000	HS-MW-3 4/13/2000	HS-MW-7 4/14/2000	HS-MW-7 5/9/2012	HS-MW-10 6/23/2004	HS-MW-10 9/23/2004	HS-MW-10 12/9/2004	HS-MW-10 3/31/2005	HS-MW-10 9/15/2005	HS-MW-11 6/23/2004	HS-MW-11 9/23/2004	HS-MW-11 12/9/2004	HS-MW-11 4/1/2005	HS-MW-11 9/15/2005	HS-MW-19 7/17/2012
TOTAL METALS (ug/L)																
Method SW6020																
Arsenic	5.0	NA	NA	NA	NA	2.28	NA	NA	NA	NA	2.83	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	2.98	NA	NA	NA	NA	5.04	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	57.6	NA	NA	NA	NA	4.82	NA	NA	NA	NA	NA
DISSOLVED METALS (ug/L)																
Method SW6020																
Arsenic	5.0	NA	NA	NA	NA	1.32	NA	NA	NA	NA	2.47	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	1 U	NA	NA	NA	NA	1.63	NA	NA	NA	NA	NA
PAHs (ug/L)																
Method SW8270																
Naphthalene	83	182	116	26.2	2.4	17.4	NA	0.1 U	1.52	1.31	25.9	NA	11.7	36.6	8.5	20
2-Methylnaphthalene	---	NA	NA	NA	380	97.9	NA	887	70.5	64.8	575	NA	658	798	492	220
1-Methylnaphthalene	---	NA	NA	NA	330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200
Acenaphthylene	---	0.958	1.5	1.04	1.5	0.772	NA	0.1 U	1.19	0.2 U	1.4	NA	0.1 U	4.59	0.5 U	1.2
Acenaphthene	990	4.19	7.45	4.79	10	4.28	NA	5.41 J	6.41	6.59	5.29	NA	9.58	20.2	25.7	8.2
Fluorene	3	4.37	8.72	4.33	8	3.48	NA	4.75	6.14	5.37	2.36	NA	8.84	16.5	16.5	6.8
Phenanthrene	---	5.87	8.63	3.78	5.7	0.466	NA	5.19 J	6.38	2.81	0.01 U	NA	9.32	29.9	28	4.2
Anthracene	9.6	4.71	0.762	0.153	0.26	0.0472	NA	0.1 UJ	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.1 U	0.5 U	0.19
Fluoranthene	3.3	0.1 U	0.1 U	0.1 U	0.059	0.01 U	NA	0.1 UJ	0.2 U	0.2 U	0.246	NA	0.176	1.51	1.94	0.047 U
Pyrene	15	0.1 U	0.1 U	0.1 U	0.09	0.01 U	NA	0.1 UJ	0.446	0.2 U	0.01 U	NA	0.238	2.01	4.05	0.076
Dibenzofuran	---	NA	NA	NA	2.9	1.29	NA	0.1 U	0.783	2.33	1.7	NA	3.33	2.39	6.21	2.2
Benzo(a)pyrene	0.018	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 U	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.259	0.5 U	0.047 U
Benzo(a)anthracene	0.018	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 UJ	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.259	0.5 U	0.047 U
Benzo(b)fluoranthene	0.018	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 U	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.183	0.5 U	0.047 U
Benzo(k)fluoranthene	0.018	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 U	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.233	0.5 U	0.047 U
Chrysene	0.018	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 UJ	0.36	0.2 U	0.01 U	NA	0.1 U	0.444	0.5 U	0.047 U
Indeno(1,2,3-cd)pyrene	0.01	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 U	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.132	0.5 U	0.047 U
Benzo(ghi)perylene	---	0.1 U	0.1 U	0.1 U	0.048 U	0.1 U	NA	1 U	2 U	2 U	0.1 U	NA	1 U	1 U	5 U	0.047 U
Dibenzo(a,h)anthracene	---	0.1 U	0.1 U	0.1 U	0.048 U	0.01 U	NA	0.1 U	0.2 U	0.2 U	0.01 U	NA	0.1 U	0.1 U	0.5 U	0.047 U
Total cPAH TEQ (ND=0.5RL)	0.018	0.1	0.1	0.1	0.036 T	0.01	NA	0.1	0.15	0.15	0.01	NA	0.08	0.35	0.38	0.04 T
SEMIVOLATILES (ug/L)																
Method SW8270																
Pentachlorophenol	10	2.3	3.12	0.5 U	0.12	0.141 J	NA	0.5 UJ	2.94	1 U	0.05 U	NA	0.5 UJ	4.02	4.26	0.77
N-Nitrosodiphenylamine	6	NA	NA	NA	0.95 U	0.02 U	NA	0.2 U	0.4 U	2.2	0.02 U	NA	0.2 UJ	0.2 U	1 U	0.95 U
2,4,6-Trichlorophenol	3	0.5 U	0.781	0.5 U	0.018 U	0.0552	NA	0.5 U	1 UJ	1 U	0.171	NA	0.5 U	0.5 UJ	2.5 U	0.018 U
2,3,5,6-Tetrachlorophenol	---	0.5 U	0.571	0.5 U	0.95 U	0.5 U	NA	5 U	10 U	10 U	0.5 U	NA	5 U	5 U	25 U	0.95 U
2,4,5-Trichlorophenol	3,600	0.5 U	0.5 U	0.5 U	0.95 U	0.05 U	NA	0.5 U	1 U	1 U	0.0638	NA	0.5 U	0.5 U	2.5 U	0.95 U
Carbazole	---	NA	NA	NA	3.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.6
TOTAL PETROLEUM HYDROCARBONS (µg/L)																
NWTPH-DX																
Diesel-range hydrocarbons	500	3140	3360	2320	3600	1530	1280	3840	1900	2060	5230	6460	5200	4090	2990	2500 J
Lube Oil-range Hydrocarbons	500	500 U	500 U	500 U	410 U	750	500 U	4430	1660	2620	500 U	500 U	100 U	500 U	500 U	410 U
BTEX (ug/L)																
Method SW8260B																
Ethylbenzene	2,100	NA	NA	NA	0.2 U	1.76	NA	NA	NA	NA	161	NA	NA	NA	NA	NA
Benzene	51	NA	NA	NA	0.2 U	0.5 U	NA	NA	NA	NA	5.13	NA	NA	NA	NA	NA
EPH (ug/L)																
Method NWEPH																
C10-C12 Aliphatics	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	---	NA	NA	NA	NA	73 J	NA	NA	NA	NA	418 J	NA	NA	NA	NA	NA
C12-C16 Aliphatics	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	---	NA	NA	NA	NA	411 J	NA	NA	NA	NA	2980 J	NA	NA	NA	NA	NA
C16-C21 Aliphatics	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	434	NA	NA	NA	NA	NA
C16-C21 Aromatics	---	NA	NA	NA	NA	212	NA	NA	NA	NA	1090	NA	NA	NA	NA	NA
C21-C34 Aliphatics	---	NA	NA	NA	NA	695	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	84.2	NA	NA	NA	NA	NA
C8-C10 Aliphatics	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	---	NA	NA	NA	NA	50 UJ	NA	NA	NA	NA	165 J	NA	NA	NA	NA	NA
DIOXINS/FURANS (pg/L)																
Method SW8290/EPA1613																
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	43.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	19700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	3860	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	297	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	329	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HxCDD	---	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	71.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5RL) - Human/Mamma	---	NA	NA	NA	NA	114.6 T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS																
Total Organic Carbon (EPA415.1; mg/L)	---	NA	NA	NA	NA	10.8	NA	NA	NA	NA	80.6	NA	NA	NA	NA	NA
FIELD PARAMETERS																
Turbidity (NTU)		NA	NA	NA	10.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.20

TABLE 6-8
ANALYTICAL RESULTS FOR CONSTITUENTS DETECTED IN GROUNDWATER AT THE R.G. HALEY SITE NEAR THE OVERLAP AREA
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Sample ID: Sample Date :	2012 Cornwall Ave LF Site Screening Level	IZ-MW-1 6/22/2004	IZ-MW-1 9/23/2004	IZ-MW-1 12/9/2004	IZ-MW-1 3/30/2005	IZ-MW-1 9/15/2005	TL-MW-10 6/23/2004	TL-MW-10 9/23/2004	TL-MW-10 12/9/2004	TL-MW-10 4/1/2005	TL-MW-10 9/14/2005	TL-MW-12 7/18/2012	TL-MW-13 7/17/2012
TOTAL METALS (ug/L)													
Method SW6020													
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED METALS (ug/L)													
Method SW6020													
Arsenic	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (ug/L)													
Method SW8270													
Naphthalene	83	0.217	NA	0.0402 J	0.0154	0.0462 X	7.58	NA	49.5	41.6	1 U	32	2.2
2-Methylnaphthalene	---	0.1 U	NA	0.1 U	0.1 U	0.1 U	16.9	NA	200	165	1450	680	23
1-Methylnaphthalene	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	520	27
Acenaphthylene	---	0.0105	NA	0.01 U	0.01 U	0.01 U	1 U	NA	1 U	96.1	1 U	2.9	0.29
Acenaphthene	990	0.0125	NA	0.01 U	0.0939	0.01 U	1.6	NA	171	327	3460	17	1.7
Fluorene	3	0.0215	NA	0.01 U	0.12	0.01 U	1 U	NA	186	458	2500	14	1
Phenanthrene	---	0.0666	NA	0.0152 J	0.398	0.0126	1 U	NA	542	1150	15400	14	1.8
Anthracene	9.6	0.0228	NA	0.01 U	0.081	0.01 U	1 U	NA	109	175	2890	0.45	0.1
Fluoranthene	3.3	0.0587	NA	0.01 U	0.0279	0.0106	1 U	NA	21	59.9	737	0.21	0.075
Pyrene	15	0.0562	NA	NA	0.0844	0.0103	0.01 U	NA	56.6	185	2050	0.38	0.13
Dibenzofuran	---	0.01 U	NA	0.01 U	0.0383	0.01 U	1 U	NA	1 U	92.2	1 U	4.8	0.95 U
Benzo(a)pyrene	0.018	0.016	NA	0.0146 J	0.0101	0.01 U	0.0201	NA	6.7	10.6	135 J	0.047 U	0.048 U
Benzo(a)anthracene	0.018	0.0196	NA	0.01 U	0.0182	0.01 U	0.01 U	NA	15.9	35.8	509	0.055	0.048 U
Benzo(b)fluoranthene	0.018	0.0121	NA	0.01 U	0.0102	0.01 U	0.013	NA	1 U	7.39	57.7 J	0.047 U	0.048 U
Benzo(k)fluoranthene	0.018	0.0258	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	1 U	3.52	78.8 J	0.047 U	0.048 U
Chrysene	0.018	0.0233	NA	0.01 U	0.028	0.01 U	0.01 U	NA	22.4	50.4	619	0.048	0.048 U
Indeno(1,2,3-cd)pyrene	0.01	0.0196	NA	0.0242 J	0.01 U	0.01 U	0.01 U	NA	1 U	2.63	1 U	0.047 U	0.048 U
Benzo(ghi)perylene	---	0.1 U	NA	0.01 U	0.1 U	0.1 U	0.1 U	NA	10 U	10 U	75	0.047 U	0.048 U
Dibenzo(a,h)anthracene	---	0.0258	NA	0.01 U	0.01 U	0.01 U	0.01 U	NA	1 U	1.85	1 U	0.047 U	0.048 U
Total cPAH TEQ (ND=0.5RL)	0.018	0.03	NA	0.02	0.01	0.01	0.02	NA	8.7	16.22	205.8	0.04 T	0.04 T
SEMIVOLATILES (ug/L)													
Method SW8270													
Pentachlorophenol	10	0.147	NA	0.05 UJ	0.25	0.0822	5 U	NA	5 UJ	5 U	1350	0.03	0.066
N-Nitrosodiphenylamine	6	0.02 U	NA	0.02 U	0.231	0.02 U	2 U	NA	2 UJ	824 J	2 U	0.95 U	0.95 U
2,4,6-Trichlorophenol	3	0.05 U	NA	0.05 U	0.05 UJ	0.05 U	5 U	NA	5 U	5 U	5 U	0.018 U	0.018 U
2,3,5,6-Tetrachlorophenol	---	0.5 U	NA	0.5 U	0.5 U	0.5 U	50 U	NA	50 U	50 U	50 U	0.95 U	0.95 U
2,4,5-Trichlorophenol	3,600	0.05 U	NA	0.05 U	0.05 U	0.05 U	5 U	NA	5 U	5 U	5 U	0.95 U	0.95 U
Carbazole	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.4	0.95 U
TOTAL PETROLEUM HYDROCARBONS (µg/L)													
NWTPH-DX													
Diesel-range hydrocarbons	500	250 U	250 U	250 U	250 U	NA	2510	79800	151000	288000	2470000	5800 J	820 J
Lube Oil-range Hydrocarbons	500	500 U	500 U	NA	500 U	500 U	500 U	10400	50000 U	65400	622000	410 U	410 U
BTEX (ug/L)													
Method SW8260B													
Ethylbenzene	2,100	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1
Benzene	51	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
EPH (ug/L)													
Method NWEPH													
C10-C12 Aliphatics	---	50 UJ	NA	NA	NA	NA	3950 J	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	---	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	---	50 UJ	NA	NA	NA	NA	45800 J	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	---	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	---	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	---	50 U	NA	NA	NA	NA	40300 J	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	---	50 U	NA	NA	NA	NA	16100 J	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	---	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aliphatics	---	50 UJ	NA	NA	NA	NA	292 J	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	---	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DIOXINS/FURANS (pg/L)													
Method SW8290/EPA1613													
1,2,3,7,8,9-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HxCDD	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dioxin/Furan TEQ (ND=0.5RL) - Human/Mamma	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CONVENTIONALS													
Total Organic Carbon (EPA415.1; mg/L)	---	57.2	NA	NA	NA	NA	98.5	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS													
Turbidity (NTU)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.20	14.30

ug/L = micrograms per liter
pg/L = picograms per liter
--- = Water Quality Standard or other criteria not established
E = Reported result is an estimate because of the presence of interference
J = The analyte was positively identified. The associated numerical result is an estimate
U = The analyte was not detected at or above the value shown
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate
NA = Not analyzed or result not available.
TEQ = Toxicity Equivalency

TABLE 6-9
TP-7 PRODUCT SAMPLE ANALYTICAL RESULTS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Analyte	Analytical Result
PAH (mg/kg)	
Naphthalene	2,200
2-Methylnaphthalene	17,000
Acenaphthylene	100 U
Acenaphthene	670
Fluorene	720
Phenanthrene	1,900
Anthracene	100 U
Fluoranthene	100 U
Pyrene	120
Benzo(a)anthracene	100 U
Chrysene	100 U
Benzo(b)fluoranthene	100 U
Benzo(k)fluoranthene	100 U
Benzo(a)pyrene	100 U
Indeno(1,2,3-cd)pyrene	100 U
Dibenz(a,h)anthracene	100 U
Benzo(g,h,i)perylene	100 U
Dibenzofuran	280
PCBs (mg/kg)	
Aroclor 1016	1 U
Aroclor 1242	1 U
Aroclor 1248	1 U
Aroclor 1254	1 U
Aroclor 1260	1 U
Aroclor 1221	2 U
Aroclor 1232	1 U
BTEX (mg/kg)	
Benzene	0.1 U
Toluene	0.1 U
Ethylbenzene	3.7
m,p-Xylene	12
o-Xylene	6.7
DIESEL RANGE HYDROCARBONS (mg/kg)	
Diesel Range Hydrocarbons	990,000
Motor Oil	10,000

mg/kg = milligram per kilogram

U = Indicates compound was analyzed for, but was not detected at the reported sample detection limit.

TABLE 8-1
SCREENING CRITERIA SUMMARY
DETECTED GROUNDWATER CONSTITUENTS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Constituents	Highest Concentration Detected in Downgradient Perimeter Samples	Preliminary Screening Level (SL) (a)	Criteria Exceedances For Downgradient Perimeter Samples (b)
Dissolved Metals (µg/L)			
Arsenic	2	5	0 of 24
Copper	2.6	2.4	1 of 24
Lead	1	8.1	0 of 24
Zinc	50	81	0 of 24
PAHs (µg/L)			
Naphthalene	3.9	83	0 of 24
Acenaphthene	1.4	3.3	0 of 24
Fluorene	1.4	3	0 of 24
Anthracene	5	9.6	0 of 24
Fluoranthene	0.18	3.3	0 of 24
Pyrene	0.39	15	0 of 24
2-Methylnaphthalene	3.3	15	0 of 24
SVOCs (µg/L)			
bis(2-Ethylhexyl)phthalate	2.5	3	0 of 24
1,4-Dichlorobenzene	1.4	5	0 of 24
VOCs (µg/L)			
Benzene	0.51	51	0 of 24
Toluene	0.2	15,000	0 of 24
Chlorobenzene	10	1,600	0 of 24
Ethylbenzene	3.1	2,100	0 of 24
1,2-Dichlorobenzene	0.36	6.1	0 of 24
1,4-Dichlorobenzene	3.2	5	0 of 24
Conventionals (mg/L)			
Manganese *(dissolved)*	1.44	0.1	22 of 24
NH_3-Ammonia (mg NH_3/L) (c)	0.636	0.035	13 of 24

µg/L = microgram per liter
mg/L = milligram per liter
Detected groundwater constituents are listed in Table 6-2 of this report.
An understanding of the text is necessary for proper interpretation of this table.
(a) PSLs based on most restrictive criteria protective of surface water or marine sediment.
(b) 0 of 24: Number of samples exceeding the SL; number of samples tested in downgradient perimeter monitoring.
(c) NH_3-Ammonia calculated using sample's total ammonia, pH, and temperature with equations from equations developed by Emerson et al. 1975.

TABLE 8-2
PRELIMINARY CLEANUP LEVELS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Indicator Hazardous Substance	Sediment (a) (mg/kg - dry)	Sediment (b) (mg/kg - OC)	Groundwater (µg/L)	Basis for Groundwater Preliminary Cleanup Level
Copper	390	---	---	---
Cadmium	(c)	---	---	---
Lead	(c)	---	---	---
Silver	6.1	---	---	---
Zinc	410	---	---	---
Bis(2-ethylhexyl)phthalate	1.3	47	---	---
cPAHs	(c)	---	---	---
PCBs (d)	0.006	---	---	---
Manganese	---	---	0.1	Surface Water ARAR - Human Health – Marine – Clean Water Act §304
NH_3-Ammonia (mg NH_3/L)	---	---	0.035	Surface Water ARAR - Aquatic Life - Marine/Chronic - Ch. 173-201A WAC

--- Cleanup level was not developed for this indicator constituent because no Screening level (SL) exceedance occurred in this medium.

(a) Sediment cleanup levels based on Sediment Quality Standard, dry weight, except as otherwise noted.

(b) Sediment cleanup levels based on Sediment Quality Standard, carbon normalized values, except as otherwise noted.

(c) Potentially bioaccumulative constituent. PCL not developed because PCBs used in RI/FS as surrogate for all relevant bioaccumulatives

(d) Sediment cleanup level for PCBs is based on PQL for individual PCB aroclors.

TABLE 8-3
SCREENING CRITERIA SUMMARY
DETECTED SEDIMENT CONSTITUENTS
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Constituent	Maximum Concentration in Surface Sediment Samples	SQS (a)	PQL (b)	Criteria Exceedances (c)
Metals (mg/kg-dry wt)				
Copper	756E	390	-	2/16
Lead	887	450	-	2/16
Silver	12J	6.1	-	1/16
Zinc	2140E	410	-	1/16
Organics (mg/kg OC)				
Bis (2-ethylhexyl)phthalate	100	47	-	2/11
Total PCBs	24.6	12	0.21	11/12
Total bulk PCBs (mg/kg-dry wt)			0.006	

E = Reported result is an estimate because of the presence of interference.

J = Analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

mg/kg = milligrams per kilogram

OC = carbon normalized

(a) Sediment Quality Standard chemical criteria (WAC 173-204).

(b) For PCBs, the preliminary cleanup level has been established at the PQL.
PQL is based on the recommended value in Ecology's Sediment Sampling and Analysis Plan Appendix (Ecology 2008)
PQL for organic carbon normalized criteria based on an average organic carbon concentration of 2.8%.

(c) 1/3: Numerator equals number of samples exceeding one or more criteria. Denominator equals number of samples tested (i.e., one sample from S-1, S-2, and S-3).

Results and criteria for copper, lead, and silver are based on dry weight.

Results for bis(2-ethylhexyl)phthalate and PCBs are normalized for TOC.

TABLE 9-1
REMEDIAL ACTION ALTERNATIVES SUMMARY
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative Number	Alternative Name	Soil Remedy	Groundwater Remedy	Indoor Air/Soil Gas/ Landfill Gas Remedy	Sediment Remedy
1	Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR	Containment by placement of low permeability cap over the Upland Site Unit, potentially consisting of low permeability soil; separation, gas control, drainage, and cover soil layers; and pavement and/or buildings. Institutional controls for maintaining Site covers and managing intrusive activities.	Low permeability cap over the Upland Site Unit to reduce surface water infiltration. Improve drainage near BNSF railroad and decommission existing stormwater system in northeast portion of Site (reduce infiltration). Site regrading to enhance stormwater runoff and decrease infiltration. Institutional controls restricting groundwater use and long term groundwater compliance monitoring to confirm compliance with cleanup standards.	Landfill gas control system beneath all capped areas of Site.	Shoreline stabilization system over intertidal and shallow subtidal zones to contain refuse/wood debris and limit human and benthic contact. Monitored natural attenuation for deep subtidal zone.
2	Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR	Containment by placement of low permeabilty cap over the Upland Site Unit, potentially consisting of low permeability soil with a scrim-reinforced liner; gas control, drainage, and cover soil layers; and pavement and/or buildings. Institutional controls for maintaining Site covers and managing intrusive activities.	Low permeability cap over the Upland Site Unit reduces surface water infiltration. Improve drainage near BNSF railroad and decommission existing stormwater system in northeast portion of Site (reduce infiltration). Site regrading to enhance stormwater runoff and decrease infiltration. Sand treatment layer underlying shoreline stabilization system to filter groundwater prior to discharge to surface water, and enhance hydrodynamic dispersion and aeration. Institutional controls restricting groundwater use and long term groundwater compliance monitoring to confirm compliance with cleanup standards.	Landfill gas control system beneath all capped areas of Site.	Shoreline stabilization system over intertidal and shallow subtidal zones to contain refuse/wood debris and limit human and benthic contact. Thin-layer sand cap in deep subtidal zone. MNR for affected uncapped areas in deep subtidal zone.
3	Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Containment Cap, and MNR	Containment by placement of two-layer low permeability cap (soil and FML) potentially consisting of low permeability soil; gas control, drainage, and cover soil layers; and pavement and/or buildings.	Two-layer low permeability cap over the Upland Site Unit reduces surface water infiltration. Improve drainage near BNSF railroad and decommission existing stormwater system in northeast portion of Site (reduce infiltration). Site regrading to enhance stormwater runoff and decrease infiltration. Upgradient groundwater diversion barrier system to reduce groundwater flow. Sand/gravel layer underlying shoreline stabilization system to filter groundwater prior to discharge to surface water (additionally enhances hydrodynamic dispersion and aeration). Institutional controls restricting groundwater use and long term groundwater compliance monitoring to confirm compliance with cleanup standards.	Landfill gas control system beneath all capped areas of Site.	Shoreline stabilization system to contain refuse/wood debris and limit human and benthic contact. Engineered sediment cap in deep subtidal zone. MNR for uncapped areas within deep subtidal zone.
4	Waste Removal	Excavation of landfill refuse and wood debris, and offsite disposal at a licensed solid waste disposal facility.	Not Applicable (source would be removed).	Not Applicable (source would be removed).	Removal of source of sediment contamination, including refuse and wood debris. Reconfiguring and stabilizing the new shoreline.

TABLE 9-2
EVALUATION OF REASONABLE RESTORATION TIME FRAME, UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Criteria	Alternative 1: Containment with Low Permeability Cap, Shoreline Stabilization, and Monitored Natural Recovery	Alternative 2: Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and Monitored Natural Recovery	Alternative 3: Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap, and Monitored Natural Recovery	Alternative 4: Waste Removal and Offsite Disposal
Potential risks to human health and the environment.	Alternative 1 is expected to achieve soil cleanup standards immediately. It may require 1 or more years following construction to achieve groundwater cleanup standards, depending on the length of time required to achieve stabilized conditions after construction. Therefore, this timeframe is reasonable given the potential risks to human health and the environment.	The timeframe for achieving soil cleanup standards is similar to Alternative 1, and the timeframe for achieving groundwater cleanup standards is faster than for Alternative 1, due to reduction in groundwater discharge resulting from shoreline sand filter system. Therefore, this timeframe is also reasonable given the potential risks to human health and the environment.	The timeframe for achieving soil cleanup standards is similar to Alternatives 1 and 2, and the timeframe for achieving groundwater cleanup standards is similar but may be slightly faster than for Alternative 2, due to reduction in groundwater discharge resulting from groundwater diversion system. Therefore, this timeframe is also reasonable given the potential risks to human health and the environment.	Excavation and offsite disposal will achieve risk reduction in a longer timeframe (4 to 5 years) based on the complexity of implementation requiring additional planning and construction time. However, with source removal, all of the potential risk will be eliminated after implementation.
Practicability of achieving shorter restoration time frame.	Achieves reasonable restoration time frame, though Alternatives 2 and 3 may be able to achieve cleanup standards for groundwater somewhat faster based on additional measures to reduce surface or groundwater infiltration to the Site.	Achieves reasonable restoration time frame, though Alternative 3 may be able to achieve cleanup standards for groundwater somewhat faster based on additional efforts to reduce groundwater infiltration.	This Alternative has the shortest practicable restoration timeframe.	Estimated restoration time frame: 4 to 5 years including design. This Alternative has the longest estimated restoration timeframe.
Current use of Site, surrounding areas, and associated resources that is, or may be, affected by releases from the Site.	Current use of the Site is limited by the presence of contamination. The estimated restoration timeframe is reasonable for future planned use of the Site uplands.	Current use of the Site is limited by the presence of contamination. The estimated restoration timeframe is reasonable for future planned use of the Site uplands.	Current use of the Site is limited by the presence of contamination. The estimated restoration timeframe is reasonable for future planned use of the Site uplands.	Cleanup action would eliminate current upland Site use and return to marine habitat. This Alternative would preclude the use of the upland portion of the Site as a park, since it would be returned to marine habitat.
Availability of alternate water supplies.	City of Bellingham municipal water supply readily available and is not affected by cleanup of the Site.	City of Bellingham municipal water supply readily available and is not affected by cleanup of the Site.	City of Bellingham municipal water supply readily available and is not affected by cleanup of the Site.	Not applicable, based on conversion to marine habitat.
Likely effectiveness and reliability of institutional controls.	Degree of effectiveness of institutional controls is high and would be effective immediately upon implementation. Long-term City/DNR ownership will minimize potential for institutional controls to be overlooked or otherwise violated.	Degree of effectiveness of institutional controls is high and would be effective immediately upon implementation. Long-term City/DNR ownership will minimize potential for institutional controls to be overlooked or otherwise violated.	Degree of effectiveness of institutional controls is high and would be effective immediately upon implementation. Long-term City/DNR ownership will minimize potential for institutional controls to be overlooked or otherwise violated.	Institutional controls not required.
Ability to control and monitor migration of hazardous substances from the Site.	Estimated restoration timeframe is appropriate based on the immediate implementation of measures to control and monitor migration of hazardous substances form the Site.	Estimated restoration timeframe is appropriate based on the immediate implementation of measures to control and monitor migration of hazardous substances form the Site.	Estimated restoration timeframe is appropriate based on the immediate implementation of measures to control and monitor migration of hazardous substances form the Site.	Control of hazardous substance migration during construction would be a significant issue. Following implementation, the contaminant source and risk of future migration would be eliminated, except for possible suspension and redistribution of hazardous substances during removal that could contaminate surface sediment.
Toxicity of hazardous substances at the Site.	Alternative 1 is expected to achieve soil cleanup standards immediately. It may require 1 or more years following construction to achieve groundwater cleanup standards, depending on the length of time required to achieve stabilized conditions after construction. Based on the toxicity of hazardous substances at the Site, the estimated restoration timeframe is reasonable.	The timeframe for achieving soil cleanup standards is similar to Alternative 1, and the timeframe for achieving groundwater cleanup standards is faster than for Alternative 1, due to reduction in groundwater discharge resulting from shoreline sand filter system. Therefore, based on the toxicity of hazardous substances at the Site, the estimated restoration timeframe for Alternative 2 is also reasonable.	The timeframe for achieving soil cleanup standards is similar to Alternatives 1 and 2, and the timeframe for achieving groundwater cleanup standards is similar but may be slightly faster than for Alternative 2, due to reduction in groundwater discharge resulting from groundwater diversion system. Therefore, based on the toxicity of hazardous substances at the Site this timeframe is also reasonable.	Alternative 4 would not reduce toxicity, but would remove hazardous substances from the Site. Based on the toxicity of hazardous substances at this Site, the estimated restoration timeframe for this Alternative is reasonable.
Natural processes which reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar Site conditions.	In addition to the upland cap achieving soil cleanup standards, a primary mechanism for reduction of concentrations in groundwater is hydrodynamic dispersion due to tidal fluctuation and increased dissolved oxygen near the shoreline caused by wave action and tidal exchange. This process is dynamic but will begin to occur immediately upon implementation and therefore the estimated restoration timeframe is reasonable.	In addition to the upland cap achieving soil cleanup standards, a primary mechanism for reduction of concentrations in groundwater is hydrodynamic dispersion due to tidal fluctuation and increased dissolved oxygen near the shoreline caused by wave action and tidal exchange. This process is dynamic but will begin to occur immediately upon implementation and therefore the estimated restoration timeframe is reasonable. The inclusion of a shoreline sand filter in this Alternative may improve the estimated restoration timeframe compared to Alternative 1.	In addition to the upland cap achieving soil cleanup standards, a primary mechanism for reduction of concentrations in groundwater is hydrodynamic dispersion due to tidal fluctuation and increased dissolved oxygen near the shoreline caused by wave action and tidal exchange. This process is dynamic but will begin to occur immediately upon implementation and therefore the estimated restoration timeframe is reasonable. The inclusion of additional groundwater diversion in this Alternative may improve the estimated restoration timeframe compared to Alternative 1.	Not applicable. Contaminant source will be removed.

TABLE 9-3
EVALUATION OF REASONABLE RESTORATION TIME FRAME, MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Criteria	Alternative 1: Containment with Low Permeability Cap, Shoreline Stabilization, and Monitored Natural Recovery	Alternative 2: Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and Monitored Natural Recovery	Alternative 3: Two-Layer Upland Cap, Upgradient Groundwater Interception, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap, and Monitored Natural Recovery	Alternative 4: Waste Removal and Offsite Disposal
Potential risks to human health and the environment.	Alternative 1 is anticipated to achieve adequate protection of human health and the environment in the intertidal and shallow subtidal areas within 3 to 5 years (2 years of cleanup action construction), and within 10 to 20 years within deep subtidal zone where MNR applied. .	Similar to Alternative 1, but increased protection in intertidal and shallow subtidal zones because of improved groundwater quality resulting from installation of sand filter layer, and increased protection in subtidal zone where sediment cap placed. Anticipated to achieve protection of human health and the environment in intertidal and shallow subtidal zones, and portion of deep subtidal zone that is capped, immediately following cleanup construction (1 to 2 years). Remainder of deep subtidal zone anticipated to achieve protection within 10 to 15 years, slightly shorter than Alternative 1 because capping of portion of deep subtidal zone should accelerate the effectiveness of MNR.	Restoration time frame anticipated to be the same as Alternative 2, but greater protection in capped portion of deep subtidal area due to thicker, engineered cap.	Dredging and offsite disposal will remove sediment contamination and source of contaminated groundwater discharge to Bellingham Bay following construction (4 to 5 years), which is a similar restoration time frame as Alternative 1 through 3 in the intertidal and shallow subtidal zones, but 5 to 15 years shorter than Alternatives 1 through 3 in the deep subtidal zone. However, redistribution and contamination of post-construction sediment surface could extend the restoration time frame by 10 to 20 years, resulting in a similar restoration time frame to the other alternatives.
Practicability of achieving shorter restoration time frame.	A shorter restoration time frame may be achievable for the portion of the Marine Site Unit subject to MNR. Practicability of achieving shorter restoration time frame evaluated in DCA.	Alternative 4 (complete removal) is anticipated to achieve a shorter restoration time frame. The practicability of achieving a shorter restoration time frame will be evaluated in the DCA.	Equivalent to Alternative 2.	None of the other alternatives provide a shorter restoration time frame. The practicability of achieving a shorter restoration time frame will be evaluated in the DCA.
Current use of Site, surrounding areas, and associated resources that is, or may be, affected by releases from the Site.	Current use limited because of releases from the Site. Aquatic resources and function will likely be restored within about 3 to 5 years following construction in intertidal and shallow subtidal zones, and 10 to 20 years in deep subtidal zone subject to MNR.	Similar to Alternative 1, except that aquatic resources and function would be more rapidly restored in the portion of the deep subtidal area that is capped rather than relying exclusively on MNR.	Equivalent to Alternative 2.	Current Site use for aquatic purposes would be significantly improved by removing waste and creating significant new aquatic habitat with improved habitat function.
Availability of alternate water supplies.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Likely effectiveness and reliability of institutional controls.	Institutional controls should be effective in limiting shellfish gathering and other activities that could compromise the integrity of the shoreline stabilization system.	Equivalent to Alternative 1.	Similar to Alternative 1. Institutional controls would likely be extended to prevent activities that could compromise the integrity of the engineered sediment cap.	Not applicable.
Ability to control and monitor migration of hazardous substances from the Site.	Implementation of the Alternative would control migration of hazardous substances in intertidal and shallow subtidal zones immediately following construction. Control of migration in the deep subtidal zone subject to MNR would be controlled within 10 to 20 years. The migration of hazardous substances would be monitored through sediment natural recovery monitoring starting immediately following construction of shoreline stabilization system and periodically until sediment cleanup standards are achieved throughout the Site.	Improved compared to Alternative 1. Additional control of hazardous substances in deep subtidal zone provided through placement of thin layer cap.	Somewhat Improved compared to Alternative 2. Additional control of hazardous substances in portion of deep subtidal zone provided through placement of engineered cap.	The control of contaminant migration would be difficult during construction due to the removal of large volumes of affected media in direct contact with tidally-affected surface water. Control not required following implementation, but natural recovery monitoring may be required if significant surface contamination results from suspension and redistribution.
Toxicity of hazardous substances at the Site.	Toxicity of hazardous substances would not be affected, but would be contained immediately in the intertidal and shallow subtidal zones. Complete containment in deep subtidal zone would not occur until natural recovery processes developed adequate clean sediment cap, estimated to be 10 to 20 years.	Improved compared to Alternative 1. Containment in deep subtidal would not occur until natural recovery processes developed adequate clean sediment cap.	Improved compared to Alternative 2. Refuse and wood debris in sediments at the Site exceed benthic criteria. Containment in deep subtidal would not occur beyond engineered cap until natural recovery processes developed adequate clean sediment cap.	Alternative would not reduce toxicity, but would remove hazardous substances from the Site.
Natural processes which reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar Site conditions.	Natural recovery of sediment quality is documented to occur at the Site in subtidal sediment.	See Alternative 1.	See Alternative 1.	See Alternative 1. Natural recovery only relevant if suspension and redistribution of contamination results in surface sediment contamination following cleanup.

TABLE 9-4
ALTERNATIVES COST ESTIMATE SUMMARY (a)
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative Number	Alternative Name	Upland Site Unit Estimated Cost [(b)]	Marine Site Unit Estimated Cost [(b)]
1	Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR	**$ 5,100,000**	**$ 3,100,000**
2	Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Thin Layer Sediment Cap, and MNR	**$ 5,700,000**	**$ 3,400,000**
3	Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap, and Monitored Natural Recovery	**$ 6,900,000**	**$ 3,800,000**
4	Waste Removal and Offsite Disposal	**$ 53,700,000**	**$ 24,500,000**

(a) All estimated costs represent present worth based on a discount rate of 3% for long-term operation, monitoring, and maintenance tasks, and are considered order of magnitude estimates with a relative accuracy range of -30 to +50 percent. Use should be limited to the comparative evaluation of alternatives. More accurate costs will be developed during the design and implementation phases of the cleanup.

(b) A detailed breakdown of estimated costs are provided in Appendix F.

TABLE 9-5
SUMMARY OF MTCA ALTERNATIVES EVALUATION AND DCA RANKING
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Site Unit	Upland Site Unit			
Alternative Number	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Alternative Name	**Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**	**Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**	**Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**	**Waste Removal and Offsite Disposal**
Alternative Description (Specific to the Upland Site Unit)	Containment by placement of low permeability cap over the Upland Site Unit, potentially consisting of low permeability soil, separation, drainage, and cover soil layers, pavement and/or buildings; landfill gas control; and institutional controls and compliance monitoring.	Containment by placement of low permeability cap over the Upland Site Unit, potentially consisting of low permeability soil with a scrim-reinforced liner, drainage, and cover soil layers, pavement and/or buildings; landfill gas control; and institutional controls and compliance monitoring.	Containment with two-layer low permeability cap (soil and FML), pavement or buildings over landfill; shoreline sand filter; stormwater and erosion control; upgradient groundwater diversion barrier system; landfill gas control; and institutional controls and compliance monitoring	Complete removal of refuse and wood waste and the associated contaminated soil; offsite disposal at a solid waste facility
Individual Ranking Criteria				
1 Meets Remedial Action Objectives	Yes	Yes	Yes	Yes
2 Compliance With MTCA Threshold Criteria				
[WAC 173-340-360(2)(a)]				
-Protect human health and the environment	Yes	Yes	Yes	Yes
-Comply with cleanup standards	Yes	Yes	Yes	Yes
-Comply with applicable state/federal laws	Yes	Yes	Yes	Yes
-Provide for compliance monitoring	Yes	Yes	Yes	Yes
3 Restoration Time Frame	est. 3 to 5 years	est. 1 to 2 years	est. 1 to 2 years	est. 4 - 5 years
[WAC 173-340-360(2)(b)(ii) and WAC 173-340-360(4)]				
-Potential risk to human health and environment	medium low	Low	Low	Low
-Practicability of achieving shorter restoration time	Low	Low	Low	Medium
-Current use of site, surrounding area, and resources	Industrial	Industrial	Industrial	Industrial
-Future use of site, surrounding area, and resources	Parkland/Mixed Use or Industrial	Parkland/Mixed Use or Industrial	Parkland/Mixed Use or Industrial	Parkland/Mixed Use or Industrial
-Availability of alternative water supplies	Yes	Yes	Yes	Yes
-Likely effectiveness/reliability of institutional controls	High	High	High	Not Applicable
-Ability to monitor migration of hazardous substances	Yes	Yes	Yes	Yes
-Toxicity of hazardous substances at the site	Low	Low	Low	Low
-Natural processes that reduce concentrations	Yes	Yes	Yes	Yes
Overall Reasonable Restoration Time Frame Reasonable	Yes	Yes	Yes	Yes

4 Relative Benefits Ranking for DCA [WAC 173-340-360(2)(b)(i) and WAC 173-340-360(3)(f)]	Alternative 1 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score	Alternative 2 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score	Alternative 3 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score	Alternative 4 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score
-Overall Protectiveness	Medium Low	4	0.3	1.2	Medium	6	0.3	1.8	Medium High	7	0.3	2.1	High	9	0.3	2.7
-Permanence	Medium	5	0.2	1	Medium	6	0.2	1.2	Medium	6	0.2	1.2	High	9	0.2	1.8
-Long-Term Effectiveness	Medium	5	0.2	1	Medium	6	0.2	1.2	Medium High	7	0.2	1.4	High	10	0.2	2
-Manageability of Short-Term Risk	High	9	0.1	0.9	High	9	0.1	0.9	Medium High	8	0.1	0.8	Low	2	0.1	0.2
-Implementability	High	9	0.1	0.9	High	9	0.1	0.9	Medium High	7	0.1	0.7	Medium Low	3	0.1	0.3
-Consideration of Public Concerns	High	10	0.1	1	High	10	0.1	1	High	10	0.1	1	High	10	0.1	1
-Net Environmental Benefit	N/A			0	N/A			0	N/A			0	N/A			0
Comparative Overall Benefit				**6.0**				**7.0**				**7.2**				**8.0**

5 Disproportionate Cost Analysis	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Estimated Remedy Cost	**$ 5,100,000**	**$ 5,700,000**	**$ 6,900,000**	**$ 53,700,000**
Magnitude of Cost Compared to Lowest Cost Alternative	--	112%	135%	1053%
Magnitude of Relative Benefit to Most Permanent Alternative	75%	88%	90%	--
Relative Benefit / (Cost / $5 Million)	5.88	6.14	5.22	0.74
Costs Disproportionate to Incremental Benefits	No	Yes	Yes	Yes
Remedy Permanent to the Maximum Extent Practicable	**No**	**Yes**	**No**	**No**

Note: Relative Benefit / Cost values are scaled per $5 million in order to compare ranges similar in scale to comparative overall benefit, allowing the plot of all 3 parameters on Figure 9-10.

TABLE 9-5
SUMMARY OF MTCA ALTERNATIVES EVALUATION AND DCA RANKING
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Site Unit	Marine Site Unit			
Alternative Number	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Alternative Name	**Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**	**Containment with Low Permeability Cap and Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**	**Containment with Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization, Engineered Sediment Cap, and Monitored Natural Recovery**	**Waste Removal and Offsite Disposal**
Alternative Description (Specific to the Marine Site Unit)	Shoreline stabilization in the intertidal and shallow subtidal zones; monitored natural recovery of contaminated deep subtidal sediments; compliance monitoring and institutional controls	Shoreline stabilization in the intertidal and shallow subtidal zones; deep subtidal thin layer cap; monitored natural recovery in un-capped deep subtidal area; compliance monitoring and institutional controls	Shoreline stabilization in the intertidal and shallow subtidal zones; deep subtidal engineered cap; monitored natural recovery in un-capped deep subtidal area; compliance monitoring and institutional controls	Removal of refuse, wood debris, and contaminated sediments from the marine environment; shoreline stabilization of the new shoreline
Individual Ranking Criteria				
1 Meets Remedial Action Objectives	Yes	Yes	Yes	Yes
2 Compliance With MTCA Threshold Criteria				
[WAC 173-340-360(2)(a)]				
-Protect human health and the environment	Yes	Yes	Yes	Yes
-Comply with cleanup standards	Yes	Yes	Yes	Yes
-Comply with applicable state/federal laws	Yes	Yes	Yes	Yes
-Provide for compliance monitoring	Yes	Yes	Yes	Yes
3 Restoration Time Frame	est. 10 - 20 years	est. 10 to 15 years	est. 10 to 15 years	est. 3 - 5 years, possibly longer if redistribution
[WAC 173-340-360(2)(b)(ii) and WAC 173-340-360(4)]				
-Potential risk to human health and environment	Medium Low	Low	Low	Low
-Practicability of achieving shorter restoration time	Medium	Low	Low	Low
-Current use of site, surrounding area, and resources	Recreation and Commercial Maritime	Recreation and Commercial Maritime	Recreation and Commercial Maritime	Recreation and Commercial Maritime
-Future use of site, surrounding area, and resources	Recreation and Commercial Maritime	Recreation and Commercial Maritime	Recreation and Commercial Maritime	Recreation and Commercial Maritime
-Availability of alternative water supplies	Not Applicable	Not Applicable	Not Applicable	Not Applicable
-Likely effectiveness/reliability of institutional controls	High	High	High	Not Applicable
-Ability to monitor migration of hazardous substances	High	High	High	Not Applicable
-Toxicity of hazardous substances at the site	Medium	Medium	Medium	Medium
-Natural processes that reduce concentrations	Yes	Yes	Yes	Yes
Overall Reasonable Restoration Time Frame	Yes	Yes	Yes	Yes

4 Relative Benefits Ranking for DCA
[WAC 173-340-360(2)(b)(i) and WAC 173-340-360(3)(f)]

	Alternative 1 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score	Alternative 2 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score	Alternative 3 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score	Alternative 4 Comparative Benefit Rating	Score	Weighting Factor	Weighted Score
-Overall Protectiveness	Medium	5	0.3	1.5	Medium High	7	0.3	2.1	Medium High	8	0.3	2.4	High	9	0.3	2.7
-Permanence	Medium	6	0.2	1.2	Medium High	7	0.2	1.4	Medium High	7	0.2	1.4	High	9	0.2	1.8
-Long-Term Effectiveness	Medium	5	0.1	0.5	Medium High	8	0.1	0.8	Medium High	8	0.1	0.8	High	9	0.1	0.9
-Manageability of Short-Term Risk	High	9	0.1	0.9	Medium High	8	0.1	0.8	Medium High	8	0.1	0.8	Low	2	0.1	0.2
-Implementability	High	10	0.1	1.0	High	9	0.1	0.9	High	9	0.1	0.9	Medium Low	4	0.1	0.4
-Consideration of Public Concerns	High	10	0.1	1.0	High	10	0.1	1.0	High	10	0.1	1.0	High	10	0.1	1.0
-Net Environmental Benefit	Medium	5	0.1	0.5	Medium	6	0.1	0.6	Medium High	7	0.1	0.7	High	9	0.1	0.9
Comparative Overall Benefit				**6.6**				**7.6**				**8.0**				**7.9**

5 Disproportionate Cost Analysis	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Estimated Remedy Cost	**$ 3,100,000**	**$ 3,400,000**	**$ 3,800,000**	**$ 24,500,000**
Magnitude of Cost Compared to Lowest Cost Alternative	--	110%	123%	790%
Magnitude of Relative Benefit to Most Permanent Alternative	84%	96%	101%	100%
Relative Benefit / Cost ($5 Million)	10.65	11.18	10.53	1.61
Costs Disproportionate to Incremental Benefits	No	No	Yes	Yes
Remedy Permanent to the Maximum Extent Practicable	**No**	**Yes**	**No**	**No**

Note: Relative Benefit / Cost values are scaled per $5 million in order to compare ranges similar in scale to comparative overall benefit, allowing the plot of all 3 parameters on Figure 9-10.

APPENDIX A

Tetra Tech, Inc. and Historical Research Associates, Inc.: *Initial Characterization of Contaminants and Uses at the Cornwall Landfill and in Bellingham Bay*

FINAL REPORT
TC-0416; 0417

INITIAL CHARACTERIZATION OF CONTAMINANTS AND USES AT THE CORNWALL LANDFILL AND IN BELLINGHAM BAY

RECEIVED

ATTORNEY GENERAL'S OFFICE
NATURAL RESOURCES DIVISION

PREPARED FOR:

ATTORNEY GENERAL OF WASHINGTON

PREPARED BY:

TETRA TECH, INC.
AND
HISTORICAL RESEARCH ASSOCIATES, INC.

30 JUNE 1995

TETRA TECH

FINAL REPORT
TC-0416; 0417

INITIAL CHARACTERIZATION OF CONTAMINANTS AND USES AT THE CORNWALL LANDFILL AND IN BELLINGHAM BAY

30 June 1995

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ACKNOWLEDGMENTS

This report was prepared by Tetra Tech of Redmond, Washington and Historical Research Associates (HRA) of Seattle, Washington for the Attorney General of Washington. The work was outlined in Task Orders Nos. 2 and 3 for Technical Litigation Support for Bellingham Bay.

Tom Johnson of Tetra Tech served as overall Project Manager. Dr. Steve Ellis of Tetra Tech and Dr. Lisa Mighetto of HRA served as task order managers. Principal authors were Curtis DeGasperi of Tetra Tech and Dr. Lisa Mighetto of HRA. Other staff from HRA included Daniel Gallacher, Linda Stutzman, and John Warner. Harry Goren of Tetra Tech also assisted HRA in their historical research. Editing and assembly of the final report was done by Bejurin Cassady, and word processing and graphics were provided by Lisa Fosse and Kim Tapia, respectively.

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1.0 INTRODUCTION

1.1 REPORT SCOPE

This report investigates the historical uses and current environmental status of a parcel of land on Bellingham Bay administered by the Washington Department of Natural Resources (DNR) and the adjacent area within a quarter-mile radius. This parcel, now known as the Cornwall Avenue Landfill, has had a variety of tenants and lease holders that have used it as a dump site since at least the 1890s. It is now a designated Model Toxics Control Act (MTCA) site. DNR is interested in what pollutants there are in the site, what potential they have to migrate (e.g., into Bellingham Bay), and what their sources might have been.

The present study surveys existing data and historical sources to determine what is already known about this site, and makes recommendations regarding what further investigations may be needed. Other sources of pollution in Bellingham Bay are examined as groundwork for distinguishing the separate environmental impact of the Cornwall Avenue Landfill. The industrial history of this site is traced to determine which leaseholders may have contributed to the contamination. Five tasks were outlined as the basis for this report:

- Compile a history of the site now known as the Cornwall Avenue Landfill to determine past uses and possible contaminants at this site.
- Compile and summarize existing information on the identity and characteristics of major point source dischargers to Bellingham Bay.
- Review and compile available literature on contaminants and biological impacts in Bellingham Bay.

2.0 STUDY AREA DESCRIPTION

Bellingham Bay is located along the northeast shore of the Puget Sound-Georgia Strait estuarine complex (Figure 2-1). The largest freshwater input to the bay is from the Nooksack River, which enters the north end of the bay. Historical average annual flow (1967-1993) measured at Ferndale is 3,873 cfs (Miles et al. 1994). Below Ferndale a portion of the Nooksack flow is diverted to the Lummi River which flows into Lummi Bay. A number of small creeks also discharge to the bay, including Chuckanut, Little Squalicum, Padden, Squalicum, and Whatcom creeks. The largest of these is Whatcom Creek which drains Whatcom Lake approximately 6 km inland and discharges to the bay through Whatcom Waterway.

Historically, the bay has been divided into an inner and outer bay (e.g., Broad et al. 1984; PTI Environmental Services 1989). The outer bay includes the delta formed at the mouth of the Nooksack River and the increasingly deeper waters to the south (Figure 2-2). Water depths west of Post Point exceed 30 m (100 ft). Bottom sediments of the outer bay range from delta sands deposited at the mouth of the Nooksack to relatively homogeneous muds in the central portion of the bay (Sternberg 1967). The inner bay includes the northeast portion of the bay between Post Point and the City of Bellingham (Figure 2-3), and receives runoff from Padden, Little Squalicum, Squalicum, and Whatcom creeks. Sediments of the inner bay consist of fine sands in Whatcom Creek Waterway with sand content decreasing with distance from the mouth of Whatcom Creek. The inner bay is the most urbanized and industrialized portion of Bellingham Bay.

The shoreline of inner Bellingham Bay has been extensively modified by dredging, filling, bulkheading, and riprapping to serve commercial and industrial uses. These modifications include three dredged industrial waterways (Squalicum Creek, I&J Street, and Whatcom Creek waterways), several boat harbor facilities (Squalicum Harbor marina, Hilton Harbor Marina, Central Floats Moorage, and Alaska State Ferry Terminal), and modifications associated with wastewater treatment and log storage at the Georgia-Pacific West Corporation sulfite pulp and paper mill. In addition, 37 Suspected or Confirmed Contaminated Sites have been identified by Ecology within the Bellingham city limits, including

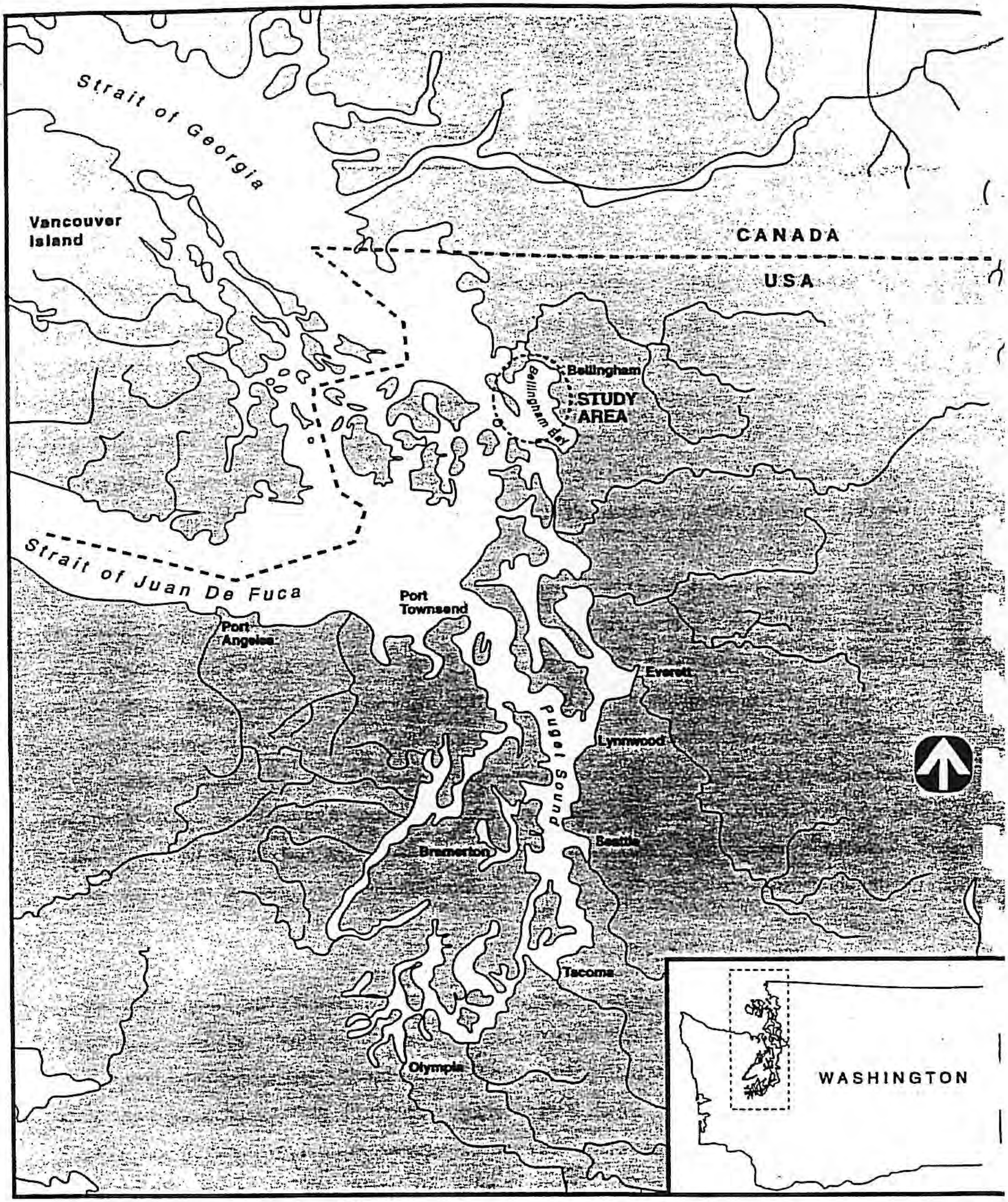


Figure 2-1. Location of Bellingham Bay Study Area.

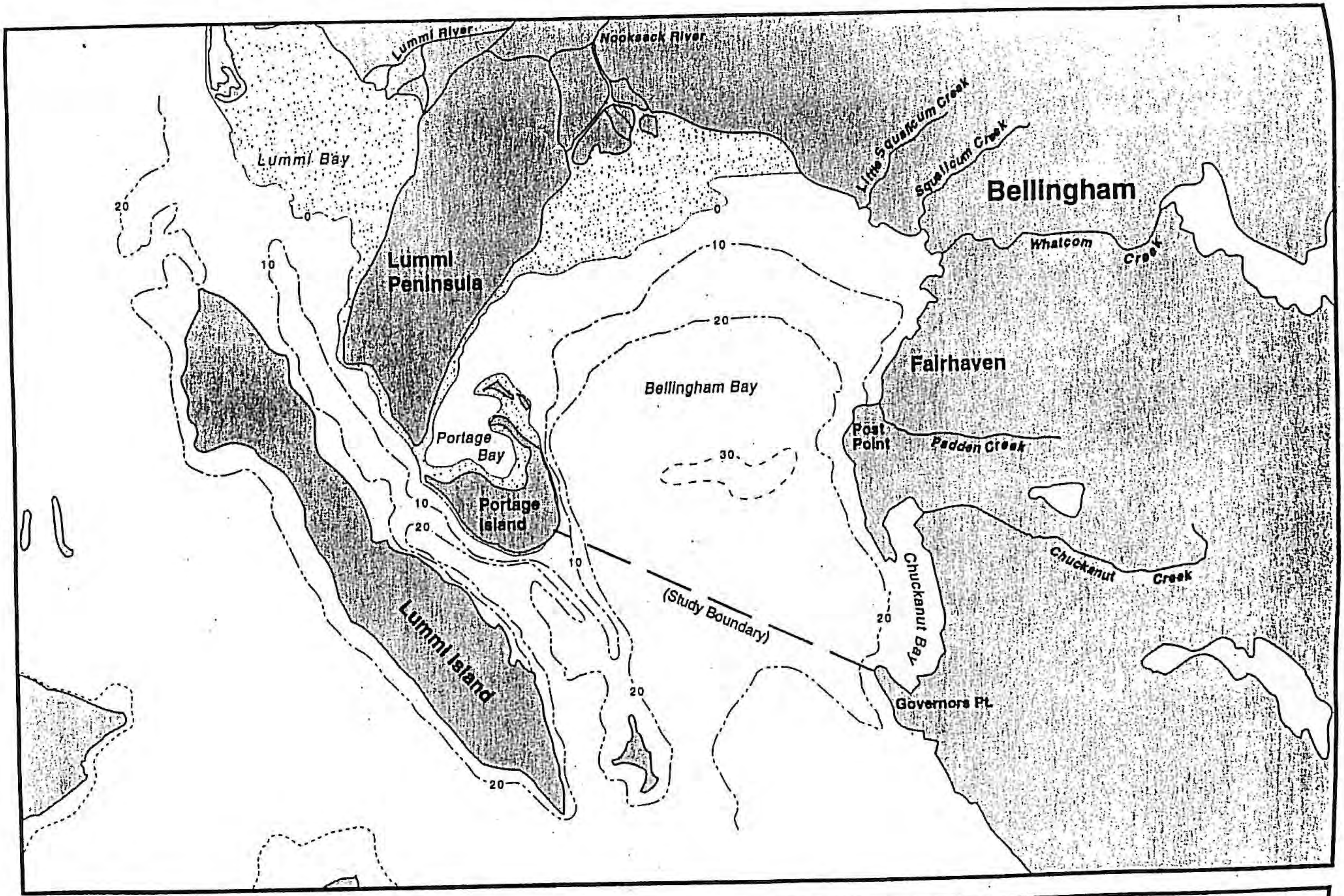
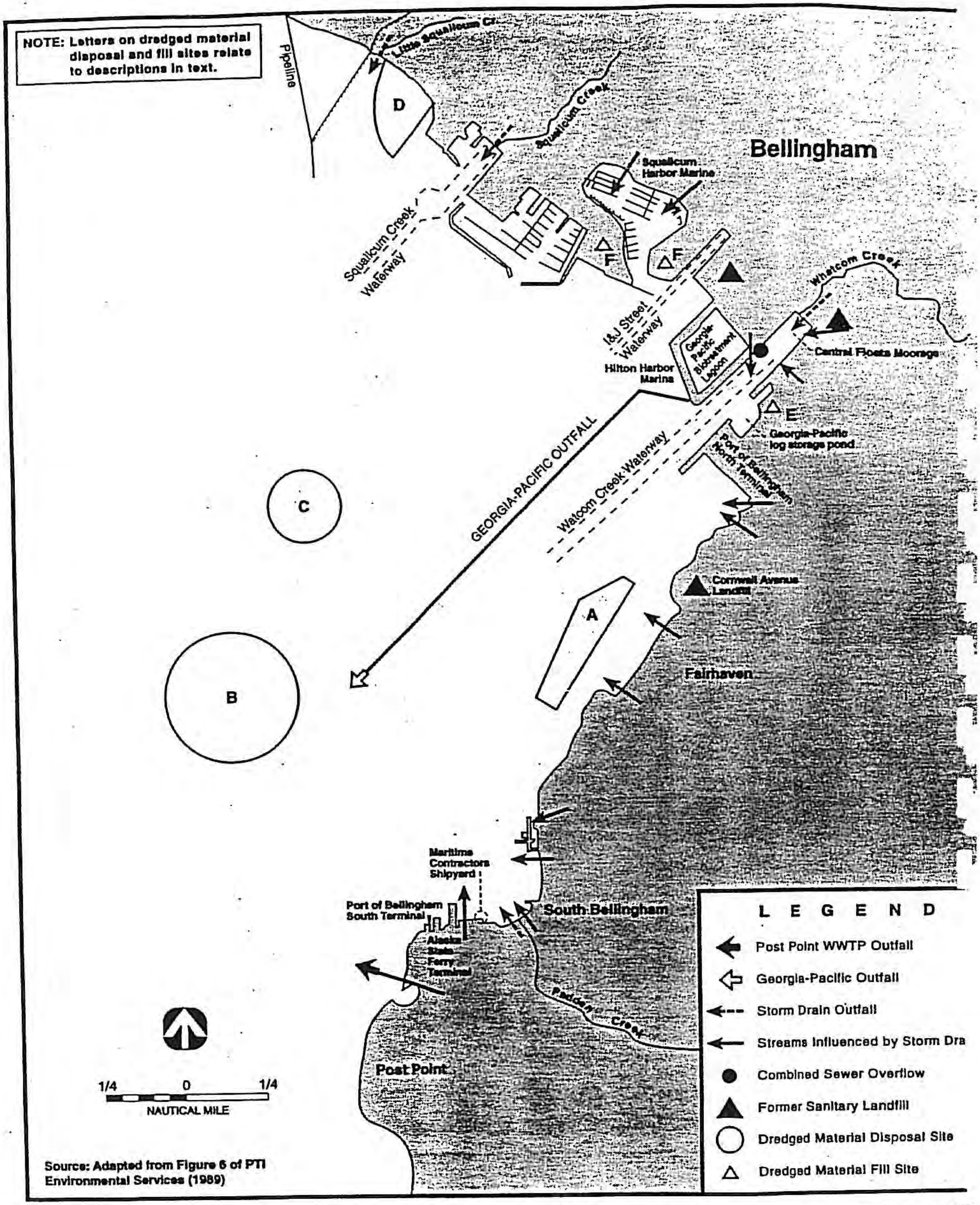


Figure 2-2. Bellingham Bay Study Area.

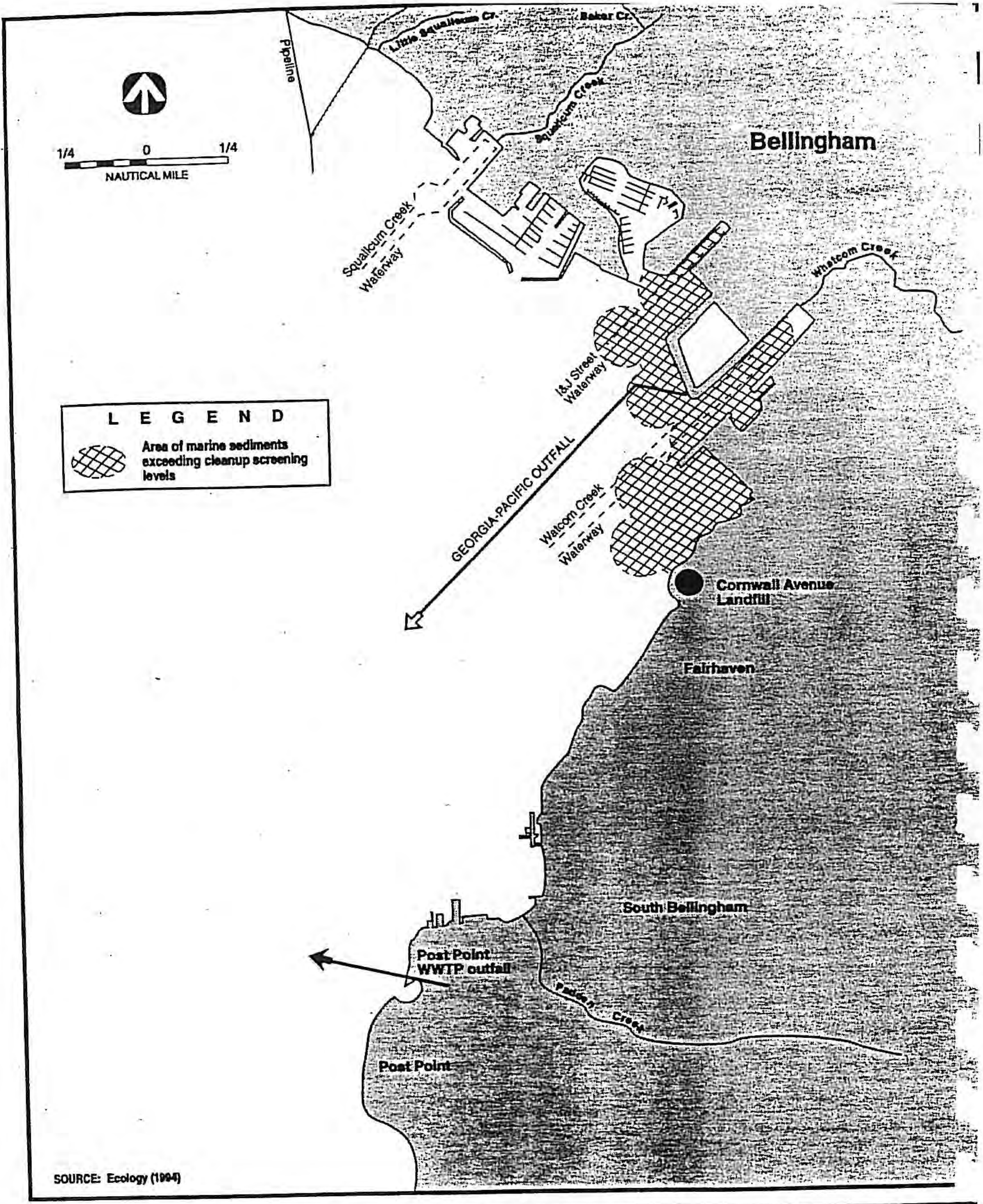

NOTE: Letters on dredged material disposal and fill sites relate to descriptions in text.

Source: Adapted from Figure 6 of PTI Environmental Services (1989)

Figure 2-3. Inner Bellingham Bay and Location of Major Contaminant Sources.

Whatcom Creek Waterway. These sites include inactive sanitary landfills adjacent to the waterfront, such as the Cornwall Avenue Landfill. The inner bay has also received contaminant inputs from industrial and municipal point sources, combined sewer overflows (CSOs), storm drains, accidental spills, and atmospheric deposition.

A significant portion of the inner bay was identified as an environmental problem area during the Bellingham Bay Action Program (PTI Environmental Services 1989). This assessment was based on the levels of contaminants measured in sediments (primarily mercury) and depressions in benthic invertebrate abundance in bottom sediments. The Sediment Management and Environmental Investigations and Laboratory Services (EILS) sections of Ecology have defined an area of marine sediments that exceed state Cleanup Screening Levels in WAC 173-204 (Ecology 1994) (Figure 2-4). The Cornwall Avenue Landfill is located along the shoreline of the southernmost extent of this area.



SOURCE: Ecology (1994)

Figure 2-4. Area of Marine Sediments Defined by Ecology as Exceeding Cleanup Screening Levels.

3.0 INVENTORY AND CHARACTERIZATION OF CONTAMINANT SOURCES

This chapter is divided into three sections. Section 3.1 summarizes available information on NPDES-permitted point sources. *Point* sources are defined in this report as discrete pollution sources that discharge directly and continuously, generally from an outfall, to the waters of Bellingham Bay. Discharges from point sources are comparatively easy to characterize and quantify.

Section 3.2 provides a summary of available information on non-point sources, including:

- Combined sewer overflows (CSOs)
- Surface water runoff
- Contaminated soil and groundwater sites
- Accidental spills
- Ports and marinas
- Atmospheric sources

Non-point sources are defined in this report as contaminant releases that occur periodically from dispersed water-based or land-based activities. Non-point pollutant sources are typically difficult to quantify because their mechanisms of transport are difficult to characterize and releases are often intermittent and sometimes unpredictable. Contaminated soil and groundwater sites included in this report are limited to sites identified as confirmed or suspected of contamination by Ecology that are located near the shoreline of Bellingham Bay.

Section 3.3 provides a summary of in-place pollutants. *In-place* pollutants in this report are relatively well-characterized sites in Bellingham Bay that have been contaminated due to historical discharges from point sources or as a result of historical disposal of contaminated dredged material. These in-place pollutants have the potential to be resuspended and transported to other locations in the bay.

The relative contaminant contribution of these three types of sources to a particular location (e.g., the intertidal area adjacent to the Cornwall Avenue Landfill) is difficult to determine. With the exception of permit monitoring programs for point sources implemented in the 1970s, few quantitative data are available to determine current and historical contaminant contribution levels from these sources. Characterization of non-permitted point sources, especially point source discharges to the bay prior to the implementation of water quality regulatory programs, is limited to a cursory overview in this study. However, non-permitted point sources, and to some extent permitted point sources, may have contributed to the non-point and in-place sources of contaminants which are characterized in this report.

3.1 POINT SOURCES

Current NPDES permit holders for point source discharges near Bellingham and state permit holders for discharge to municipal wastewater treatment plants and to groundwater were identified by reviewing data in the Water Quality Permit Life Cycle System (WQPLCS) maintained by the Department of Ecology. The WQPLCS data base lists names, locations, and types of facilities that have NPDES and state wastewater discharge permits. However, Ecology does not ensure the accuracy of these data due to possible undiscovered errors in the data reported by the facilities or errors made during data entry. Therefore, actual permit files of the major facilities were reviewed at Ecology offices, and the information summarized below for the major facilities is considered accurate.

For minor facilities, the WQPLCS data was verified where possible by additional data sources (e.g., PTI Environmental Services 1989). However, this information is considered only a general overview of the types of these facilities located in the vicinity of Bellingham Bay and the Cornwall Avenue Landfill.

NPDES-permitted point sources are divided by Ecology into four categories:

- <u>Municipal Facilities</u> - Municipal wastewater treatment plants (WWTPs) that discharge treated domestic wastewater. Some portion of the wastewater may come from industrial sources that discharge pre-treated or untreated wastewaters to the municipal wastewater collection system.

- Industrial Facilities - Private industrial plants that discharge treated process wastewater, treated sanitary wastewater, stormwater runoff, cooling tower and boiler blowdown water, contact or non-contact cooling water, water supply filter-backwash water, or water used for other industrial needs. A facility classified as industrial does not necessarily discharge industrial process wastewater.

- Agricultural Facilities - These facilities discharge wastewater and materials resulting from farming or animal husbandry. Carl Post Dairy is the only agricultural facility with a discharge permit in the vicinity.

- Aquacultural Facilities - These facilities periodically discharge fish culture wastewater, and water used to clean ponds. The Bellingham Hatchery on Whatcom Creek is permitted to discharge fish hatchery wastewater.

Each of these discharge categories are further designated as *major* or *minor*, a classification scheme used by Ecology. In general, major facilities discharge relatively large quantities of wastewater and have the greatest potential to cause environmental harm. Only two facilities that discharge to Bellingham Bay are classified as major facilities, one industrial (Georgia-Pacific West Corporation) and one municipal (Post Point WWTP). The locations of these two facilities are shown in Figure 2-3. These two major point sources are characterized below.

3.1.1 Georgia-Pacific West Corporation

The Georgia-Pacific West Corporation (formerly Georgia-Pacific Corporation) currently produces bleach sulfite and chemi-mechanical pulp and a variety of paper products at a location along Whatcom Waterway (Figure 2-3). This location has been a pulp and paper production site since 1925. Georgia-Pacific began operation of the facility after purchasing it from the Puget Sound Pulp and Timber Company in 1963.

The mill uses the sulfite process to produce bleached pulp and tissue paper products. In addition to these products, the mill produces a number of by-products from the spent pulping liquor, including alcohol and lignin products. The plant also produces chlorine, caustic soda, and sulfuric acid. A mercury cell chlor-alkali plant is located on site. Since 1965 the chlor-alkali plant has produced the chlorine (sodium hypochlorite) and caustic soda (sodium chlorate) that is used in the pulp bleaching process. The chlor-alkali plant has been associated with significant historical discharge of mercury-laden wastes to the bay; first to Whatcom Waterway (1965-1979) and then to Bellingham Bay via an extended outfall (1979-present). The amount of mercury wastes discharged from Georgia-Pacific to the bay was reduced from 10-20 lbs/day (an estimated total of 10-20 tons) before controls to less than 0.2 lbs/day after initial controls were implemented in August 1970 (Dahlgren, E., 1973, personal communication). Additional treatment controls, implemented in 1974 and subsequently, have continued to decrease mercury discharges to the bay. Discharge permit limitations for the monthly average discharge of mercury have decreased from 0.5 lbs/day in 1970, to 0.2 lbs/day in 1973, 0.07 lbs/day in 1979, and 0.05 lbs/day beginning in 1985 (PTI Environmental Services 1989). The current discharge of mercury averages 0.01 lbs/day (Ecology 1988).

Until 1979, Georgia-Pacific discharged wastewaters via a number of outfalls that emptied into Whatcom Waterway and their log pond. In 1979 the facility began using a primary clarifier and aeration lagoon for treating oxygen-demanding wastes and an 2,400-m (8,000-ft) extended outfall, including a 610-m (2,000-ft) diffuser, terminating in approximately 17 m (55 ft) of water in Bellingham Bay (Figure 2-4). The diffuser section contains 500 3.8-cm (1.5-in) diameter ports (SAIC 1989).

The pulping process at the Georgia-Pacific plant separates and purifies cellulose fibers from wood, and requires that lignin, resins, and fatty acids that hold the fibers together be removed. Separation and purification happens in two steps: delignification and bleaching. Sodium hydroxide and sodium sulphide are used under high temperature and pressure to delignify an aqueous mixture of wood chips. The material extracted in this process still contains some lignin, and is further purified by bleaching. The cooking liquor from the delignification process is treated in a recovery boiler and much of the waste is recycled or used for producing by-products on-site.

In the bleaching process, elemental chlorine gas further reduces the lignin content through oxidation and chlorination. Chlorination increases the water solubility of the lignin. Bleach plant effluents are not recycled due to the corrosive chlorides present. This process step also results in the production of chlorinated organic compounds including dioxins and furans.

Effluent sampling, including analysis of centrifuged effluent solids, has identified a number of metals and organic contaminants in the wastewater discharged from this facility (Table 3-1). Metals detected in whole effluent or effluent solids include arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. Organic compounds include volatile organic compounds (chloroform, 2-butanone, toluene), 4-methylphenol, polynuclear aromatic hydrocarbons (PAHs), and resin acids/guaiacols. One pesticide, delta-BHC, has also been reported, but the data are suspect due to the absence of the more common gamma-BHC compound (lindane) in the sample (Hallinan and Ruiz 1988).

Sediment in the vicinity of the extended wastewater outfall has been shown to contain contaminants, primarily metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), PAHs, bis(2-ethylhexyl)phthalate, and resin acids/guaiacols (Table 3-2). However, only mercury concentrations exceeded sediment quality standards-chemical criteria (see Section 4.1). Sediment sampling in the vicinity of the former chlor-alkali plant discharge to Whatcom Waterway indicated elevated concentrations of mercury, PAHs, dibenzofuran, 2-butanone, toluene, and total xylenes. Sediment quality standards-chemical criteria were exceeded for two PAH compounds, benzo(g,h,i)perylene and indeno-(1,2,3-cd)pyrene. Sediment mercury concentrations exceeded the chemical criterion by almost two orders of magnitude (Hallinan and Ruiz 1990), which was consistent with previous surveys of the Georgia-Pacific log pond (e.g., Bothner 1973; Nelson et al. 1974; Stanley 1980).

Waste streams discharged by the Georgia-Pacific facility include stormwater, hydraulic barking water, and wastewater from pulp and paper, lignin, acid, alcohol, and chlor-alkali production plants. The chlor-alkali plant and associated wastestreams are described in more detail below. This facility is also the site of two state-listed hazardous waste sites: the Georgia-Pacific biotreatment lagoon and the Georgia-Pacific mercury waste landfill (see Section 3.2).

3.1.1.1 Chlor-alkali plant. The chlorine gas and caustic soda used in the chemical pulping process has been produced on-site in the chlor-alkali plant since 1965. In general, chlorine gas is generated electrolytically from a salt solution using mercury-cell technology. The salt is produced from evaporated seawater and is dissolved in filtered water from Lake Whatcom prior to use in the plant. Some recycled brine contaminated with mercury is used in this process. The pH of the brine solution is raised using caustic soda to precipitate calcium, magnesium, and other impurities, including mercury. The solids are removed by settling and filtration. The pH is then lowered through the addition of acid and the solution

TABLE 3-1. RESULTS OF GEORGIA-PACIFIC EFFLUENT ANALYSES

Constituent	Effluent (μg/L)	Centrifuged Effluent Solids (mg/kg dry)
Metals (Total)		
Antimony	1U	2U
Arsenic	3.7	3.2
Beryllium	1.2	0.35
Cadmium	10U	7.3
Chromium	116	112
Copper	23.2	57.8
Lead	4.2	29.3
Mercury	0.39	1.89
Nickel	22.4	16.1
Selenium	1U	1.4
Silver	0.5U	0.37
Thallium	1U	0.19
Zinc	201B	585
Volatile Organics		
Chloroform	42	1,900
2-Butanone	3U	27,000
Toluene	1U	320
Phenols		
Phenol	2U	13,000U
4-Methylphenol	2U	26,000E
2,4-Dichlorophenol	4U	26,000U
2,4,6-Trichlorophenol	4U	26,000U
Polyaromatic Hydrocarbons (PAHs)		
Naphthalene	4U	32,000E
Acenaphthylene	2U	16,000E
Phenanthrene	2U	48,000E
Fluoranthene	2U	40,000E
Pyrene	2U	37,000E
Miscellaneous		
Dibenzofuran	2U	13,000U
Resin Acids/Guaiacols		
Isopimeric acid	6U	960U
Palustric acid	6U	960J
Abietic acid	6U	1,600
Dehydroabietic acid	6U	2,500
14-Chlorodehydroabietic acid	6U	3,000
12-Chlorodehydroabietic acid	6U	15,000
Dichlorodehydroabietic acid	6U	13,000
Guaiacol	2U	1,400
4,5-Dichloroguaiacol	2U	320
3,4,5-Trichloroguaiacol	5	3,400
4,5,6-Trichloroguaiacol	2U	1,400
Tetrachloroguaiacol	7	5,100
Pesticides		
Delta-BHC	0.50	8U

Source: Hallinan and Ruiz (1990).

Qualifiers:

U = Not detected at detection limit shown.
B = Also detected in method blank.
E = Estimated amount, EPA CLP holding time from extraction to analyses was exceeded.
J = Estimated amount, concentration is below method detection limit.

TABLE 3-2. RESULTS OF SEDIMENT ANALYSES CONDUCTED IN THE VICINITY OF GEORGIA-PACIFIC
(Page 1 of 2)

Constituent	Centrifuged Effluent Solids (mg/kg dry)	Sediments (mg/kg dry)				Sediment Quality Standrd (mg/kg dry)
		Field Control	At Outfall	Near Outfall	Chlorine Plant Outfall	
% Fines[a]	96.2	98.7	80.6	96.2	76.6	–
% Sand	3.8	1.3	19.4	3.9	23.5	–
% Gravel	<2.0	<2.0	<2.0	<2.0	<2.0	–
% TOC	37.0	2.4	2.2	3.3	8.3	–
% Dry weight	15.1	26.9	41.3	35.0	26.3	–
Metal						
Arsenic	3.2	7.0	9.2	11.8	6.9	57
Beryllium	0.35	0.48	0.41	0.53	0.53	–
Cadmium	7.3	0.2U[b]	0.2U	0.53	1.24	5.1
Chromium	112	64.7	71.0	85.8	66.2	260
Copper	57.8	41.1	50.0	52.9	68.9	390
Lead	29.3	18.2	35.3	17.6	40.9	450
Mercury	1.89	0.26	0.48	0.77	34.9	0.41
Nickel	16.1	56.3	80.0	106	66.1	–
Selenium	1.4	0.63	0.35	0.45	0.44	–
Silver	0.37	0.16	0.14	0.16	0.29	6.1
Thallium	0.19	0.13	0.17	0.17	0.43	–
Zinc	585	109	122	120	167	410

Constituent	Centrifuged Effluent Solids (μg/kg dry)	Sediments (μg/kg dry)[c]				Sediment Quality Standrd (mg/kg dry)
		Field Control	At Outfall	Near Outfall	Chlorine Plant Outfall	
Volatile Organics						
Chloroform	1,900	7.0U	5.0U	5.0U	7.0U	–
2-Butanone	27,000	22.0U	15.0U	15.0U	32.0	–
Toluene	320	7.0U	5.0U	5.0U	9.0	–
Total xylenes	10.0U	7.0U	5.0U	5.0U	11.0	–
Phenols						
4-Methylphenol	26,000 (70)E	250U	160U	190U	250U	420[d]
Low Molecular Weight PAHs						
Anthracene	13,000U	250U	160U	190U	890 (11)E	220
Aphthalen	32,000 (87)E	500U	320U	380U	510U	99
Acenaphthylene	16,000 (43)E	250U	160U	190U	250U	66
Acenaphthene	13,000U	250U	160U	190U	760 (9)E	66
Fluorene	13,000U	250U	160U	190U	460 (6)E	23
Phenanthrene	48,000 (130)E	250U	310 (14)E	500 (15)E	4,200 (51)E	100
Total LMW PAHs	96,000 (260)E	–	310 (14)E	500 (15)E	6,310 (76)E	370
High Molecular Weight PAHs						
Pyrene	37,000 (100)E	250U	370 (17)E	610 (19)E	9,900 (120)E	1,000
Fluoranthene	40,000 (110)E	250U	270 (12)E	420 (13)E	7,000 (84)E	160
Benzo(a)anthracene	13,000U	250U	160U	190U	5,200 (63)E	110
Chrysene	13,000U	250U	160U	190U	6,300 (76)E	110
Benzo(b)fluoranthene	26,000U	500U	320U	380U	–	–
Benzo(k)fluoranthene	26,000U	500U	320U	380U	13,000 (160)E	–
Benzo(a)pyrene	26,000U	500U	320U	380U	6,600 (80)E	99
Indeno(1,2,3-cd)pyrene	26,000U	500U	320U	380U	3,200 (39)E	33
Dibenzo(a,h)anthracene	26,000U	500U	320U	380U	1,300 (16)E	33
Benzo(g,h,i)perylene	26,000U	500U	320U	380U	3,100 (37)E	31
Total HMW PAHs	77,000 (210)E	–	640 (29)E	1,030 (31)E	54,600 (660)E	960

TABLE 3-2. RESULTS OF SEDIMENT ANALYSES CONDUCTED IN THE VICINITY OF GEORGIA-PACIFIC
(Page 2 of 2)

Constituent	Centrifuged Effluent Solids (µg/kg dry)	Sediments (µg/kg dry)[c]				Sediment Quality Standrc (mg/kg dry)
		Field Control	At Outfall	Near Outfall	Chlorine Plant Outfall	
Phthalates						
bis (2-Ethylhexyl)phthalate	13,000B	590 (25)E	270 (12)E	290 (9)E	1,200 (15)E	47
Miscellaneous						
Dibenzofuran	13,000U	250U	160U	190U	300 (3.6)E	15
Isopimeric acid	960.0U	110U	70U	110	–	–
Palustric acid	960J	110J	70J	88	–	–
Abietic acid	1,600	110U	83	260	–	–
Dehydroabietic acid	2,500	110	190	300	–	–
14-Chlorodehydroabietic acid	3,000	110U	90	190	–	–
12-Chlorodehydroabietic acid	15,000	110	520	1,100	–	–
Dichlorodehydroabietic acid	13,000	110U	330	660	–	–
Guaiacol	1,400	36	23	29	–	–
3,4,5-Trichloroguaiacol	3,400	36	23	29	–	–
4,5,6-Trichloroguaiacol	1,400	36U	23U	29	–	–
Tetrachloroguaiacol	5,100	36U	23U	29	–	–

Source: Hallinan and Ruiz (1990).

[a] Silt + Clay

[b] Qualifiers:

U = Not detected at detection limit shown.
J = Estimated amount, concentration is below method detection limit.
E = Estimated amount, EPA CLP holding time from extraction to analyses was exceeded.

[c] Value in parentheses is concentration in mg/kg organic carbon.

[d] Value in µg/kg dry weight (ppb dry).

is passed through steel electrolytic cells consisting of a mercury cathode (liquid mercury flowing along the bottom of the cell) and titanium anodes. Chlorine gas forms at the anode which is collected for use in the pulp bleaching plant. Metallic sodium formed at the cathode amalgamates with the mercury and leaves the cell at the outlet.

The depleted brine is treated to remove residual chlorine and then recycled. The amalgam of mercury and sodium is cycled through a counter-current decomposer where mercury acts as the anode. The sodium is liberated and reacts with the water to form sodium hydroxide. Hydrogen gas saturated with mercury is liberated at the cathode. The hydrogen gas is used as fuel at the plant. The sodium hydroxide contains fine solids, including elemental mercury, that are filtered from the solution. At the inlet and outlet end of the cells the liquid mercury stream is covered by water to reduce volatilization of the elemental mercury. This water becomes contaminated with mercury.

Prior to 1970 the most significant mercury discharge to the bay was in water used to reduce mercury volatilization (Bothner 1973). Other direct discharges of mercury prior to 1970 included the solids collected from precipitating calcium, magnesium, and other impurities from recycled brine, and the discharge of solids removed from the sodium hydroxide produced in the counter-current decomposer. From 1965 to 1970 these wastestreams, along with non-contact cooling water, were discharged to a log pond connected to Whatcom Waterway.

In 1970 several modifications were made to reduce the amount of mercury discharged to the bay. These modifications included 1) recovering mercury from the hydrogen gas, 2) removing solids during brine recycling, 3) collecting solids removed from the sodium hydroxide rather than releasing them to the bay, and 4) recycling the water used to reduce mercury volatilization and diverting part of it to a settling pond constructed on a partial fill of the existing log pond. The overflow from the settling pond was treated with an activated charcoal filter system before discharge to the log pond. These measures reduced total mercury discharge to about 0.2 lbs/day (Bothner 1973).

In 1974 additional measures were taken to treat mercury wastes from the chlor-alkali plant. Sludge from the settling pond was removed and a new treatment system was installed to treat the removed sludge and the effluent from the settling pond prior to discharge. The treatment system consisted of a sulfide precipitation process followed by filtration to remove particulates. The treated sludge and filter backwash from the new treatment system were disposed of in an off-site landfill. At this time the log pond was further modified through diking and filling. Approximately eight acres of the log pond were diked and filled with material dredged from the log pond and Whatcom Waterway. The dredge spoils were dewatered, covered with gravel ballast, and topped with asphalt.

In 1976, approximately 1.6 million gallons of sludge from the settling basin were removed and treated using a chemical fixing process (Chemfix®). The process involved the solidification of the sludge using a mixture of sodium silicate and Portland cement. The sludge treated with this process was landfilled on-site on 2.5 acres of land within the 1974 log pond fill area. The sludge was covered with a plastic liner, 6 inches of sand, and 4 inches of asphalt. This landfill has now been listed by the state as a hazardous waste site (see Section 3.2.3). In 1980, the settling basin sludge deposit was removed and landfilled off-site and the settling basin was filled with upland material. At this time the treated chlor-alkali plant discharge was routed to the extended outfall in Bellingham Bay.

3.1.2 Post Point WWTP

Prior to 1974, the city's domestic wastes were treated at the Whatcom Creek Waterway WWTP which discharged primary treated wastewater to inner Bellingham Bay. The Post Point WWTP was constructed southwest of the City of Bellingham to the east of Post Point (Figure 2-3) and began operation in 1974, providing primary treatment for domestic and industrial wastes for Bellingham and outlying areas. The treatment plant outfall terminates approximately 610 m (2,000 ft) offshore in 25 m (82 ft) of water. The diffuser section is 130 m (427 ft) long and consists of thirty-five 15-cm (6 in) ports (CH2M Hill 1984). The facility has since been modified to provide secondary treatment. These modifications were completed in 1993. In addition to changes in the treatment system, projects to reduce the volume of stormwater discharge to the treatment plant (and combined-sewer overflows) were completed in 1986.

The Post Point WWTP has provided treatment for domestic wastewaters including household hazardous and sanitary wastes, stormwater runoff, and the wastewaters from industrial facilities. The types of wastes discharged to the WWTP have shifted over the years as industrial operations changed systems or products, or opened or closed operations. Wastewaters have been discharged to the Post Point WWTP from fish hatcheries, seafood and vegetable processing plants, and wood treatment and plywood manufacturing facilities (PTI Environmental Services 1989).

Effluent permit monitoring requirements for the Post Point WWTP are limited to biochemical oxygen demand, total suspended solids, fecal coliform bacteria, and pH. Therefore, very few data are available to determine the concentration of metals and organic contaminants in the WWTP effluent. Data provided by CH2M Hill (1984) indicate the presence of the metals antimony, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc in WWTP effluent (Table 3-3). Organic compounds detected in the effluent include bis(2-ethylhexyl)phthalate, chloroform, tetrachloroethene, toluene, pentachlorophenol, hexachlorocyclohexane, and the Aroclor PCB 1260 (Table 3-3).

Sediment sampling for metals and organic compounds in the vicinity of the WWTP discharge has also been limited (CH2M Hill 1984; Reif 1988). The detection limits achieved for organic compounds were too high for comparison to sediment management standards-chemical criteria (Table 3-4). Metals concentrations were generally below those reported for sediments collected from Puget Sound reference locations except for mercury. Mercury concentrations exceeded the sediment management standards-chemical criteria at two of the four sediment sampling locations in the vicinity of the Post Point WWTP outfall (Table 3-4).

3.1.3 Minor Municipal and Industrial Facilities

In 1882, the first sewers were installed in the developed portion of the Bellingham area. These sewers discharged to creeks or directly to Bellingham Bay. Minor industries in Bellingham Bay, particularly seafood and vegetable processing facilities, discharged their wastes directly to the bay until 1974 when these wastes were diverted to the Post Point wastewater treatment plant. Other minor but significant point source discharges to Bellingham Bay and tributary creeks have included a cement plant and a number of wood treatment facilities.

There are approximately 49 permitted minor municipal, industrial, fish hatchery, and farm operations located in the vicinity of Bellingham (Table 3-5). Forty-seven of these operations are classified as industrial. These facilities operate under a variety of permits, including permits for discharge to the Post Point WWTP (14), discharge to State groundwaters (1), minor municipal discharge permits (1), minor industrial discharge permits (5), and general permits for discharge to surface waters (28) (see Table 3-5).

TABLE 3-3. CONTAMINANTS DETECTED IN WET WEATHER AND DRY WEATHER 24-HOUR COMPOSITE SAMPLES OF THE EFFLUENT FROM THE POST POINT WWTP[a]

Chemical	Wet Weather Effluent	Dry Weather Effluent
Organic Compounds (μg/L)		
Bis(2-ethylhexyl)phthalate	12	21
Chloroform	7	6
Tetachloroethene	<5	4
Toluene	<5	9
Pentachlorophenol	<10	14
Hexachlorocyclohexane (Lindane)	<0.1	0.04
PCB-1260	<2	0.53
Metals[b] (mg/L)		
Antimony	0.001	<0.001
Arsenic	<0.005	<0.005
Beryllium	<0.02	<0.001
Cadmium	<0.01	0.01
Chromium	0.012	0.01
Copper	0.37	1.4
Lead	0.01	0.005
Mercury	<0.0002	0.0006
Nickel	<0.04	0.08
Selenium	0.002	<0.005
Silver	<0.001	0.004
Thallium	<0.005	0.01
Zinc	0.08	0.09

Source: CH2M Hill (1984).

[a] Wet weather period = November-April; dry weather period = May-October.

[b] Metals analyzed by the total metals digestion method.

TABLE 3-4. SUMMARY OF CONTAMINANTS DETECTED IN SEDIMENTS SAMPLED IN THE VICINITY OF THE POST POINT WWTP

	Stations	
Metals	REO1 (mg/kg dry weight)	REO2 (mg/kg dry weight)
Arsenic	35U[a]	35
Chromium	80	80
Copper	54	55
Lead	22	18
Mercury	0.66	0.380
Nickel	98	110
Zinc	120	130
Volatiles	(µg/kg dry weight)	(µg/kg dry weight)
Acetone	91	160

Source: Reif (1988).

[a] Qualifiers:

U = Not detected at detection limit shown.

TABLE 3-5. MINOR NPDES AND STATE DISCHARGE PERMITTEES IN THE BELLINGHAM VICINITY

Facility	Type		Address	Zip Code	Facility Description	Location	Permit ID
ALPHA TECHNOLOGIES	Industrial	to POTW	3116 MERCER STREET	98225			ST0007361A
ARROWAC FISHERIES	Industrial	to POTW	207 HARRIS AVENUE	98225	FISH PROCESSOR	BELLINGHAM BAY	ST0007265A
ASSOC S & G - Y ROAD PIT	Industrial	General	PORTION OF SE 1/4 OF SECTION 19		Sand & Gravel GENERAL PERMIT		WAG503121A
AXTON AGGREGATES - EAST	Industrial	General	600 EAST AXTON	98225	Sand & Gravel GENERAL PERMIT		WAG503221A
AXTON AGREGATES - WEST	Industrial	General	440 EAST AXTON	98226	Sand & Gravel GENERAL PERMIT		WAG503131A
AXTON PARTNERSHIP/PULLAR PIT	Industrial	General	640 E. AXTON ROAD	98225	Sand & Gravel GENERAL PERMIT		WAG503214A
B & J FIBERGLASS	Industrial	General	4905 GUIDE MERIDIAN	98226	BOATYARD		WAG030058A
BELLINGHAM COLD STORAGE	Industrial	Minor	SQUALICUM FILL	98225	SEAFOOD PROCESSING AND COLD STORAGE	BELLINGHAM BAY	WA0002143B
BELLINGHAM FROZEN FOODS	Industrial	to Ground	PO BOX 1016	98225	VEGETABLE PROCESSING AND FREEZING	BELLINGHAM BAY	ST0007322B
BELLINGHAM HATCHERY	Aquaculture	General	WHATCOM FALLS PARK	98226	UPLAND FISH REARING	WHATCOM CREEK	WAG133001B
BELLINGHAM MARINE INDUSTRIES INC	Industrial	General	1001 C STREET	98225	BOATYARD		WAG030006A
BELLINGHAM MARINE INDUSTRIES, INC	Industrial	General	1001 C STREET	98225	Sand & Gravel GENERAL PERMIT		WAG503228A
BORNSTEIN SEAFOODS INC	Industrial	to POTW	1001 HILTON AVENUE	98225	BOTTOM FISH PROCESSOR	BELLINGHAM BAY	ST0007304B
BROOKS MFG	Industrial	Minor	IOWA AND PACIFIC STREETS	98225	WOOD PRESERVING	WHATCOM CREEK	WA0030805B
CARL POST DAIRY	Agriculture	General	5390 SAND ROAD	98226	DAIRY GENERAL PERMIT		WAG013002A
CASCADE SEAFOODS	Industrial	to POTW	2925 ROEDER AVENUE	98225	FISH PROCESSOR	BELLINGHAM BAY	ST0007318A
CHARLES MCNALLIE - FOX PIT	Industrial	General	2 MILES S OF LK SAMISH RD & COLONEY	98226	Sand & Gravel GENERAL PERMIT		WAG503000A
COSTCO WHOLESALE	Industrial	to POTW	4299 GUIDE MERIDIAN	98226	ONE HOUR PHOTO FINISHING	BELLINGHAM BAY	ST0007335A
COWDEN INC	Industrial	General	3463 CEDARVILLE ROAD	98226	Sand & Gravel GENERAL PERMIT		WAG503059A
COWDEN INC	Industrial	General	3463 CEDARVILLE ROAD	98226	Sand & Gravel GENERAL PERMIT		WAG503059A
COWDEN INC	Industrial	General	3463 CEDARVILLE ROAD	98226	Sand & Gravel GENERAL PERMIT		WAG503059A
ENCOGEN NORTHWEST	Industrial	to POTW	915 NORTH CORNWALL AVENUE	98227	COGENERATION FACILITY		ST0007336A
FERNDALE READY MIX & GRAVEL - B'HAM	Industrial	General	BAKERVIEW SPUR	98225	Sand & Gravel GENERAL PERMIT		WAG503235A
GN PLYWOOD INC DBA MT BAKER PLYWOOD	Industrial	to POTW	2929 ROEDER AVE	98225	PLYWOOD MANUFACTURING	BELLINGHAM BAY	ST0007253C
HAWLEY HILTON HARBOR MARINA	Industrial	General	1000 HILTON AVENUE	98225	BOATYARD		WAG030024A
HOME PORT SEAFOODS	Industrial	to POTW	2875 ROEDER AVENUE	98225	SEAFOOD PROCESSOR		ST0007362A
ICICLE SEAFOODS, INC (REPACK)	Industrial	to POTW	2825 ROEDER AVENUE	98225	SEAFOOD PROCESSING		ST0007350A
ICICLE SEAFOODS, INC (SURIMI)	Industrial	to POTW	500 WEST ORCHARD	98227	SEAFOOD PROCESSING		ST0007349A
LAKESIDE INDUSTRIES-WHATCOM BUILDER	Industrial	General	703 E LAUREL ROAD	98227	Sand & Gravel GENERAL PERMIT		WAG503202A
LUDTKE-PACIFIC TRUCKING INC	Industrial	General	1507 E. ILLINOIS STREET	98226	Sand & Gravel GENERAL PERMIT		WAG503080A
LUDTKE-PACIFIC TRUCKING/WASCHKE RD	Industrial	General	NORTH END OF WASCHKE ROAD		Sand & Gravel GENERAL PERMIT		WAG503079A
MARINE SERVICES NW	Industrial	General	2551 ROEDER AVENUE	98225	BOATYARD		WAG030083A
MARITIME CONTRACTORS	Industrial	Minor	201 HARRIS AVENUE	98225	SHIPBUILDING AND REPAIR	BELLINGHAM BAY	WA0031348A
NEW WEST FISHERIES	Industrial	to POTW	601 WEST CHESTNUT STREET	98225	SEAFOOD PROCESSOR - HERRING ROE	BELLINGHAM BAY	ST0007345A
OCEAN STAR SEAFOODS	Industrial	to Ground	6069 HANNEGAN RD	98225	SALMON PROCESSOR	GROUNDWATER	ST0007285A
OESER COMPANY	Industrial	Minor	730 MARINE DRIVE	98225	WOOD PRESERVING	BELLINGHAM BAY	WA0030813B
PACIFIC CONCRETE	Industrial	General	2800 WEST STREET	98225	SAND AND GRAVEL WASHING/CONCRETE BATCH PLANT AND CONCRETE PRODUCT	GROUNDWATER	WAG503028A
PACIFIC CONCRETE IND-NW PIT/HOY PIT	Industrial	General	5564 NORTHWEST ROAD		Sand & Gravel GENERAL PERMIT		WAG503061A
PADDEN CREEK MARINE INC	Industrial	General	809 HARRIS AVENUE	98225	BOATYARD		WAG030033A
TILBURY CEMENT-BELLINGHAM	Industrial	Minor	MARINE DRIVE	98225	CEMENT MANUFACTURING	BELLINGHAM BAY	WA0001198B
TRANS-OCEAN PRODUCTS, INC.	Industrial	to POTW	PO BOX 5606	98227	SEAFOOD PROCESSOR		ST0007354A
TRIDENT SEAFOOD (SOUTH)	Industrial	to POTW	17 SQUALICUL FILL	98225	SEAFOOD PROCESSING	BELLINGHAM BAY	ST0007303A
TRIDENT SEAFOOD (WEST)	Industrial	to POTW	17 SQUALICUL FILL	98225	SEAFOOD PROCESSING	BELLINGHAM BAY	ST0005165A
WELDCRAFT STEEL & MARINE INC	Industrial	General	9 SQUALICUM WAY	98225	BOATYARD		WAG030051A
WHATCOM BUILDERS	Industrial	General	703 E LAUREL ROAD	98227	Sand & Gravel GENERAL PERMIT		WAG503192A
WHATCOM BUILDERS	Industrial	General	703 E LAUREL ROAD	98227	Sand & Gravel GENERAL PERMIT		WAG503192A
WHATCOM CO - ABLE PIT	Industrial	General	LAUREL RAOD	98226	Sand & Gravel GENERAL PERMIT		WAG503050A
WHATCOM CO - CLARK PIT	Industrial	General	VALLEY VIEW ROAD	98226	Sand & Gravel GENERAL PERMIT		WAG503048A
WILDER CONSTRUCTION-HANNEGAN PLANT	Industrial	General	3876 HANNEGAN	98226	Sand & Gravel GENERAL PERMIT		WAG503261A

[illegible] = Pu[illegible] Own[illegible] [illegible]eatm[illegible] [illegible]orks

The five permitted minor industrial discharges are from Bellingham Cold Storage, Brooks Manufacturing, Maritime Contractors, Oeser Company, and Tilbury Cement (formerly Columbia Cement Corporation). Three of these facilities are listed by Ecology as Confirmed or Suspected Contaminated Sites (see Section 3.2.3). These sites include two wood treatment operations, Brooks Manufacturing and Oeser Company, which are located in the Whatcom Creek and Little Squalicum Creek drainages, respectively, and Maritime Contractors, a shipyard located near the Alaska State Ferry Terminal on Post Point.

In addition to current permittees, other wood treatment and wood products facilities have been permitted to discharge industrial waste to Bellingham Bay. From 1970 through 1975, Mount Baker Plywood discharged process wastewater to Bellingham Bay after treatment in a lagoon and seepage pond (PTI Environmental Services 1989). The R.G. Haley Company, a former wood treatment facility adjacent to the Cornwall Avenue Landfill and a state listed Suspected or Confirmed Contaminated Site, was permitted to discharge non-contact cooling water and stormwater runoff to Bellingham Bay and process wastewater to a seepage pit on site (Ecology and Environment, Inc. 1986). Because the R.G. Haley site is located adjacent to the Cornwall Avenue Landfill, the type and extent of contamination at this site is described in more detail in Section 5.2.

3.2 NON-POINT SOURCES

Non-point sources of contaminants as defined in this report include CSOs, surface water runoff, contaminated soil and groundwater sites, accidental spills, ports and marinas, and atmospheric sources. Due to the limited quantitative data for non-point sources, it is difficult to assess the relative importance of non-point vs. point source discharges to Bellingham Bay. However, it is likely that non-point sources may be considered a significant source of contaminants found in the bay, with the possible exception of mercury. Non-point contaminant sources are characterized below.

3.2.1 Combined Sewer Overflows (CSOs)

The City of Bellingham's storm water and sanitary wastewater collection systems are not entirely separate. Heavy rainfall runoff causes CSOs when combined storm and sanitary sewer capacity is exceeded. The excess flow, consisting of a mixture of storm and untreated municipal wastewater, discharges from interceptors and pump stations and eventually to surface waters. Since 1974, relatively frequent CSOs have occurred at four locations in Bellingham. These locations are the C Street interceptor, the Oak Street pump station, the lower Cornwall pump station, and the Post Point WWTP (Figure 2-3). The City of Bellingham has implemented a program to reduce CSO discharges and currently overflows only occur at the C Street interceptor, the former location of the Whatcom Creek Waterway WWTP outfall. Overflow from this site is predominantly domestic wastewater. Industrial wastes enter the sewer collection system below this interceptor at the Oak Street pump station (PTI Environmental Services 1989).

3.2.2 Surface Water Runoff

Surface water runoff enters Bellingham Bay directly from shoreline areas and indirectly via the Nooksack River and a number of creeks. These drainage areas have been divided into ten distinct basins, discussed below in Section 3.2.2.1.

The Bellingham Bay Action Program incorporated storm drain sediment sampling, in two phases, as part of the response to problem areas identified. Phase I focused on storm drain sediments at the mouths of storm drain outfalls and creeks that discharge directly to Bellingham Bay and the upper reaches of Squalicum and Whatcom Creeks (PTI Environmental Services 1991). Phase II focused on source tracing studies in four selected storm drain basins that were assigned high priority for investigation in Phase I, but did not have obvious upland contaminant sources (Cubbage 1994). Phase II also included sampling at locations in Whatcom Creek, Squalicum Harbor, and Maritime Contractors Shipyard. Results of sampling at Maritime Contractors Shipyard are reviewed in a separate report (Cubbage, J., 14 October 1993, personal communication). The results of the Phase I and Phase II storm drain studies are summarized in Section 3.2.2.2.

3.2.2.1 Bellingham Bay Drainage Basin Overview. The following description of the areas that drain to the Bellingham Bay study area is derived primarily from Creahan (1988).

City of Bellingham--The City of Bellingham has sewered the area from Little Squalicum Creek to Post Point (Figure 2-3). This system is almost entirely separated from the sanitary sewer system, with the exceptions noted above. Two storm drains discharge to Little Squalicum Creek, four to Squalicum Creek, forty-two to Whatcom Creek, and thirteen to Padden Creek. These drains route rainfall runoff from city streets, parking lots, rooftops, and the surface areas of some industrial facilities, including former wood treatment plants and the chip and log storage area (see Sections 3.1.1 and 3.2.3) at the

Georgia-Pacific chlor-alkali plant. In addition, 37 Suspected or Confirmed Contaminated Sites have been identified by Ecology within the Bellingham city limits (see Section 3.2.3).

The City of Bellingham is also underlain by coal mines which operated between 1853-1878 (Sehome Mine) and 1917-1955 (Bellingham Coal Mine) (Moen 1969). Some of the bituminous coal from these mines was shipped from Bellingham via boat and rail; loading operations would have resulted in coal spilling onto the surface and directly into the bay. A significant portion of the coal was used in local cement plants and a coal gasification plant located in the area that is now Boulevard Park. The cement plants and the gasification plant could all contribute to pollution in Bellingham Bay via former atmospheric deposition and leaching from slag. The location in Boulevard Park is on the state list of Suspected or Confirmed Contaminated Sites (see Section 3.2.3).

Nearshore Bellingham Bay–Rainfall runoff drains into Bellingham Bay from nearshore areas which cover a total of 16 km^2 (6.2 mi^2) of commercial, residential, industrial, forested, and agricultural land. Nonpoint sources of contaminants from this area include, but are not limited to oil and fuel leakage, septic tank failures, runoff from the Bellingham International Airport, and runoff from a slag pile at the Taylor Avenue dock (PTI Environmental Services 1989).

Nooksack River Basin–The Nooksack River basin is the largest area [approximately 1,500 km^2 (580 mi^2)] that drains into Bellingham Bay. Major urban areas in the basin include Ferndale, Lynden, and Everson. Each of these towns discharges municipal wastewater to the Nooksack River. Nonpoint contaminant sources within the basin include runoff from agricultural, residential, and urban land. Agricultural activities in the basin include dairy operations and berry farming.

Mining of metallic and non-metallic minerals has also been a significant activity in the Nooksack River drainage historically (Moen 1969). Metallic mineral deposits in the basin include chromium, copper, gold, lead, silver, and zinc (Moen 1969). Surface erosion and groundwater dissolution of mineral deposits could also contribute metals to the Nooksack River.

Mining operations have extracted gold using a mercury recovery process in at least one location (Great Excelsior Mine) in the Nooksack River basin (Moen 1969). Elevated concentrations of mercury have been measured higher up in the basin, at the mouth of Boulder Creek on the North Fork of the Nooksack

River (Babcock and Kolby 1973). This mercury was attributed to natural sulfide mineralization along the Boulder Creek fault zone. Sediment sampling conducted in the lower Nooksack River indicated lower mercury concentrations, similar to those in deep sediments deposited in Bellingham Bay that presumably represent pre-industrial background levels (Babcock and Kolby 1973).

Little Squalicum Creek Basin--Little Squalicum Creek basin drains forested and residential upland areas and some industrial areas near the mouth of the creek. Two storm drains enter the creek just beyond the Bellingham city limits. One of these drains property adjacent to the Oeser Cedar Company's wood treatment facilities. This facility is on the state list of confirmed and suspected contaminated sites (see Section 3.2.3). Confirmed contaminants include base/neutral/acid and phenolic compounds. Contamination with petroleum products is suspected.

Squalicum Creek Basin--The Squalicum Creek basin covers approximately 65 km^2 (25 mi^2) and drains primarily forested land. However, agricultural, residential, commercial, and industrial areas are found near the mouth of the creek. The four storm drains that enter Squalicum Creek drain primarily residential runoff.

Whatcom Creek Basin--The Whatcom Creek drainage basin covers approximately 293 km^2 (113 mi^2) including Whatcom Lake [2,025 ha (5,000 acres)]. Approximately 30 percent of the basin is forested and the remainder is used for residential, commercial, and industrial purposes. One storm drain directs runoff from the Brooks Manufacturing Company's wood treating facilities to Whatcom Creek via Fever Creek, a small tributary (see Section 3.2.4). The Brooks Manufacturing Company site is on the state list of Suspected or Confirmed Contaminated Sites (see Section 3.2.3).

Padden Creek Basin--The Padden Creek basin covers approximately 16 km^2 (6.2 mi^2) of primarily residential areas with smaller portions of commercial, agricultural, and forested areas.

Chuckanut Creek Basin--The Chuckanut Creek basin covers approximately 34 km^2 (13 mi^2) of primarily forest land. Residential and commercial areas occupy smaller areas. Runoff to Chuckanut Creek includes drainage from Interstate 5.

Nearshore Chuckanut Bay--Nearshore Chuckanut Bay includes runoff from primarily forested and residential areas. Runoff from this area also includes drainage from Chuckanut Drive, a popular shoreline road.

Lummi Peninsula Basin--The Lummi Peninsula basin drains forested land with limited residential development. Municipal wastewater from the Lummi Indian Reservation is treated and discharged to Hale Passage.

3.2.2.2 Storm Drain Sediment Contaminant Tracing Studies. The storm drain locations sampled in Phase I of the storm drain tracing study (PTI 1991) are shown in Figure 3-1. A total of 16 sediment samples were collected and analyzed. Results were screened against marine and freshwater sediment quality criteria and mean urban street dust contaminant concentrations. A number of contaminants exceeding the criteria and mean street dust levels were identified in 7 of the 16 samples (Table 3-6). The contaminants included arsenic, cadmium, chromium, copper, nickel, zinc, phenols, chlorinated benzenes, phthalates, PAH compounds, and the pesticide chlordane. The most contaminated storm drains were located at the mouth of Little Squalicum Creek (BELL16), storm drains to Whatcom Waterway (BELL08 and BELL09), and a storm drain just north of Padden Creek (BELL03).

Three storm drainage basins were selected for follow-up studies in Phase II (Figure 3-2). These basins were above the Phase I sampling locations BELL16 (Little Squalicum Creek), BELL09, and BELL13. The latter two locations drain to Whatcom Creek Waterway. Two marine sediment samples were collected from Squalicum Harbor, and two locations on Whatcom Creek were sampled. Several of the problem chemicals identified during the Phase I study were not identified during the Phase II study. Contaminants in Whatcom Creek that were above freshwater screening levels were pentachlorophenol and 4-methylphenol (Table 3-7). Sediments at one location in Whatcom Creek also showed evidence of toxicity to aquatic organisms (see Section 4.3). Chemicals exceeding marine sediment criteria in the BELL09 basin included lead, zinc, 4-methylphenol, and butylbenzylphthalate (Table 3-7). Chemicals exceeding marine sediment criteria in the BELL13 basin included lead, zinc, 4-methylphenol, and butylbenzylphthalate. Problem chemicals in the Squalicum Creek basin (BELL16) included copper, phenol, chlorinated phenols, 4-methylphenol, butylbenzylphthalate, and dimethylphthalate. Phenol was detected above marine sediment criteria in Squalicum Harbor marina sediments.

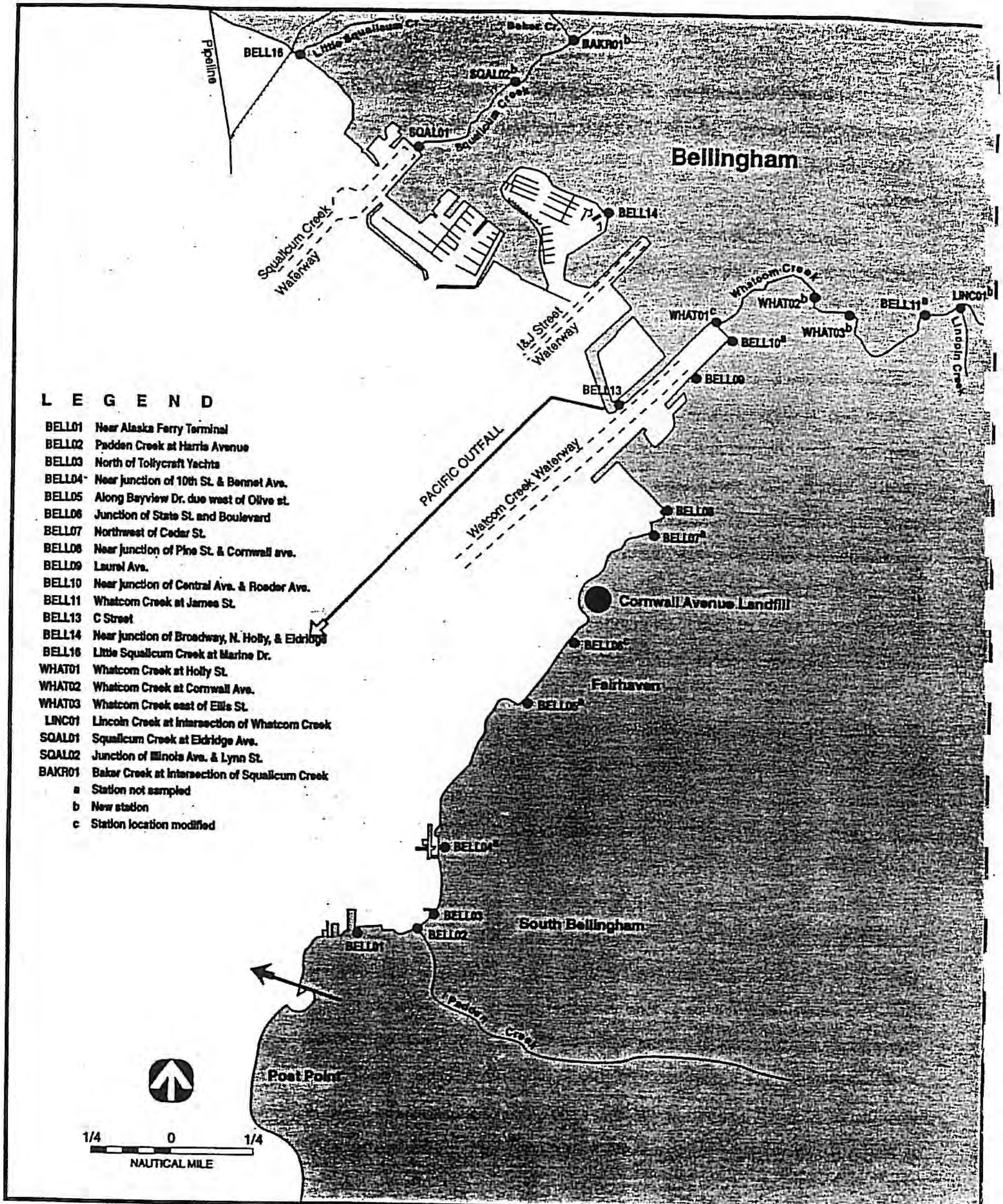


Figure 3-1. Phase I Storm Drain Source Tracing Study (PTI Environmental Services 1991) Sampling Stations.

TABLE 3-6. CHEMICALS EXCEEDING DECISION CRITERIA BY STATION DURING THE PHASE I STORM DRAIN SOURCE TRACING STUDY

	1	2	3	Decision Criteria
Station	Marine Sediment Quality Standards	Freshwater Sediment Criteria[a]	90th Percentile	Chemicals Exceeding Any Criteria (1, 2, or 3) and Mean Street Dust Levels
BELL02		Zinc		
BELL03	Bis(2-ethylhexyl)phthalate Benzoic acid Benzyl alcohol Butyl benzyl phthalate Phenol Zinc		Nickel	Benzoic acid[b] Benzyl alcohol[b] Phenol Nickel Zinc
BELL06	Bis(2-ethylhexyl)phthalate			
BELL08	Dibenz(a,h)anthracene Bis(2-ethylhexyl)phthalate Butyl benzyl phthalate Zinc			Dibenz(a,h)anthracene[b] Bis(2-ethylhexyl)phthalate Butyl benzyl phthalate Zinc
BELL09	Arsenic Cadmium Chromium Copper Zinc		Nickel	Arsenic Cadmium Chromium Copper Nickel Zinc
BELL13	1,4-Dichlorobenzene Copper Zinc			1,4-Dichlorobenzene[b] Copper Zinc
BELL14	Bis(2-ethylhexyl)phthalate	Total Chlordane	alpha Chlordane gamma Chlordane[c]	Total chlordane[b] alpha Chlordane[b] gamma Chlordane[b]
BELL16	Dibenz(a,h)anthracene Acenaphthene Dibenzofuran Indeno(1,2,3-cd)pyrene	Zinc		Dibenz(a,h)anthracene[b] Acenaphthene[b] Dibenzofuran[b] Indeno(1,2,3-cd)pyrene[b] Zinc
WHAT01		Lead, Zinc		
WHAT02	Bis(2-ethylhexyl)phthalate			
WHAT03	Butyl benzyl phthalate	Zinc		
LINC01	Bis(2-ethylhexyl)phthalate Indeno(1,2,3-cd)pyrene Phenanthrene	Zinc		
SQAL01		Chromium		Chromium
SQAL02	Bis-2-ethylhexyl)phthalate Butyl benzyl phthalate	Lead Zinc		
BAKR01		Zinc		

Source: PTI Environmental Services (1991).

[a] Freshwater criteria compared only to creek stations or storm drains that discharge to creeks: BELL02, BELL16, WHAT01, WHAT02, WHAT03, LINC01, SQAL01, SQAL02, BAKR01, JAP01, EDGE01, and POW01.

[b] These compounds were apparently analyzed for in street dust samples but not detected. Detection limits for the street dust samples were not available. Therefore, any detected concentrations are considered exceedances.

[c] Gamma chlordane had a detection frequency of <1.0% in 32 Puget Sound surveys.

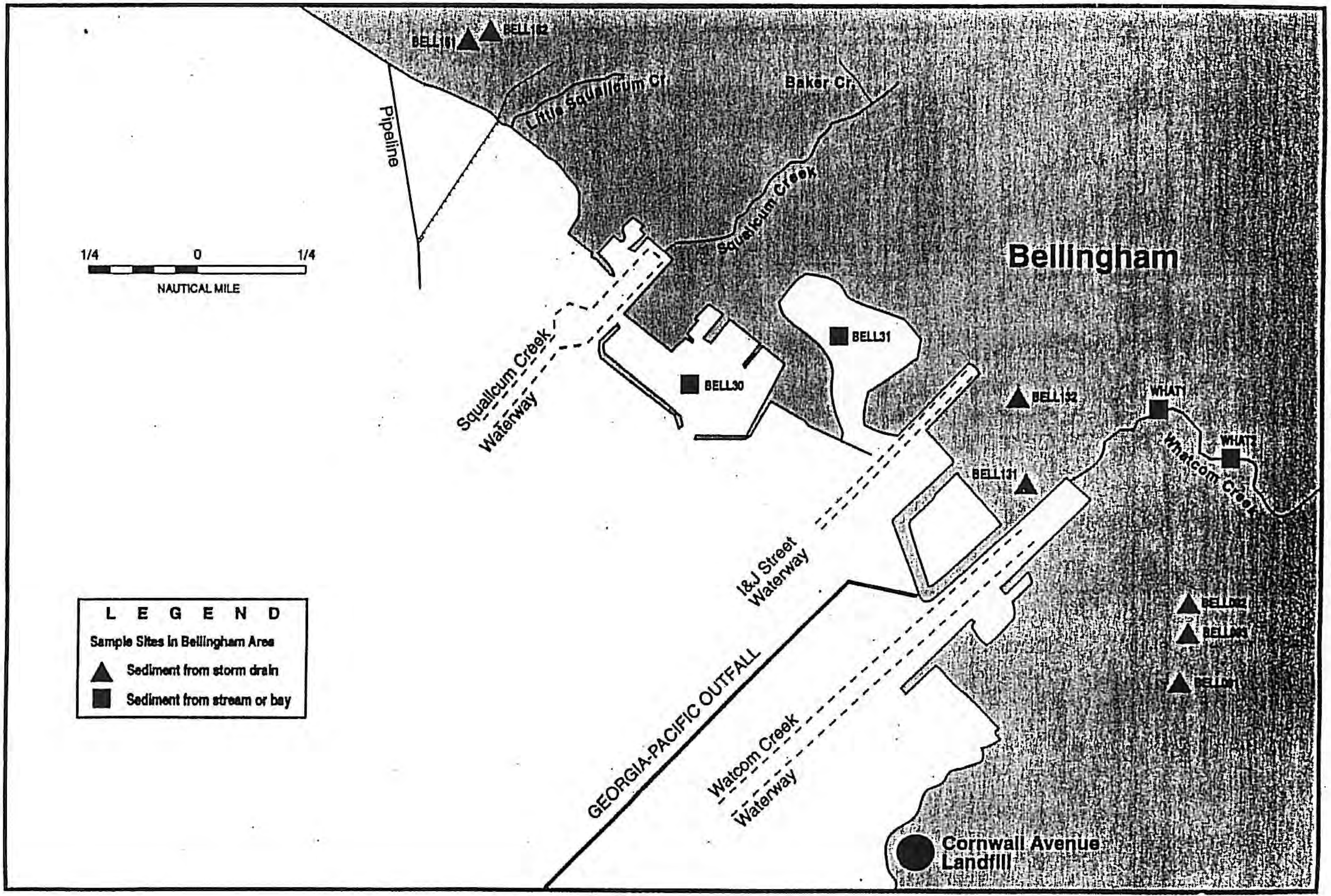


Figure 3-2. Phase II Storm Drain Tracing Study sampling Stations (Cubbage 1994).

TABLE 3-7. REVIEW OF CHEMICALS FOUND IN SEDIMENTS IN THE PHASE II STORM DRAIN SOURCE TRACING STUDY

Site	Description	Chemicals above Marine Criteria (Ecology 1991), Freshwater Guidelines (Persaud et al. 1993), and/or Significant Bioassay Results	Other Chemicals Found at Over 2X Quantification Limit (Excluding Metals)
WHAT1	Whatcom Creek near Prospect	*Hyalella* bioassay mortality; some Microtox® response, pentachlorophenol, 4-methylphenol	PAH
WHAT2	Whatcom Creek near Cornwall	4-methylphenol	pentachlorophenol, PAH
BELL30	Squalicum marina	phenol	--
BELL31	Squalicum marina	phenol	methylphenol
BELL091	Garden at E. Laurel	4-methylphenol	nitrophenol, toluene, PAH
BELL092	Parking lot near Railroad and Maple	lead, zinc, butylbenzylphthalate	toluene, acetone, xylenes, 2-butanone, 4-methylphenol, PAH
BELL093	Maple between Chestnut and Railroad	butylbenzylphthalate	toluene, xylenes, PAH
BELL131	Bottom of "C" Street	--	--
BELL132	"F" street between Holly and Roeder along alley	lead, zinc, butylbenzylphthalate, 4-methylphenol	toluene, PAH
BELL161	Marine Drive near Bennett	copper	--
BELL162	Bennett near Marine Drive	phenol, chlorinated phenols, butylbenzylphthalate, 4-methylphenol, dimethylphthalate	xylenes, acetone, PAH

Source: Cubbage (1994).

3.2.3 Contaminated Soil and Groundwater Sites

Contaminated soil and groundwater sites in the vicinity of Bellingham Bay can contribute contaminants to the bay via both groundwater seepage and the contamination of surface water that eventually discharges to the bay. There are currently 37 sites in Bellingham listed as confirmed or suspected to have contaminated soil, drinking water, groundwater, or surface water (Table 3-8). One of these sites is Whatcom Creek Waterway, which is part of Bellingham Bay. This was identified as a problem area during the Bellingham Bay Action Program.

Twenty-three of these sites are in the inner Bellingham Bay study area (including Whatcom Creek and the Squalicum Creeks): 1) B&B Paint, 2) Bellingham National Bank, 3) Bosman Fuel, 4) Boulevard Park, 5) Chevron/Port of Bellingham, 6) Cornwall Avenue Landfill, 7) DeWilde Nursery, 8) Frank Brooks Manufacturing, 9) Georgia-Pacific biotreatment lagoon, 10) Georgia-Pacific mercury waste landfill and settling pond, 11) Maritime Contractors Inc., 12) Maritime Heritage Center Park, 13) Murray Chris-Craft Cruisers-West, 14) Oeser Cedar/Little Squalicum Creek, 15) Port of Bellingham/4th and Harris Street, 16) Port of Bellingham/Hilton Harbor, 17) Port of Bellingham/Pier 5 Oil, 18) Port of Bellingham/-Squalicum Harbor, 19) R.G. Haley Intl. Corp., 20) Roeder Avenue Landfill, 21) Sunshine Cleaners, 22) Thompson Property, and 23) Unocal Bulk Plant #0042.

Confirmed contaminants identified at these sites include metals, petroleum, semi-volatile compounds (including PAHs and phenolic compounds), PCBs, pesticides, and other conventional inorganic contaminants (Table 3-8). These sites represent potential surface and groundwater sources of contaminants to inner Bellingham Bay. More detailed information is provided in Section 5.0 for the Cornwall Avenue Landfill and the former R.G. Haley International Corp. wood treatment facility, the only other site within 1/4 mile of the Cornwall Avenue Landfill.

3.2.4 Accidental Spills

Accidental spills of materials on land or directly in water may result in contamination of Bellingham Bay. The U.S. Coast Guard National Response Center in Washington, D.C. maintains a national data base on accidental spills of materials to land or water. This database is composed only of spills reported to the U.S. Coast Guard, and its validity is not confirmed by the Coast Guard. PTI Environmental Services (1989) summarized data available from this data base from 1973 to 1988. Detailed information was available for only one spill. This spill occurred on 1 January 1981 when a 10,000-gallon storage tank at the

TABLE 3-8. CONFIRMED AND SUSPECTED CONTAMINATED SITES IN BELLINGHAM
(Page 1 of 4)

Site Name	Address	Zip Code	Site[a] Stat Code	Ind[b] Site Stat	Warm[c] Bin #	Affected Media	Status[d]	BNAs	HOCs	Metals/CN	Other Metals	PCB	Pesticides	Petroleum	Phenolics	Non-Halogenated Solvents	Dioxin	PAH	Reactive Waste	Corrosive Waste	Radioactive Waste	Conventionals, Organic	Conventionals, Inorganic	Asbestos
Axton Aggregate Gravel Pit	390 E. Axton Rd.	98226	4 4 4 4			Soil Drinking Wtr. Groundwater Surface Water	C S S S							C S S S										
B&B Paint/Bennett Ave.	3006 Bennett Ave.	98225-1440	1 1 1 1			Air Soil Groundwater Surface Water	C C S S		C C S S	 S S S						C C S S								
Bellingham National Bank	863 N. State St.	98225	4 4	3 3		Groundwater Soil	S S							S S										
Bosman Fuel	2100 Grant & Kentucky Sts.	98225	1 1 1 1 1 1			Sediment Soil Surface Water Air Drinking Wtr. Groundwater	C C C S S S			C C C S S S				S S S S S S		S S S S S S								
Boulevard Park	N End Bayview Drive	98226	2 2 2 2		1 1 1 1	Groundwater Soil Surface Water Sediment	C C C S			C C C S				C C C S				C C C S				 S		
Cedarville Landfill	Cedarville Road	98226	1 1 1 1 1 1			Air Drinking Wtr. Groundwater Sediment Soil Surface Water	S S S S S S																S S S S S S	
Chevron/Port of Bellingham	1020 'C' St.	98225	4 4 4	2 2 2		Groundwater Soil Surface Water	C C C		S S S					C C C	S S S	C C C		S S S						
Cornwall Avenue Landfill	S. end Cornwall Ave./Bell. Bay	98225	2 2 2 2		2 2 2 2	Sediment Groundwater Surface Water Soil	S C C S			S C C S		 S	 S										C C S	
De Wilde Nursery	3410 NW Ave.	98225	1 1			Soil Groundwater	C S							C S										
Frank Brooks Manufacturing	2120 Pacific St.	98226	1 1 1 1			Surface Water Sediment Groundwater Soil	C S S S							 S S	C S S S									
Georgia Pac-Bio Trmt Lgn	Foot of C St	98225	2		2	Surface Water	C			S														
Georgia Pacific Airport Landfill	4255 Mitchell Way	98226	4		4	Groundwater	C			C					C									
Georgia Pacific Corporation	300 W Laurel	98225	3 3 3		5 5 5	Groundwater Soil Sediment	S C C			C C S														

TABLE 3-8. CONFIRMED AND SUSPECTED CONTAMINATED SITES IN BELLINGHAM
(Page 2 of 4)

Site Name	Address	Zip Code	Site Stat Code[a]	Ind Site Stat[b]	Warm Bls #[c]	Affected Media	Status[d]	BNAs	HOCs	Metals/ CN	Other Metals	PCB	Pesticides	Petroleum	Phenolics	Non-Halogenated Solvents	Dioxin	PAH	Reactive Waste	Corrosive Waste	Radioactive Waste	Conventionals, Organic	Conventionals, Inorganic	Asb -e
Grenier Oil Co.	1100 Sunset Dr.	98226	1			Groundwater	C							C		C								
			1			Soil	S							S		S								
			1			Surface Water	S							S		S								
Lummi Indian Reser. Dump	Chief Martin Rd	98226	1			Drinking Wtr.	S			S			S											
			1			Groundwater	S			S			S											
			1			Soil	S			S			S											
			1			Surface Water	S			S			S											
Lummi Shore Dump	Lummi Shore Dr. & Scott Rd.	98227	1			Drinking Wtr.	S		S	S	S	S	S	S		S						S	S	
			1			Groundwater	S		S	S	S	S	S	S		S						S	S	S
Maritime Contractors, Inc.	201 Harris Ave.	98225	1	1		Sediment	C			C	C	C			C									
			1	1		Groundwater	S			S	S	S						S						
			1	1		Surface Water	S			S	S	S			S			S						
			1	1		Soil	C	C		C	C	C						C						
Maritime Heritage Ctr Park	Central Ave. & W. Holly St.	98225	1	2		Soil	C			C														
			1	2		Groundwater	C				C													
McGill Property	3851 Britton rd.	98226	1			Groundwater	C							C										
			1			Drinking Wtr.	S							S										
			1			Soil	S							S										
Murray Chris-Craft Cruisers-W.	9th & Harris	98225	4		2	Air	S									S								
			4		2	Sediment	S							S	S	S								
			4		2	Surface Water	S							S	S	S								
			4		2	Groundwater	C		C															
			4		2	Soil	S		S							S								
Northwest Pipeline/Bellingham	Britton Rd. & Mt. Baker Hwy.	98226	1			Soil	C			C														
			1			Air	S			S														
Oeser Cedar/Lile Squalicum	730 Marine Dr.	98225	2		1	Air	C	C							C									
			2		1	Groundwater	C	C						S	C									
			2		1	Sediment	C	C						S	C									
			2		1	Soil	C	C						S	C									
			2		1	Surface Water	C	C						S	C									
Olivine Ash Landfill	928 Thomas Rd.	98226	1			Air	S			S													S	
			1			Groundwater	S			S													S	
Port of Bellingham-4th/Harris	4th and Harris	98225	4	2		Groundwater	C							C										
			4	2		Soil	C							C										
			4	2		Air	S							S										
			4	2		Sediment	S							S										
			4	2		Surface Water	S							S										
Port of Bellingham/ Hilton Harbor	1301 W. Holly St.	98225-2926	1	2		Groundwater	C							C										
			1	2		Soil	S							C										
			1	2		Sediment	S							S										
			1	2		Surface Water	S							S										
Port of Bellingham/ Pier 5 Oil	Pier 5, Squalicum Way	98225	1			Soil	C			C				C										
			1			Surface Water	C			S				C										
			1			Sediment	S			S				S										

TABLE 3-4. CONFIRMED AND SUSPECTED CONTAMINATED SITES IN BELLINGHAM
(Page 3 of 4)

Site Name	Address	Zip Code	Site[a] Stat Code	Ind[b] Site Stat	Warm[c] Bin #	Affected Media	Status[d]	BNAs	HOCs	Metals/ CN	Other Metals	PCB	Pesti-cides	Petro-leum	Pheno-lics	Non-Halogenated Solvents	Dio-xins	PAH	Reactive Waste	Corrosive Waste	Radio-active Waste	Conventionals, Organic	Conventionals, Inorganic	Asbest-os
Port of Bellingham/ Squalicum	Squalicum Harbor	98227	1			Sediment	C			C														
			1			Air	S			S														
			1			Surface Water	S			S														
R.G. Haley Intl Corp	Foot of Cornwall Av (S end)	98225	2		.3	Groundwater	C	C										C						
			2		3	Soil	C	C										C						
Roeder Avenue Landfill	W. of Roeder Ave. at f St.	98225	1			Sediment	C	S		C				S	S									
			1			Surface Water	C	S	S					S	S									
			1			Soil	C	S	S	C				S	S									
			1			Groundwater	S	S	S	S				S	S									
Sunshine Cleaners (Former)	S. Coll. Pkwy W/36th N/Fielding	98225	4	2	2	Groundwater	C		C															
			4	2	2	Soil	C		C															
Thermal Reduction Landfill	1524 Slater Rd	98226	1			Air	C			C	S		C										C	
			1			Groundwater	C			C	S		C										C	
			1			Sediment	C			C	S		C										C	
			1			Surface Water	C			C	S		C										C	
			1			Drinking Wtr.	S			S	S		S										S	
			1			Soil	S			S	S		S										S	
Thompson Property	2729 Kulshan St.	98225	1			Groundwater	S							S										
			1			Soil	S							S										
			1			Surface Water	S							S										
Trans Mountain Oil Pipe Line	1009 E. Smith Rd.	98226	3		1	Soil	C							C										
			3		1	Drinking Wtr.	S							S										
			3		1	Groundwater	S							S										
			3		1	Sediment	S							S										
Unocal Bulk Plant #0042	Kentucky St. & Grant St.	98225	4	2		Groundwater	C			S				C		C								
			4	2		Soil	C			S				C		C								
			4	2		Surface Water	S			S				C		S								
			4	2		Air	S			S				S		S								
Whatcom Co. Public Works G	2175 E. Bakerview Rd. (Spur)	98226	1	2		Groundwater	C		C					C		C								
			1	2		Soil	C		C					C		C								
			1	2		Drinking Wtr.	S		S					S		S								
			1	2		Sediment	S		S					S		S								
Whatcom Waterway	Waterway W. of Holly St. Bridge	98225	2		1	Sediment	C		S	C		C						C				S	S	
			2		1	Air	C			C												S	S	
			2		1	Soil	C	C	S	C				S	S			C				S	S	
			2		1	Surface Water	C	C	S	C				S	S			C				S	S	
			2		1	Groundwater	S	S	S	S				S	S									

TABLE 3-8. CONFIRMED AND SUSPECTED CONTAMINATED SITES IN BELLINGHAM

(Page 4 of 4)

Site Name	Address	Zip Code	Site Stat Code[a]	Ind Site Stat[b]	Warm Bin #[c]	Affected Media	Status[d]	BNAs	HOCs	Metals/ CN	Other Metals	PCB	Pesticides	Petroleum	Phenolics	Non-Halogenated Solvents	Dioxin	PAH	Reactive Waste	Corrosive Waste	Radioactive Waste	Conventionals, Organic	Conventionals, Inorganic	As -

[a] SITE STAT CODE = ECOLOGY SITE STATUS: Indicates the current status of sites relative to the MTCA cleanup process. Code choices are:

1 = Awaiting Site Hazard Assessment (SHA)
2 = Ranked, Awaiting Remedial Action (RA)
3 = Remedial Action in progress
4 = Independent Remedial Action
5 = Construction completed, Operation & Maintenance Underway
6 = RA Completed, Confirmational Monitoring Underway
7 = RA Conducted, residual contamination left on site; on-going institutional controls required
8 = RA and all activities completed (no monitoring)

[b] IND SITE STAT = INDEPENDENT SITE STATUS: This column only applies to those sites undergoing an independent cleanup. Code choices are:

1 = Release report received, awaiting assessment by PLP (PLP = Potentially Liable Person)
2 = Independent Site Assessment or Interim RA Report received
3 = Final Independent RA Report received

[c] WARM BIN#: Indicates the outcome of the WAshington Ranking Model (WARM). The WARM BIN Number will be a number between 1 and 5. A result of 1 indicates the greatest assessed risk to human health and to the environment. A result of 5 indicates the lowest assessed risk. A zero indicates that the site is either on the federal National Priorities List (NPL) or a sub-site or operable unit of an NPL site. NPL sites are ranked under the federal Hazard Ranking System (HRS).

[d] AFFECTED MEDIA: For each site, there may be contaminant information for up to six environmental media: Groundwater, surface water, air, soil, sediments or drinking water.

The media status column and the numbered contaminant type columns may be coded:

C(Confirmed) - The presence of hazardous substances has been confirmed by laboratory analysis (or field determination in the case of petroleum contamination).

S(Suspected) - Due to preliminary investigations or the nature of business operations or manufacturing processes, certain contaminants are suspected to be present at the site.

R (Remediated) - Contaminants have been treated or removed to met cleanup levels established for the site. (This status determination may only be made by Ecology.)

S = Suspected

C = Confirmed

R = Remediated

Frank Brooks Manufacturing Company ruptured and spilled oil containing 5-10 percent pentachlorophenol into Fever Creek. The oil was contained in Fever Creek by a sorbent boom until the creek water level dropped and the oil went under the boom and into Whatcom Creek. The spill was estimated to have caused the mortality of over 44,000 fish, including salmon, steelhead, and cutthroat trout.

3.2.5 Ports and Marinas

Port facilities and commercial and recreational marinas are potential sources of contaminants, primarily petroleum products and chemicals associated with boat maintenance and ship repair (e.g., copper- and tributyltin-based paints). The locations of these facilities is shown in Figure 2-3. Marine sediment investigations have been conducted at four locations: two locations at the Port of Bellingham, Squalicum Harbor Marina, and Maritime Contractors Shipyard. These locations and sediment sampling results are discussed below.

3.2.5.1 Port of Bellingham. The Port of Bellingham owns and operates two dock facilities (Figure 2-3). The North Terminal is located south of the Georgia-Pacific plant site. The South Terminal is located near Post Point just west of the mouth of Padden Creek. The South Terminal is also the location of the new Alaska State Ferry System Terminal. Several properties along or near the waterfront that belong to the Port of Bellingham have been identified as Confirmed or Suspected Contaminated Sites (see Section 3.2.3 and Table 3-8).

Sediment sampling conducted in the vicinity of the Alaska State Ferry System Terminal prior to construction did not indicate the presence of chemicals at concentrations that would cause adverse biological effects. Sediment sampling was also conducted by the Port of Bellingham in 1991 to assess possible sediment contamination in the vicinity of the Whatcom International Shipping Pier at the Port of Bellingham North Terminal near the mouth of Whatcom Creek Waterway. Sediment mercury, PAH, dibenzofuran, and pentachlorophenol concentrations detected in these samples exceeded sediment management standards-chemical criteria in at least one of the three surface sediment samples collected (see Section 4.1).

3.2.5.2 Squalicum Harbor Marina. The Squalicum Harbor Marina is located to the west of Whatcom Creek Waterway (Figure 2-3). Two locations in the harbor were sampled in March 1993 as part of the Phase II storm drain source tracing study (Cubbage 1994). Surface sediments were analyzed for metals, volatile organic compounds, chlorinated pesticides and PCBs, total organic carbon, grain size, chlorinated phenols, and phenoxy herbicides. The concentration of phenol detected at both sediment sampling locations exceeded sediment management standards-chemical criteria.

3.2.5.3 Maritime Contractors Shipyard. The Maritime Contractors Shipyard is located west of Padden Creek near Post Point (Figure 2-3). Two subtidal sediment sampling locations and one intertidal location at the mouth of a storm drain were sampled within the shipyard in March 1993 (Cubbage, J., 14 October 1993, personal communication). Surface sediments were analyzed for grain size, total organic carbon, metals, volatile organic compounds, semi-volatile organic compounds, chlorinated pesticides and PCB, and organotin compounds. The sediment concentrations of copper, lead, and zinc at one of the subtidal stations and at the intertidal station exceeded the marine sediment criteria. Marine sediment standards for phenol were exceeded at the both subtidal locations. The Puget Sound Dredge Disposal interim screening level for tributyltin (30 μg/kg) and the sediment quality standard for PCB were exceeded at all three locations. It was suggested that the shipyard was the source of PCB and tributyltin and that the storm drain was the source of the metals (Cubbage, J., 14 October, personal communication). Tributyltin was commonly used in anti-fouling bottom paint on ships, so shipyard activities would be the likely source of this contaminant.

3.2.6 Atmospheric Sources

The atmospheric contribution of contaminants to aquatic environments is generally poorly known. Sources of contaminants include waste-to-energy power plants, and coal gasification plants, and non-point sources such as automobile exhaust, dust, and forest fires. Potentially significant sources of atmospheric pollutants in the Bellingham area include cement plants (which have burned coal and other fuels to produce cement), the coal gasification plant located in what is now Boulevard Park, and atmospheric emissions from the Georgia-Pacific facility, specifically from wood-waste fired power production, the chlor-alkali plant, and pulp and paper processing facilities. Contaminants associated with burning coal and wood include PAHs and metals.

3.3 IN-PLACE SOURCES

In-place pollutants are found in bottom sediments in Bellingham Bay contaminated historically as the result of disposing of contaminated solids directly, or incorporated in sediments dredged from other contaminated areas. These locations include Whatcom Waterway and sites in Bellingham Bay where sediments dredged from the waterway have been deposited (see Figure 2-3). Whatcom Creek Waterway was first dredged in 1935 and subsequent maintenance dredging occurred in 1940, 1942, 1949, 1953, and 1957. In 1961, an extensive dredging project expanded the Whatcom Creek Waterway and in 1966 maintenance dredging was performed. The disposal sites used for these operations are not known (PTI Environmental Services 1989).

In 1969, the U.S. Army Corps of Engineers (U.S. ACOE) performed maintenance dredging of Whatcom Creek Waterway using a submerged pipe dredge to remove 99,424 m^3 (130,042 yd^3) of material which was disposed of at site A (Starr Rock) shown in Figure 2-3 (Broad et al. 1984). These sediments were likely contaminated to some degree as a result of historical pollutant discharges of Georgia-Pacific and City of Bellingham wastewater and other point and non-point discharges to Whatcom Creek Waterway. Georgia-Pacific dredged the inner waterway again in 1974. Dredge spoils from this operation were disposed of in a diked-off area within the Georgia-Pacific log pond (site E of Figure 2-3). This is the same general location where Georgia-Pacific later landfilled mercury contaminated sludge treated using the Chemfix® process (see Section 3.1.1).

The I&J Street Waterway was first dredged by the U.S. ACOE in 1966. The spoils from this project were deposited at site B shown in Figure 2-3. The U.S. ACOE began dredging the Squalicum Creek Waterway in 1931. It was dredged again in 1963, and spoils from this project were deposited at site D shown in Figure 2-3. Between 1979 and 1983 dredge spoils from a number of locations along the waterfront, including the Squalicum and I&J Street waterways, were deposited at site C shown in Figure 2-3.

In 1981, the U.S. ACOE diverted the mouth of Squalicum Creek from the inner tidal flats area back to its original location in the Squalicum Creek Waterway. The tidal flats area was then dredged to form the new small boat marina. Materials from this excavation were deposited in Site F (Figure 2-3) to form a parking area for the new marina facilities.

As part of the Puget Sound Dredge Disposal Analysis (PSDDA) program, a non-dispersive open-water disposal site has been located in the deep portion of Bellingham Bay off Post Point.

4.0 ENVIRONMENTAL MONITORING IN BELLINGHAM BAY

Chemical and biological variables that have traditionally been used to evaluate the environmental effects of anthropogenic contamination in urban bays of Puget Sound include 1) sediment chemistry, 2) benthic invertebrate abundance and community structure, 3) laboratory tests of sediment toxicity, 4) tissue concentrations of contaminants in marine organisms, and 5) the occurrence of tissue abnormalities in marine organisms (e.g., liver lesions or tumors). Regulatory criteria have been developed for only the first three indicators. The available data for evaluating all five of these indicators in Bellingham Bay is summarized below.

4.1 SEDIMENT CHEMISTRY

Chemical analyses of Bellingham Bay sediments have been made since the 1970s (Table 4-1). Initial studies focused on sediment mercury contamination in the vicinity of Georgia-Pacific chlor-alkali plant discharges to Whatcom Creek Waterway (Bothner 1973; Nelson et al. 1974; Stanley 1980). Following diversion of these discharges in 1979 to the extended outfall in Bellingham Bay, a number of studies measured other metals and organic contaminants. Some of these studies were related to Puget Sound-wide assessments (Malins et al. 1982; Battelle 1986), including sampling conducted as part of the Puget Sound Ambient Monitoring Program (PSAMP) (Tetra Tech 1990) and surveys of DNR aquatic lands (Tetra Tech 1991). Other sediment sampling programs have focused on assessing sediment quality associated with particular discharges or dredging projects (see Table 4-1).

Sediment chemistry results for fourteen of the surveys identified in Table 4-1 have been entered into Ecology's SEDQUAL data base (Vu, T., 26 April 1995, personal communication). Sampling locations for these surveys are shown in Figure 4-1. Ecology used these data to provide a generalized sediment quality screening evaluation for the inner harbor area of Bellingham Bay (see Figure 2-4). Ecology grades SEDQUAL data into one of four levels of quality (Ecology 1991):

TABLE 4-1. SUMMARY OF SEDIMENT CONTAMINANT STUDIES IN BELLINGHAM BAY

Survey Description	Duration	Sponsor	Reference
Bellingham Bay Mercury Study	1970-1973	University of Washington	Bothner 1973; Crecelius et al. 1975; Bothner et al. 1980
1985 Puget Sound Eight-Bay Survey[a]	1983, 1984	U.S. EPA	Battelle 1986
Post Point WWTP Sediment Studies	n/a	City of Bellingham	CH2M Hill 1984
Columbia Cement Proposed Maintenance Dredging[a]	January 1986	Columbia Northwest Corp.	n/a
National Status & Trends Program	1986, 1987	NOAA	NOAA 1991
NPDES Class II Inspection - Post Point WWTP[a]	August 1987	Ecology	Reif 1988
NPDES Class II Inspection - Georgia-Pacific[a]	August 1988	Ecology	Hallinan and Ruiz 1990
Alaska Ferry Terminal Construction Survey[a]	March 1989	City of Bellingham	n/a
PSDDA Phase 2 Baseline Survey[a]	April-May 1989	Ecology	n/a
PSAMP - 1989 Sediment Survey[a]	1989	Ecology	Tetra Tech 1990
Maintenance Dredging of Bellingham Bay[a]	Nov. 1990-Nov. 1991	U.S. ACOE/Port of Bellingham	n/a
PSAMP - 1990 Sediment Survey[a]	1990	Ecology	n/a
Aquatic Lands Sediment Quality Reconnaissance[a]	February 1991	DNR	Tetra Tech 1991
PSAMP - 1991 Sediment Survey[a]	1991	Ecology	n/a
Port of Bellingham International Shipping Pier Replacement[a]	April 1991	Port of Bellingham	n/a
NPDES Class II Inspection - Georgia-Pacific[a]	April 1993	Ecology	Golding 1994
Sediment Sampling at Maritime Contractors Shipyard	March 1993	Ecology	Cubbage, J., 14 October 1993
Sediment Sampling at Squalicum Harbor Marina	April 1993	Ecology	Cubbage 1994
Sediment Sampling in Whatcom Creek	April 1994	Ecology	Cubbage 1994
Metals Study of Bellingham Bay[a]	March 1993	Ecology	Cubbage, J. 7 June1993

[a] Data contained in Ecology's SEDQUAL Database.

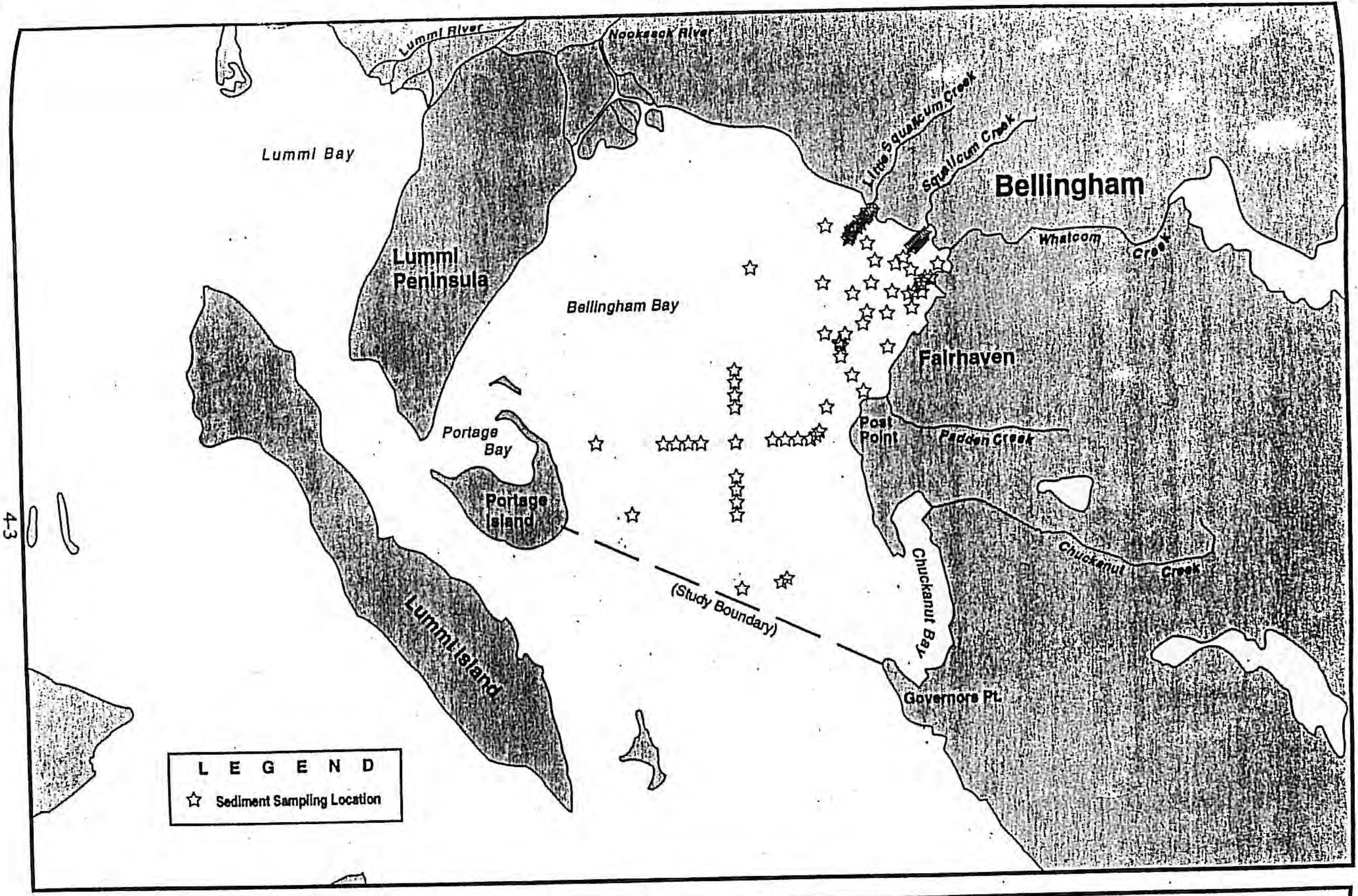


Figure 4-1. Sediment Sampling Locations in Bellingham Bay Contained in Ecology's SEDQUAL Database.

Level 1	Data are acceptable for all project uses. The data are supported by appropriate documentation that confirms their compliance with quality assurance and quality control requirements listed in Puget Sound Estuary Program protocols or other methods authorized by Ecology and allows comparison with data that will be generated during the cleanup study.
Level 2	Data are acceptable for most project uses. Appropriate documentation may not be available to confirm conclusions on data quality or to support legal defensibility. These data are supported by a summary of quality control information, and the environmental distribution suggested by other studies. The data are thus considered reliable and potentially comparable to data that will be produced during the cleanup study.
Level 3	Data are acceptable for screening-level analyses. The data can be used to estimate the nature and extent of contamination. No supporting quality control information is available, but standard methods were used, and there is no reason to suspect a problem with the data based on 1) an inspection of the data, 2) their environmental distribution relative to data produced by other studies, or 3) supporting technical reports. These data should be considered estimates and used only to provide an indication of the nature and possible extent of contamination.
Level 4	Data are not acceptable for use in the cleanup decision process. The data may have been acceptable for their original use. However, little or no supporting information is available to confirm the methods used, no quality control information is available, or there is documentation in technical reports that suggests the data may not be acceptable for use in regulatory decision-making.

The SEDQUAL data for Bellingham Bay meet the data quality requirements of Level 2 and in some cases Level 1 (Vu, T., 26 May 1995, personal communication). Therefore, these data are acceptable for use in the preliminary screening-level analysis presented below.

A preliminary screening analysis was conducted using the marine sediment quality standards-chemical criteria (Table I, WAC 173-204) and the detected metals and organic compounds for which quality standards are available. The contaminants were separated into the following groups for discussion and presentation: 1) metals, 2) low-molecular weight PAHs, 3) high-molecular weight PAHs, 4) dibenzofuran, 5) phthalates, and 6) phenols. Constituents which have organic carbon-normalized criteria but which were not accompanied by analysis of sediment total organic carbon (TOC) content were analyzed assuming a sediment TOC content of 1 percent as recommended by Ecology (1991).

4.1.1 Metals

Locations of stations exceeding the sediment quality criteria for metals are shown in Figure 4-2. The mercury criterion was exceeded at 39 stations, the copper criterion at one, and the arsenic and zinc criteria at one. Mercury contamination of sediments extends from the mouth of Whatcom Creek Waterway to offshore areas in the vicinity of the Post Point WWTP outfall.

4.1.2 Low Molecular Weight PAH

Locations of stations exceeding sediment quality criteria for low molecular weight PAHs are shown in Figure 4-3. These exceedances were for acenaphthene, anthracene, fluorene, phenanthrene, and 2-methylphenol, all measured during the Port of Bellingham Whatcom International Shipping Pier replacement project, and for phenanthrene measured in the Squalicum Creek Waterway as part of a maintenance dredging project.

4.1.3 High Molecular Weight PAH

A number of high molecular weight PAH compounds exceeded sediment criteria at a few locations in inner Bellingham Bay (Figure 4-4). Exceedances were noted at two locations sampled as part of a maintenance dredging project, one location at the Georgia-Pacific log pond sampled as part of the 1988 Class II Inspection conducted by Ecology, and at two locations sampled as part of the Whatcom International Shipping Pier replacement project.

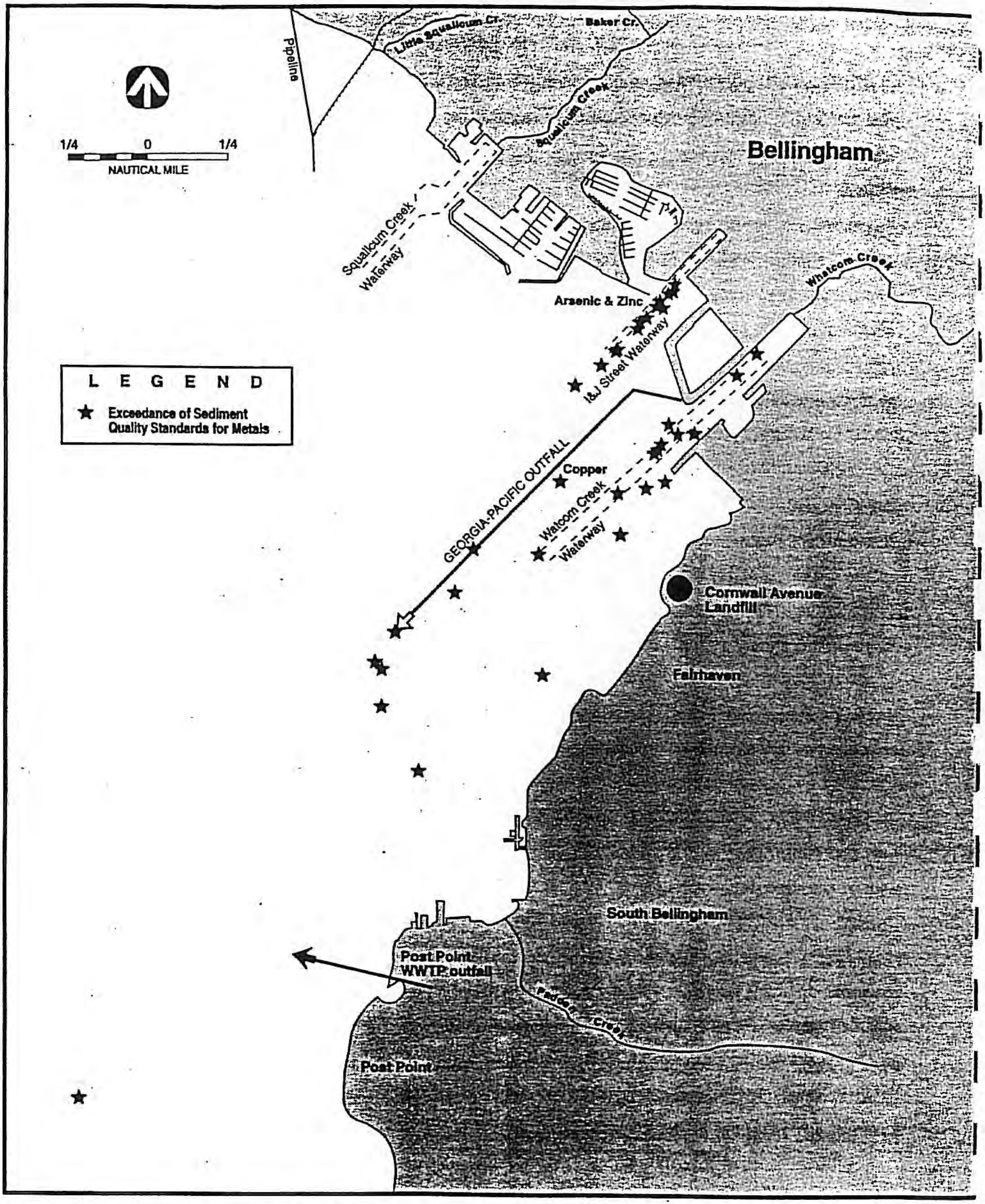


Figure 4-2. Exceedances of Sediment Quality Standards for Detected Metals. [Note: All exceedances are for mercury except where noted.]

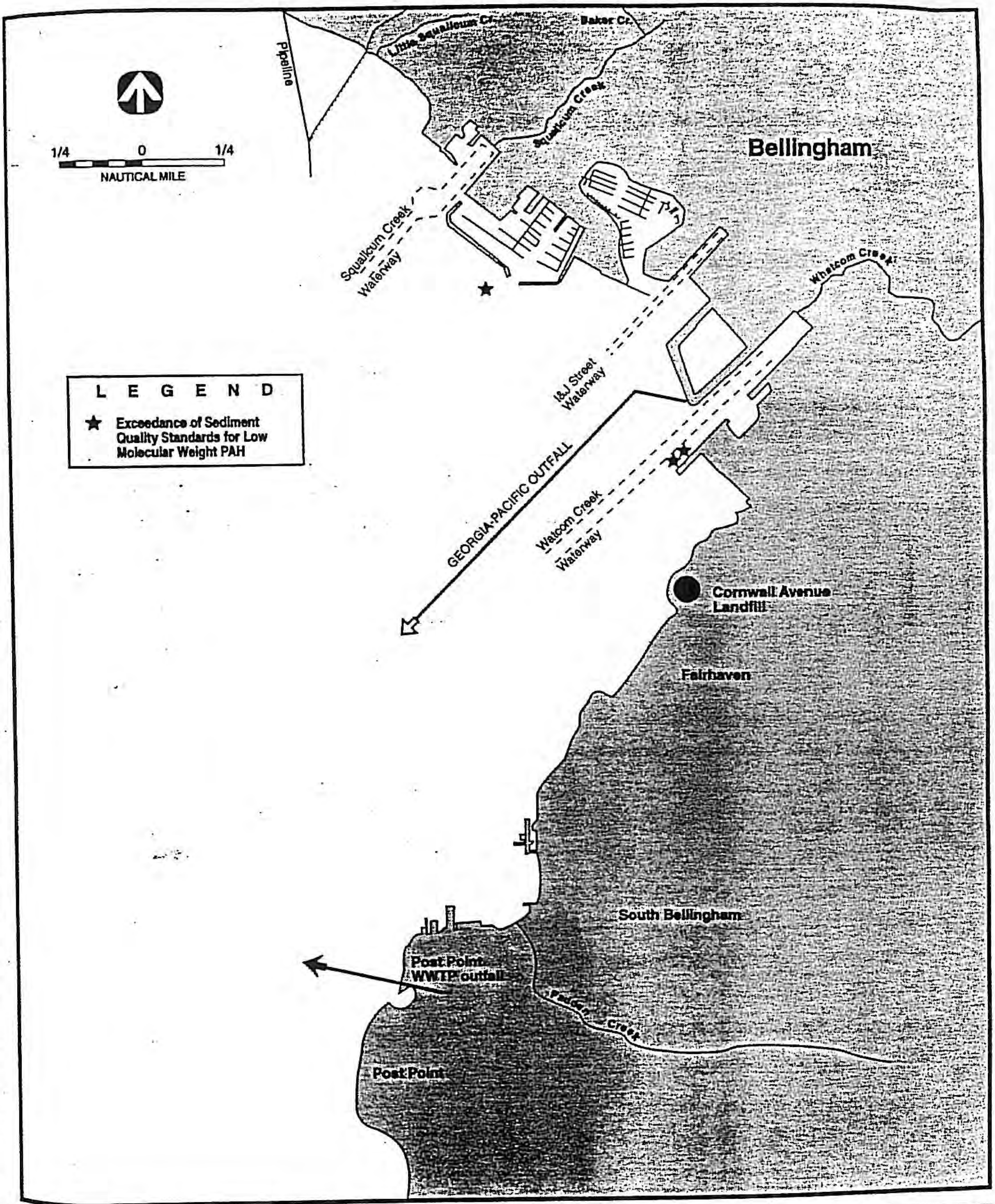


Figure 4-3. Exceedances of Sediment Quality Standards for Detected Low Molecular Weight PAH.

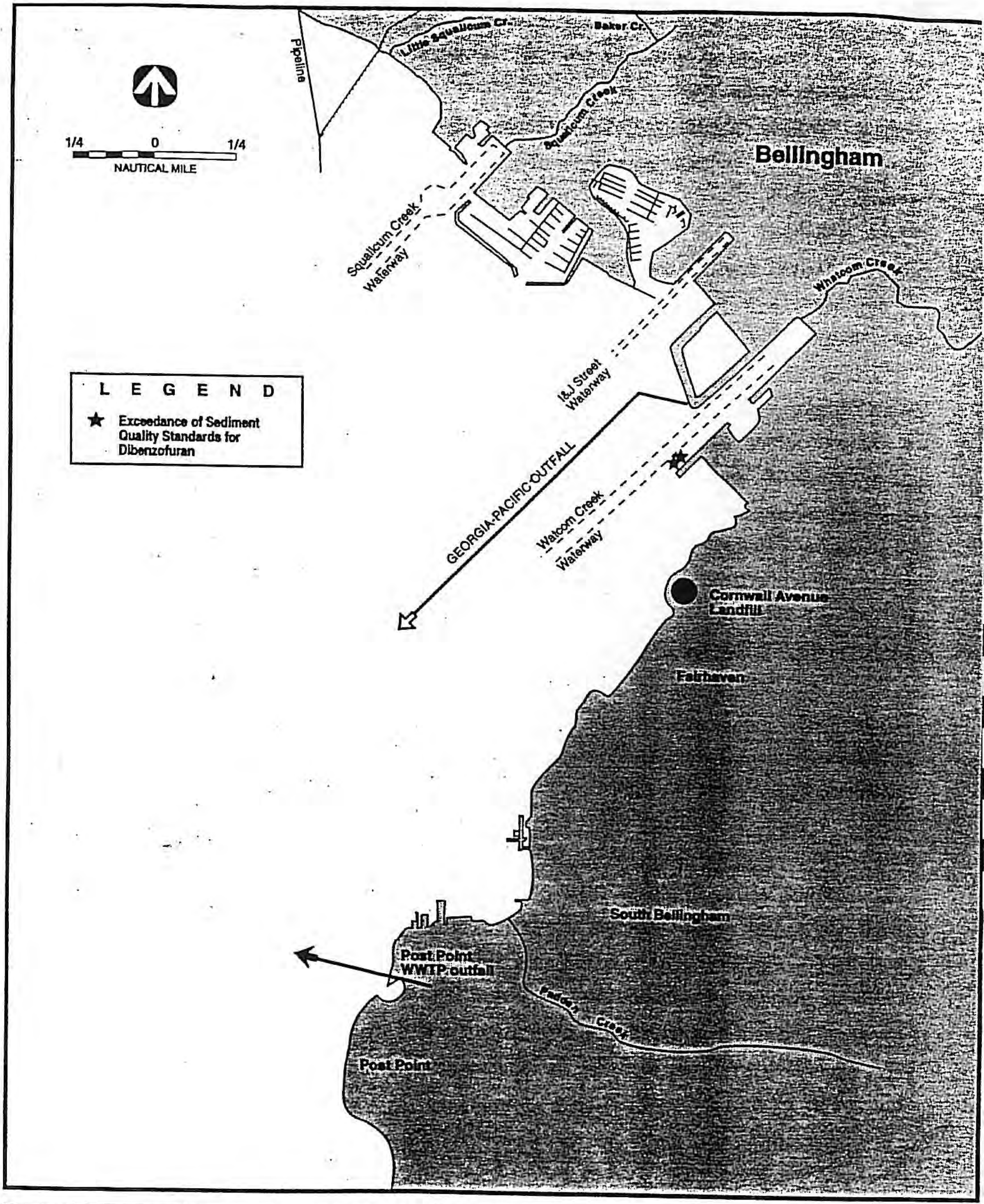


Figure 4-5. Exceedances of Sediment Quality Standard for Dibenzofuran.

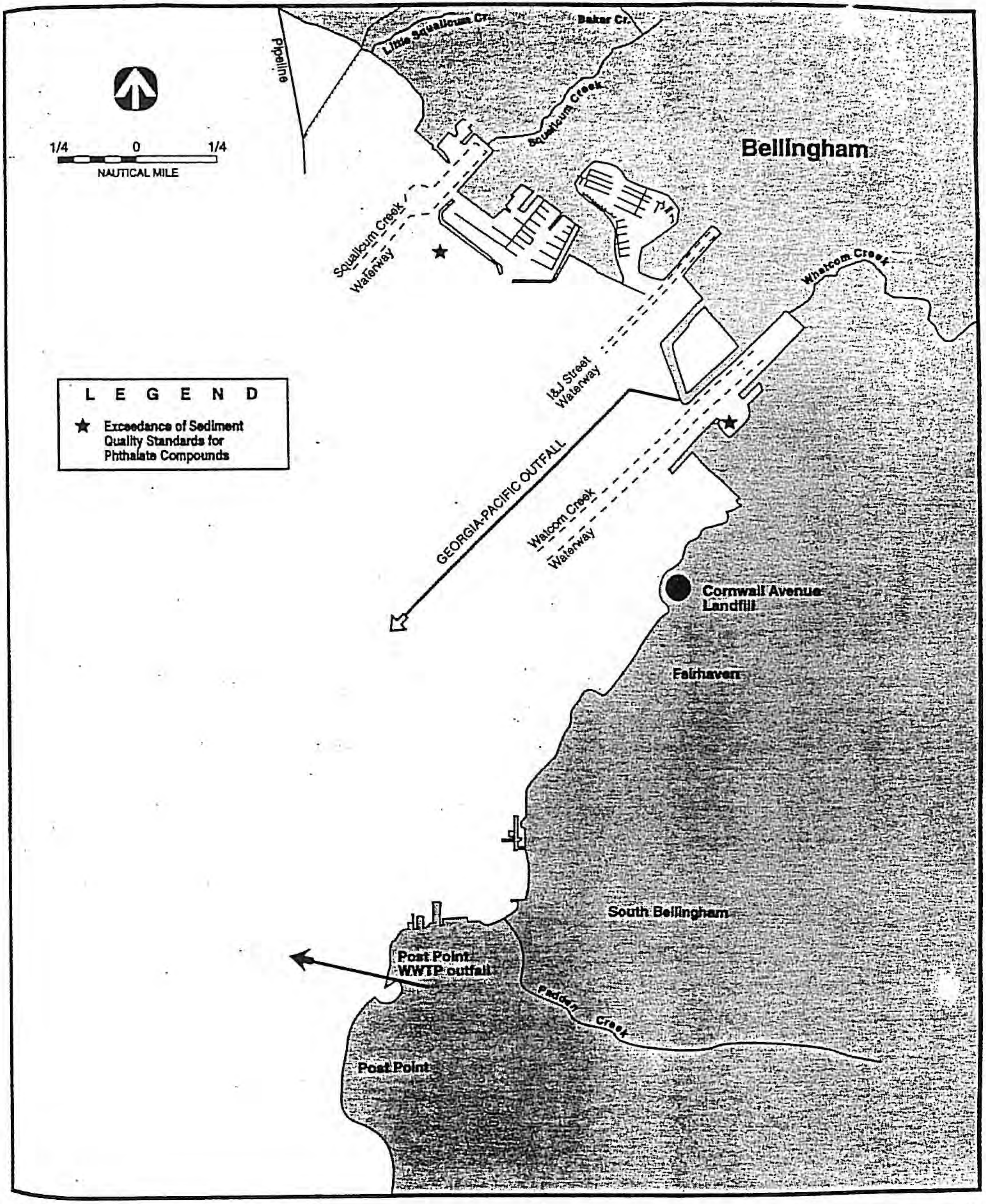


Figure 4-6. Exceedances of Sediment Quality Criteria for Detected Phthalate Compounds. [Note: Only bis(2-ethylhexyl)phthalate exceeded the standards.]

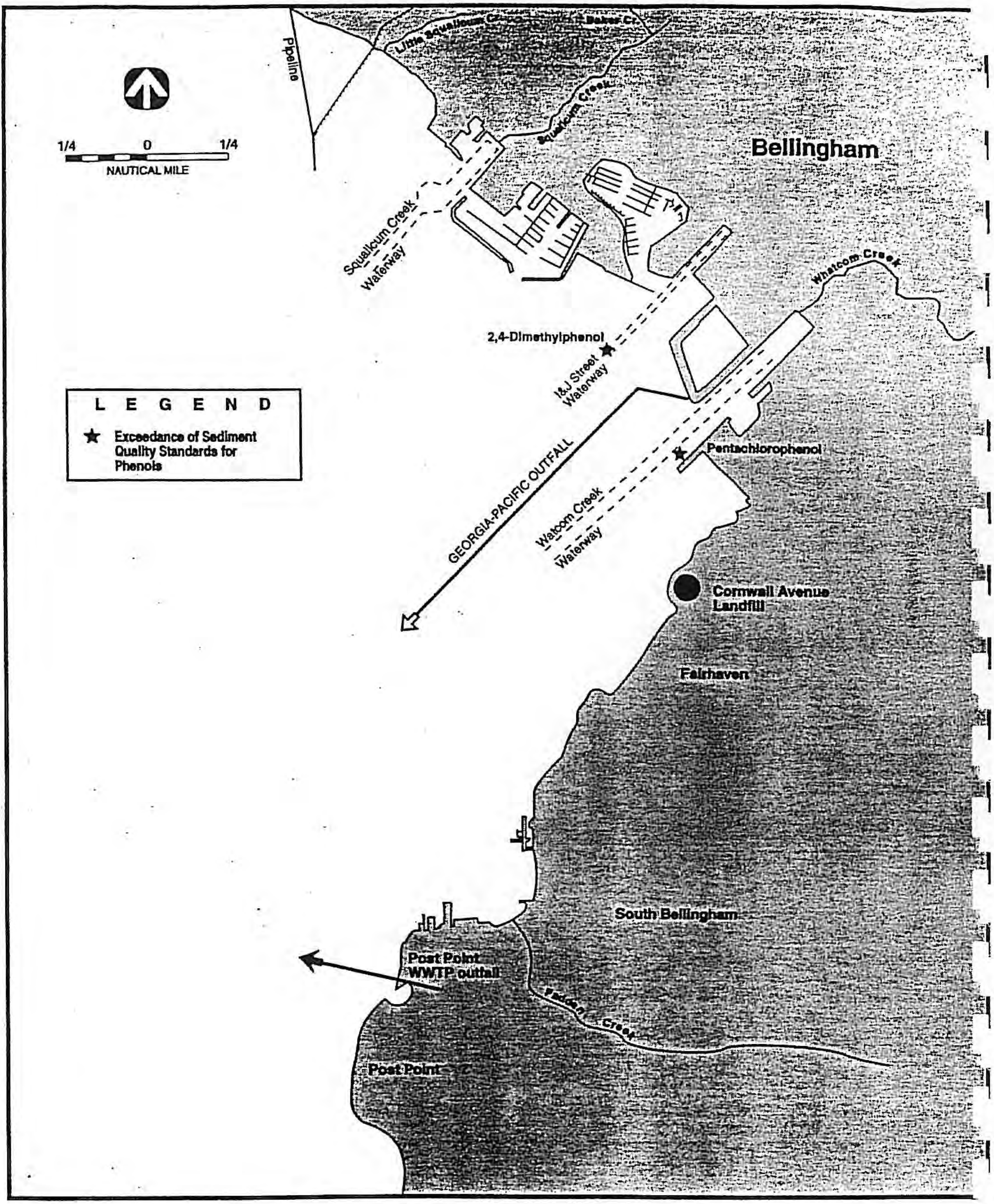


Figure 4-7. Exceedances of Sediment Quality Criteria for Detected Phenols.

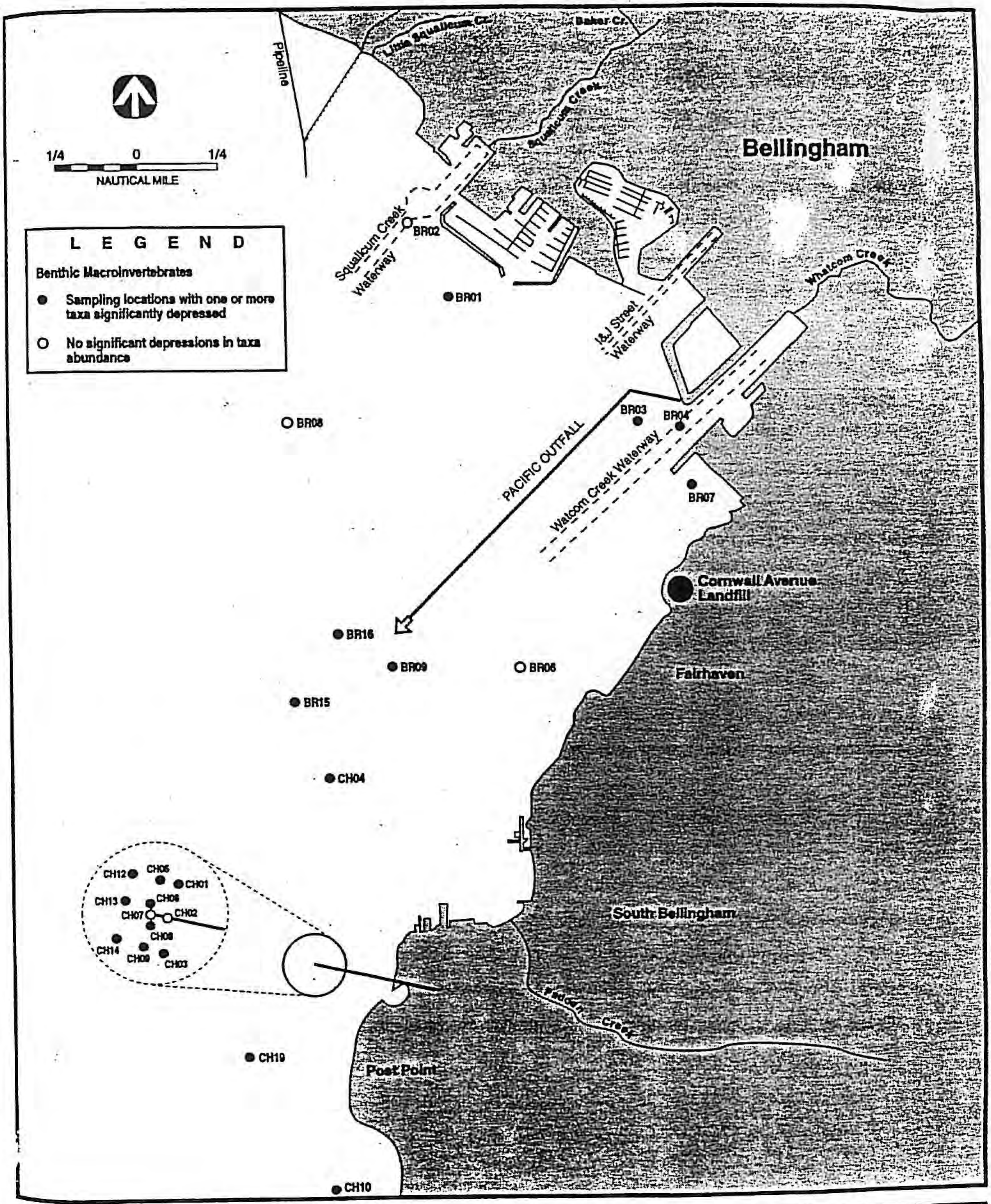


Figure 4-8. Locations of Stations Sampled for Benthic Macroinvertebrates in Inner Bellingham Bay.

4.3 SEDIMENT TOXICITY

Only five studies conducted in or adjacent to inner Bellingham Bay have assessed the toxicity of sediments to laboratory test organisms. These were conducted by Chapman et al. (1984), Batelle (1986), Reif (1988) near the Post Point WWTP outfall, Hallman and Ruiz (1990) at the Georgia-Pacific outfall, and Golding (1994) at the Georgia-Pacific log pond. Whatcom Creek sediments were assessed as part of the Phase II storm drain source tracing study (Cubbage 1994).

All of these studies used the acute amphipod (*Rhepoxynius abronius*) mortality test which can be used in conjunction with other acute and chronic tests to establish whether or not adverse effects to benthic organisms are likely to occur. Sediment locations where acceptable amphipod bioassays were performed are shown in Figure 4-9. Assuming that only bioassays that result in less than 75 percent survival are biologically meaningful (Mearns et al. 1986), the areas identified as potentially toxic to benthic organisms include the vicinity of the Post Point outfall (station RE01), outer Whatcom Creek Waterway (station BA05), the Georgia-Pacific log pond (station E904), and a location in Whatcom Creek (station WHAT1). The lowest amphipod survival (23 percent) was observed in sediments collected from the Georgia-Pacific log pond during a Class II inspection conducted by Ecology in 1988 (Hallinan and Ruiz 1990). The sediment concentration of mercury and two PAH compounds, benzo[g,h,i]perylene and indeno[1,2,3-cd]pyrene, exceeded sediment quality standards. Mercury exceeded the standard of 0.41 mg/kg by approximately two orders of magnitude.

The most recent complete Class II inspection of Georgia-Pacific (April 1993) sampled sediments near the extended outfall only (Golding 1994). In addition to the acute amphipod bioassay, the acute mussel (*Mytilus edulis*) larval mortality/abnormality bioassay and the acute juvenile polychaete (*Neanthes arenaceodentata*) mortality bioassay were performed on these sediments. The acute mussel larval test showed significant depressed survival at both station SED1 (65 percent) and SED2 (76 percent). The mussel test also showed significant abnormality at station SED1 (26 percent), the same station that showed significant mussel larval mortality. The *Neanthes* test indicated a biologically significant response at station SED2 (76 percent survival).

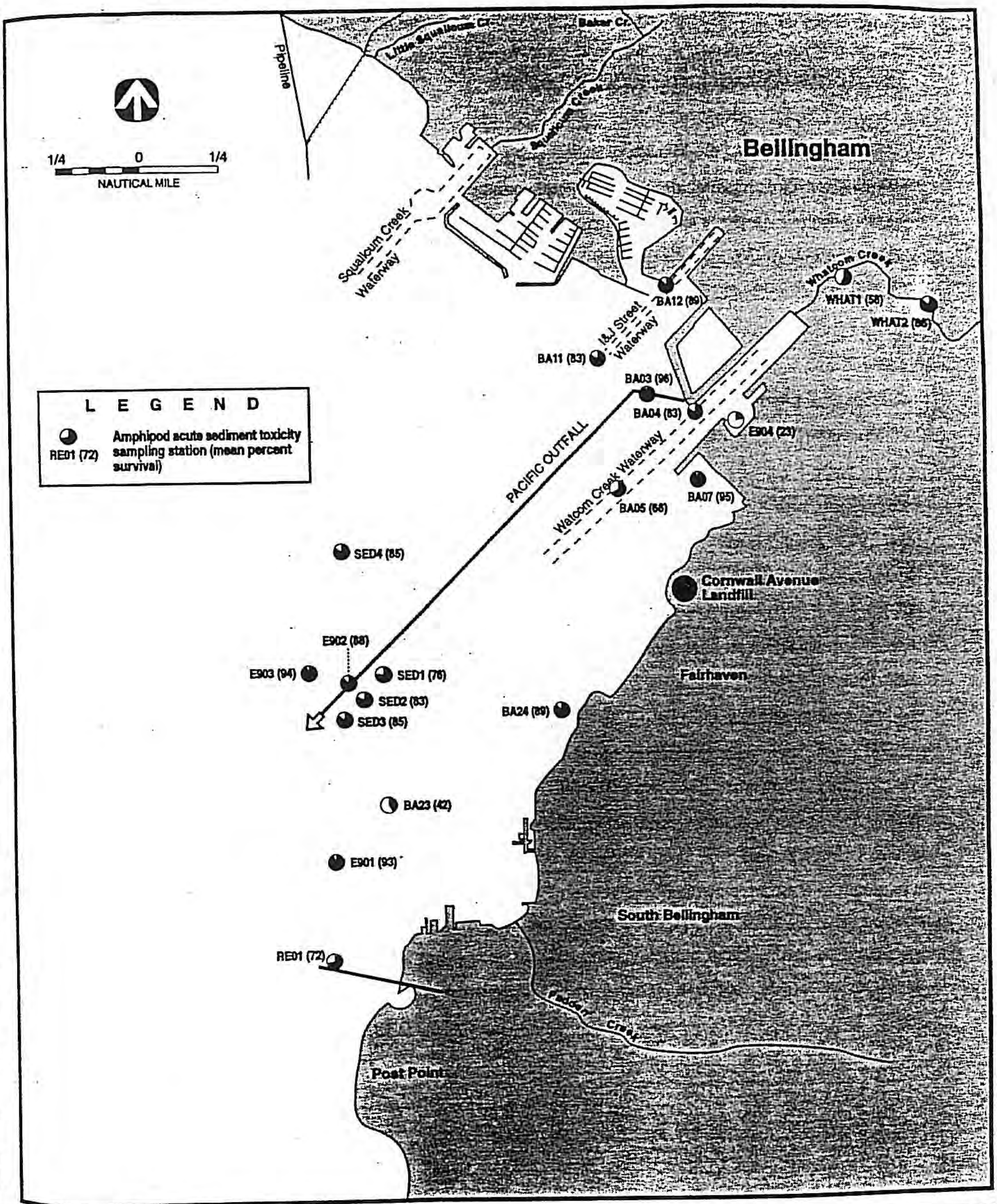


Figure 4-9. Locations of Stations Sampled for Sediment Toxicity in Inner Bellingham Bay.

4.4 CONTAMINANT BIOACCUMULATION

The bioaccumulation of contaminants has the potential to cause acute and chronic toxicity to marine organisms. The consumption of certain contaminated seafoods can affect human health. There are currently no state standards for contaminant concentrations in biota to protect aquatic life or human health. Assessment of potential human health impacts is typically based on two approaches. The first approach uses the U.S. Food and Drug Administration (FDA) guidelines for contaminants in food called the FDA Action Levels (U.S. FDA 1984 and 1985). If the FDA Action Level of a particular contaminant is exceeded in a sampled food product, the product cannot be sold commercially. The second approach involves a risk-based analysis of potential carcinogenic and non-carcinogenic health effects based on assumptions regarding consumption rate and duration of exposure of humans to contaminated foods.

Mercury has been the primary focus of bioaccumulation studies conducted in Bellingham Bay since at least 1973 (Rasmussen and Williams 1975; Nelson et al. 1974; Roesijadi et al. 1981; CH2M Hill 1984). However, more recent studies have included the analysis of additional metals (arsenic, lead, cadmium), PCBs, pesticides, pentachlorophenol, and PAHs (NOAA 1989; Cubbage 1991; SAIC 1991). These more recent studies provide the most relevant data for assessing potential adverse effects to aquatic organisms and human health. Although a risk-based screening of the existing data is beyond the scope of this report, some generalizations can be made based on comparing existing data to FDA Action Levels. In general, tissue mercury concentrations in clams and crabs in Bellingham Bay have declined over time and are currently below the FDA Action Level of 1.0 mg/kg wet weight. The highest concentration of mercury measured in edible tissue collected during the two most recent studies was 0.15 mg/kg wet weight which was measured in a Dungeness crab (*Cancer magister*) sample collected from the mouth of Whatcom Creek Waterway (Cubbage 1991). FDA Action Limits were also available for comparing total PCBs (2 mg/kg wet weight), DDE (5 mg/kg wet weight), and chlordane (0.3 mg/kg wet weight) concentrations measured in these studies. All muscle tissue analyses of crab and clam indicated concentrations of PCBs, DDE, and chlordane well below the current FDA Action levels for these compounds (Cubbage 1991).

4.5 TISSUE ABNORMALITIES

Tissue abnormalities have also been used as indicators of adverse environmental effects in urban bays of Puget Sound (Malins et al. 1982). The prevalence of histopathological lesions of the liver (i.e., neoplasms and necrotic lesions) in English sole (*Parophrys vetulus*) has been used as a key biological indicator. However, no information is available on tissue abnormalities in aquatic organisms collected from Bellingham Bay. Malins et al. (1982) reported no liver lesions in English sole collected off Eliza Island, approximately 2 km (1.3 mi) south of the study area.

5.0 CORNWALL AVENUE LANDFILL AND R.G. HALEY SITES

The Cornwall Avenue Landfill underlies property currently leased by DNR to the Georgia-Pacific West Corporation. The landfill has been identified by Ecology as a confirmed or suspected contaminated site under the Model Toxics Control Act, and graded 2 on a scale of 1 to 5, where grade 1 is the highest priority for investigation and remedial action (Ecology, no date, size hazard assessment). The only other site within 1/4 mile of the landfill that has been identified by Ecology as a confirmed or suspected contamination site is the former R.G. Haley International Corporation, Inc. wood treatment facility, which is adjacent to the landfill (Figure 5-1). This site has been given the grade of 3 on the above scale.

Section 5.1 is a detailed history of this site and the surrounding area prepared by HRA, Inc. Sections 5.2 and 5.3 review contaminant sampling processes and results from this site and the immediate vicinity.

5.1 HISTORICAL OVERVIEW OF CORNWALL AVENUE LANDFILL AND VICINITY

5.1.1 Early Industries in Bellingham Bay

During the nineteenth century, Bellingham Bay became one of the first industrial areas in Washington. Lumbering began in the early 1850s with the development of a saw mill on Whatcom Creek. Vast stores of timber soon attracted additional lumbering operations along Bellingham Bay, which provided access to markets. During the early 1850s, settlers also discovered coal, and established the first coal mining operation in Washington Territory (Anonymous 1902, Moen 1969).

In 1853, Henry Hewitt and William Brown found an outcropping of coal while scouting for logs near Sehome Hill, south of what is now Laurel Street, between State Street and the shoreline. The claim was sold to a group of San Francisco businessmen, who organized the Bellingham Bay Coal Company. In 1855, they opened the Sehome Mine, which produced at the rate of 500 tons per year. Its shaft began at the intersection of Railroad Avenue and Myrtle Street, eventually extending as far northwest as the

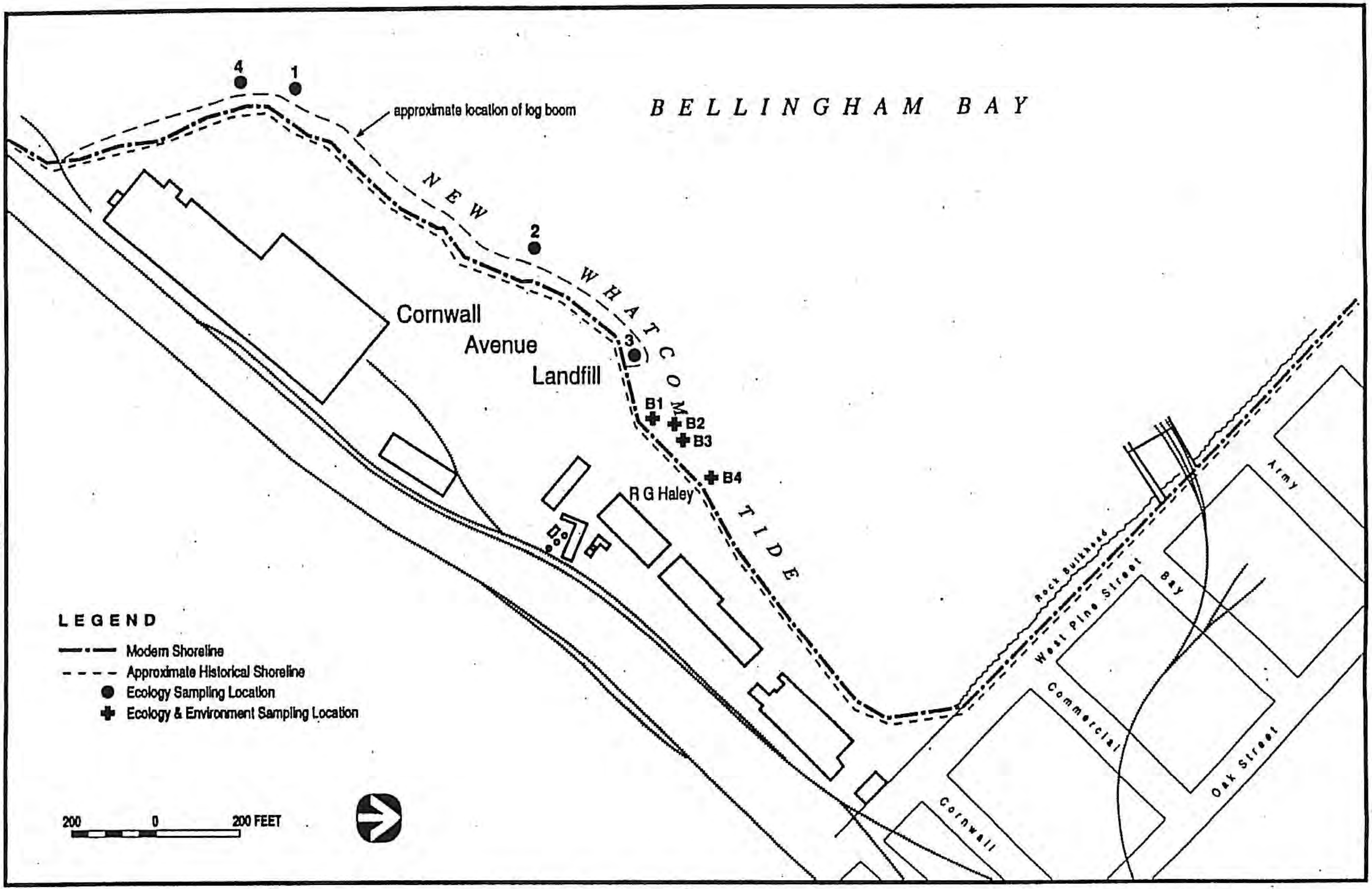


Figure 5-1. Cornwall Landfill Area and Offshore Intertidal Sampling Locations.

intersection of Champion, Unity and Dock (now Cornwall) Streets. The Sehome vein proved to be 17 feet thick, and the dip and the strike carried the seam under the waters of Bellingham Bay. The Washington State Division of Mines and Geology reported that Sehome coal was mined beneath the tidewaters (Batchelor 1982).

Operation of the Sehome Mine was periodically interrupted by fires caused by explosive gases, and flooding owing to inadequate pumping equipment. By 1878, its supply of coal had dwindled, and the mine shut down (Batchelor 1982, Tweit interview 1995). A map dated 1966 indicates that coal mining activity covered an approximate area that includes what is now the Cornwall Landfill (Washington Surveying and Rating Bureau). Coal mining continued in the Bellingham Bay area after the Sehome Mine closed. Workers loaded coal at the Sehome wharf, located at the foot of Dock Street, which became Cornwall in the mid-1920s. This structure, which remained in use through the early twentieth century, featured rail lines to the edge, and chutes to drop the coal into the cargo compartments of waiting ships (Scott and Turbeville 1980) (Figure 5-2).

5.1.2 Bellingham Bay Improvement Company

The mild success of the coal industry encouraged additional development of the area at the foot of Dock Street. In 1883, investors in the Bellingham Bay Coal Company formed the Bellingham Bay and British Columbia Railroad Company to promote the area as a terminus for the transcontinental railroad. During the 1880s, the company constructed a rail line from the tidewater to the national boundary, where it connected with the Canadian Pacific Railroad. In 1889, Cornwall and the other investors established the Bellingham Bay Improvement Company (BBIC), to develop the Bellingham Bay area through real estate platting and sales. The Bellingham Bay and British Columbia Railroad Company operated under the BBIC's charter, which called for starting new industries and building additional transportation systems (Prosser 1903, Kraig 1981, Kraig 1989).

In 1891, the BBIC constructed a saw mill along the waterfront, using the Sehome wharf at the foot of Dock Street. A map of the BBIC's early facilities dated 1891 indicates that a "dump," perhaps associated with lumbering operations, was located at Elk and Beech Streets, near the project area (Whatcom County Appraiser's Map 1891). Although Historical Research Associates did not locate additional references, this map could indicate that dumping remained a longstanding use of the property. The BBIC mill, which became the second largest on Puget Sound, featured a capacity of two hundred thousand feet of lumber

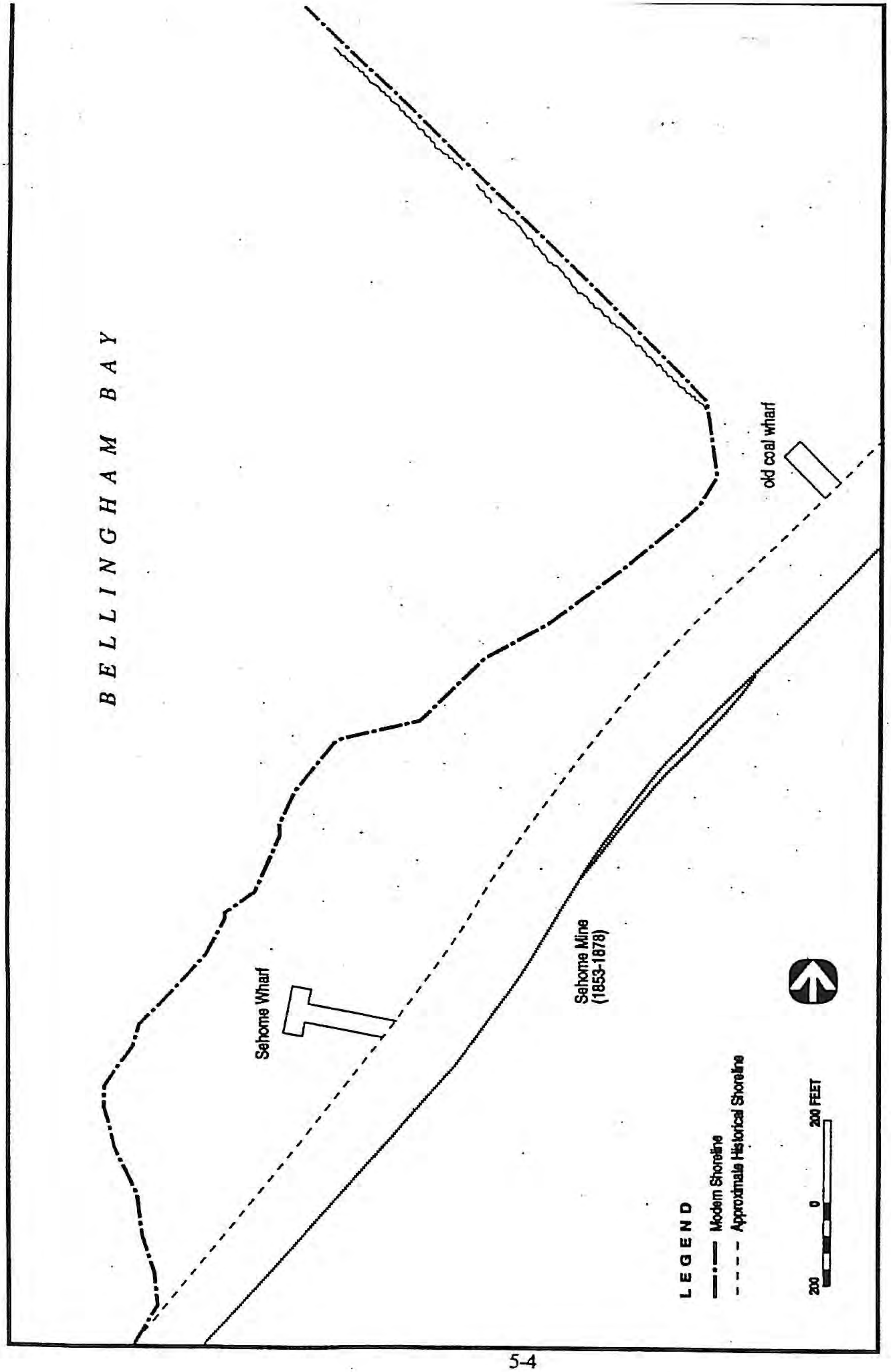


Figure 5-2. Cornwall Landfill Area 1880-1890.

every ten hours, and employed 200 workers. "Perhaps no other one company has done as much for the improvement and progress" of Bellingham, noted one historian in 1903, "for it has largely promoted industrial and commercial interests with the result that the city's growth has been augmented and its prosperity largely increased" (Prosser 1903). In 1911, the BBIC petitioned the Board of State Land Commissioners to fill in a portion of the harbor in the project area. For all its early promise, however, the BBIC proved to be short-lived. By 1912, the Bellingham Securities Syndicate had purchased its properties, and the mill and rail lines were sold to private investors, signalling the end of an era of high expectations and boosterism in the Bellingham Bay area. In 1933, the Bellingham Bay Improvement Company dissolved, and around 1940, the Bellingham Securities Syndicate also disbanded (Kraig 1989) (Figures 5-3 and 5-4).

5.1.3 Bloedel Donovan Lumber Company

In 1913, the Bloedel Donovan Lumber Company purchased the mill at the foot of Dock Street. This entity resulted from the merging of the Lake Whatcom Logging Company and the Larson Lumber Company that same year (Clark 1969). By 1918, Bloedel Donovan had remodeled the mill, adding a sash and door factory as well as a box factory. The company stored 40 million feet of box lumber at the site, and maintained one of the largest privately-owned deep water docks on the Pacific Coast (Koert and Biery 1980) (Figure 5-4).

In 1925, the State of Washington leased portions of the project area to the Bloedel Donovan Lumber Company, stating that "The lessee shall not make or suffer to be made any artificial filling in of said leased area or any deposit of rock, earth, ballast, refuse, garbage or other matter within such area, except as provided by law or as approved in writing by the Commissioner of Public Lands" (State of Washington 1925). By World War II, timber reserves had become depleted, and Bloedel Donovan holdings were liquidated in 1945 and 1946. In 1942, the company assigned a portion of its lease to the Port of Bellingham, which purchased the mill in 1947 for $75,000 (Edson, no date) (Figures 5-5 to 5-7).

5.1.4 Brooks Lumber Company/American Fabricators

During the early twentieth century, Frank N. Brooks became "one of the prominent operators" in Bellingham's lumber industry. Described as a "true westerner," Brooks was a native of Minneapolis who established the Brooks Lumber Company in Michigan in 1914. Five years later, he moved his business to

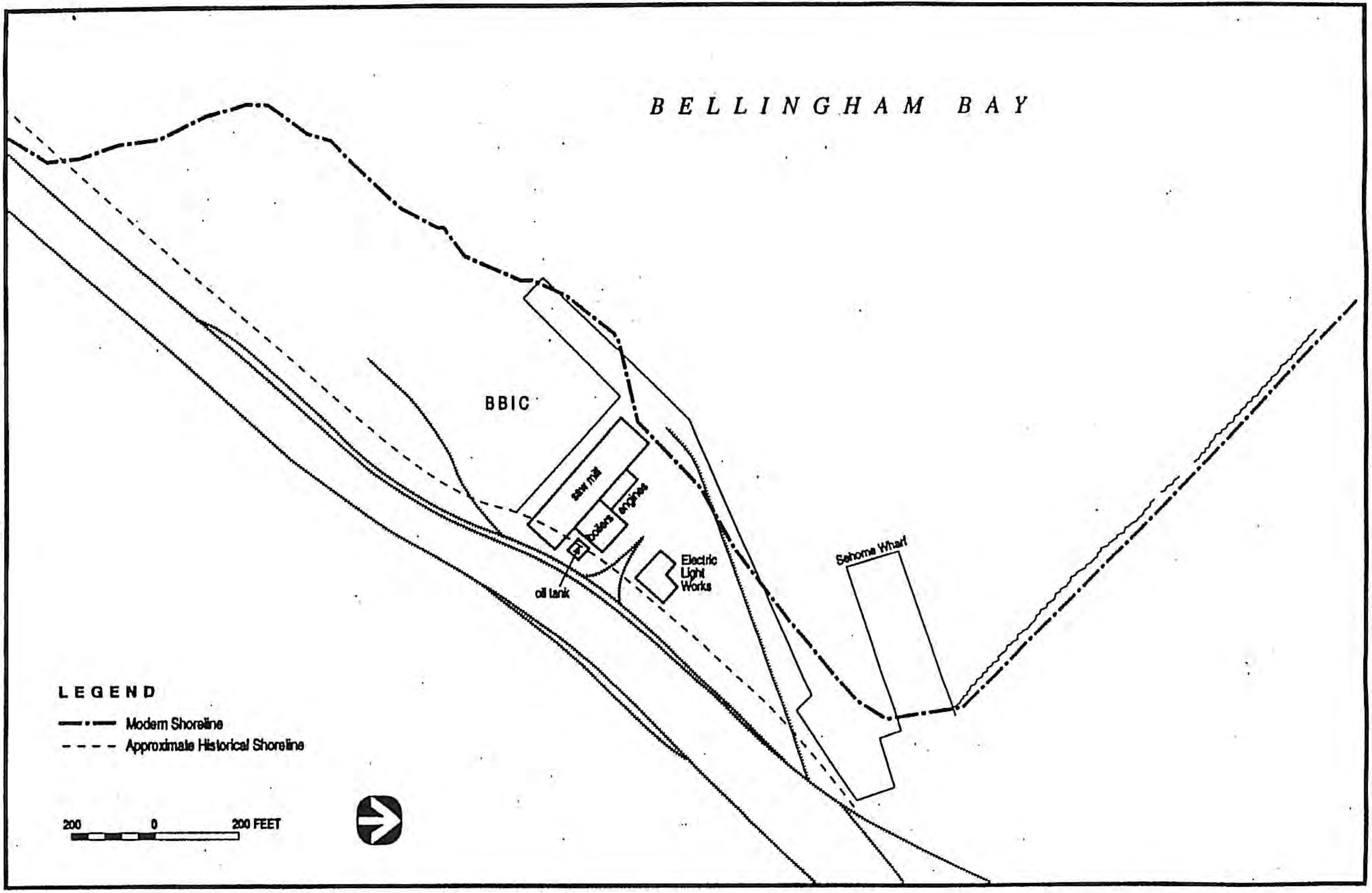


Figure 5-3 Cornwall Landfill Area 1890-1900.

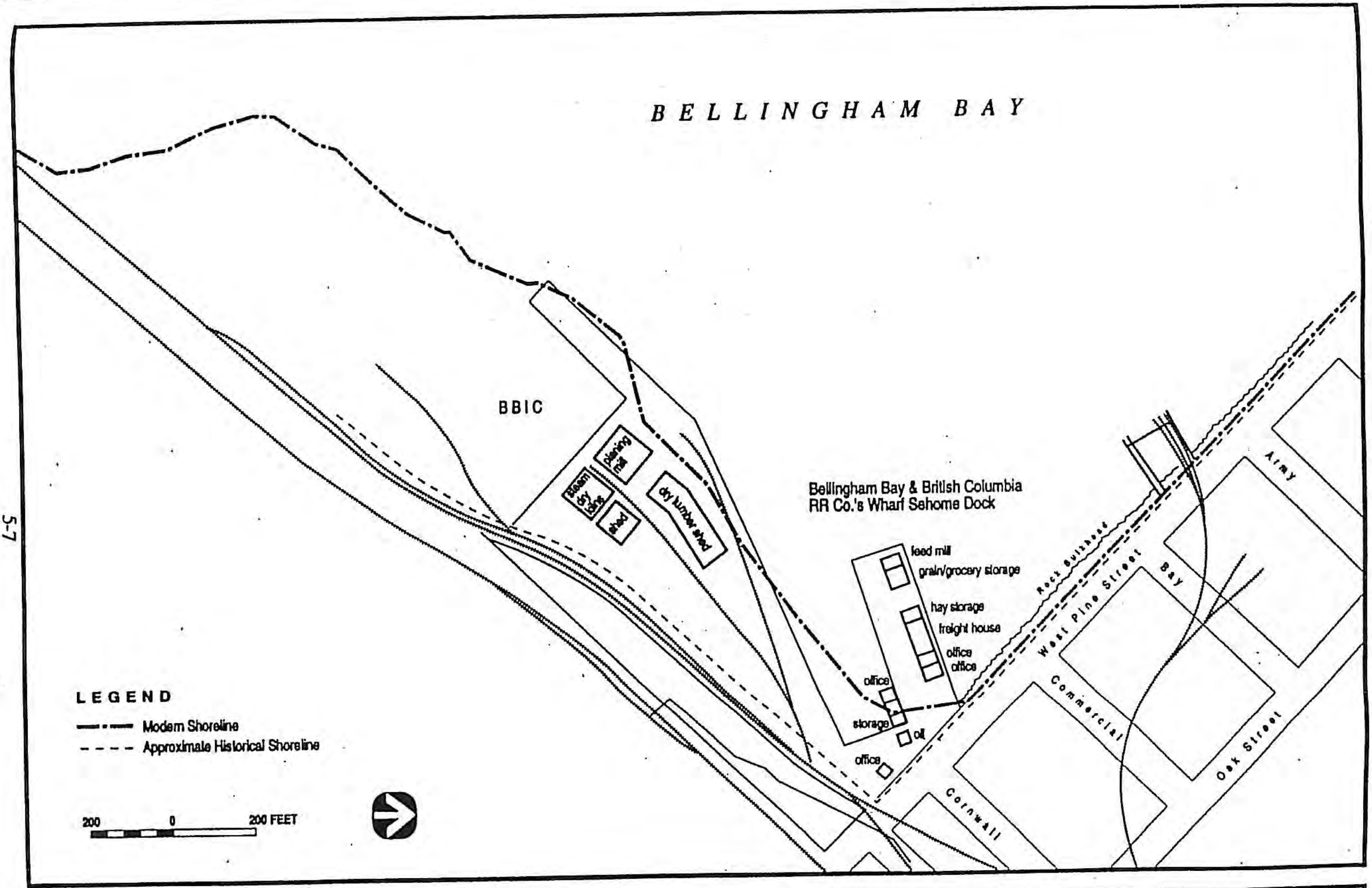


Figure 5-4 Cornwall Landfill Area 1900-1910.

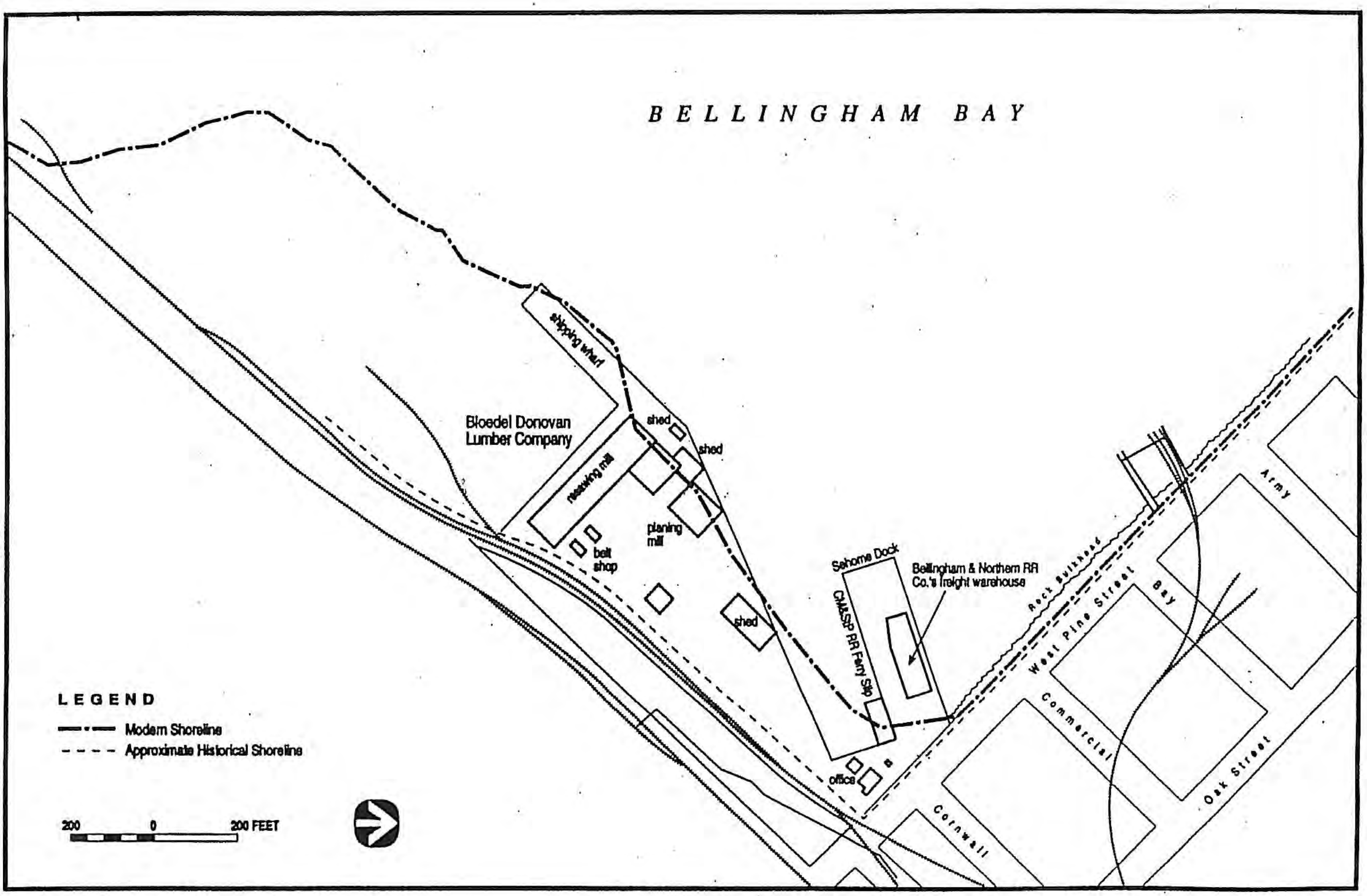


Figure 5-5 Cornwall Landfill Area 1910-1920.

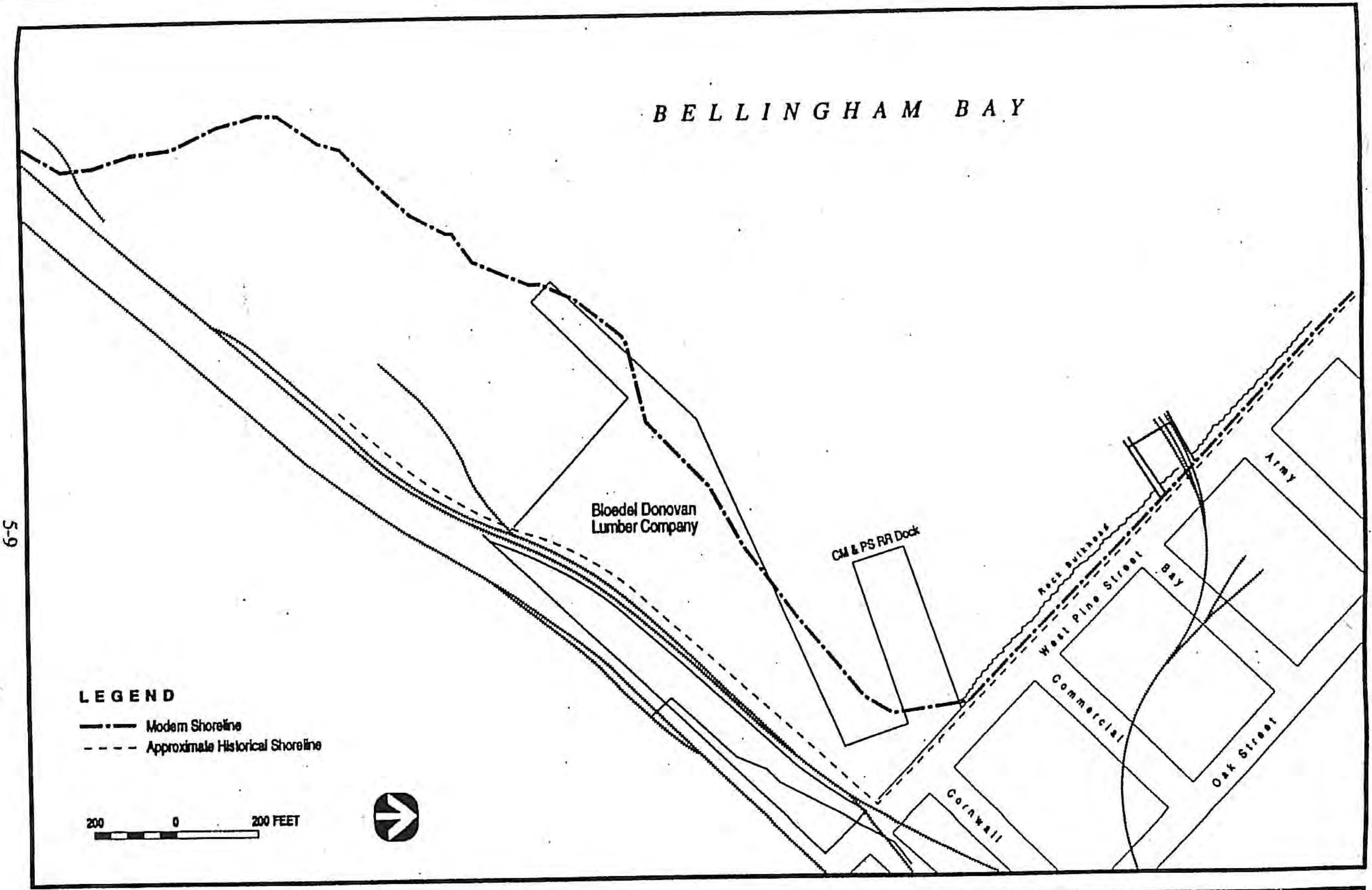


Figure 5-6 Cornwall Landfill Area 1920-1930.

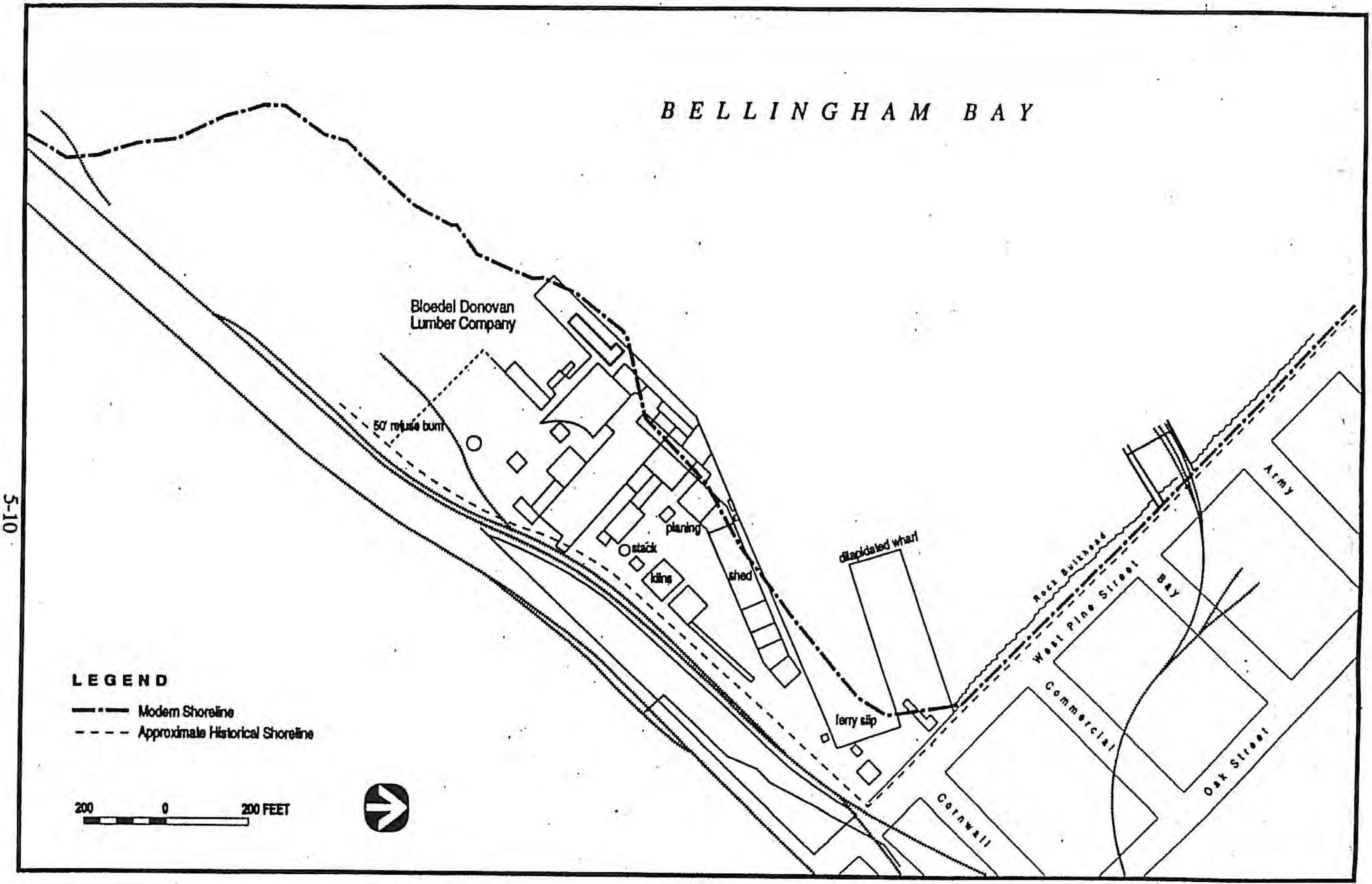


Figure 5-7 Cornwall Landfill Area 1930-1940.

Bellingham Bay (Roth 1926). Brooks Lumber Company first appeared in *Polk's Bellingham and Whatcom County Directory* in 1920-1921 (Polk 1921).

It is not clear when this company began operating in the project area. In 1927, Brooks complained that Bellingham's lack of facilities for handling lumber for water shipment had forced small mills out of business in the area. His objective was to persuade the U.S. Army Corps of Engineers to proceed with improvements on Squalicum Creek (U.S. House 1928). In 1942, the American Wood-Preservers' Association reported that the Brooks Lumber Company maintained two wood-treatment tanks, measuring 6x8x24, in Bellingham. The American Wood-Preservers' Association continued to report the wood-treating activities of the company, which became Brooks Manufacturing, through the early 1990s (American Wood-Preservers' Assn. 1942, 1990).

In 1954, *Polk's Bellingham and Whatcom County Directory* listed American Fabricators, with Frank C. Brooks, Frank N. Brooks's son, as president (Polk 1954). During the 1950s, American Fabricators, a division of Brooks Lumber Company, was located at the foot of Cornwall Avenue, suggesting that Brooks Lumber Company had been operating at this site. An interview confirmed that Brooks Lumber Company was located at the site around this time (Dahlgren interview 1995). American Fabricators was involved in glue lamination of wood structures, and operated one of the nation's largest plants devoted to this activity.

By the early 1960s, this company had purchased "the old Bloedel Donovan office buildings and site" (Hitchman 1972). In 1962, American Fabricators leased 9 1/2 acres of fill land to the City of Bellingham for an extension of the city garbage dump (Bellingham Herald 1962). Polk Directories indicate that Brooks Manufacturing and American Fabricators moved to Iowa Street in 1974 (Polk 1974). Brooks Manufacturing continues to conduct business at this location.

5.1.5 International Cross Arm/R.G. Haley/G.R. Plume Company

International Cross Arm Company first appeared in *Polk's Bellingham and Whatcom County Directory* in 1923 (Polk 1923). During the 1920s, this business operated in Victoria, British Columbia, where J.O. Cameron served as its president. International Cross Arm Company also ran a "substantial" wood by-product factory in Bellingham, where it was located at the foot of Taylor Avenue. Here it manufactured cross arms for telegraph and telephone lines, and Axel G. Bulow managed the facility (Roth 1926).

The American Wood-Preservers' Association began reporting the wood-treating activities of International Cross Arm Company during the early 1950s (American Wood-Preservers' Assn. 1952). At that time, the company was conducting its wood-treating business at 499 Cornwall Avenue, where it stored up to 2 1/2 million board feet. In 1956, the company began doing business as R.G. Haley International Corporation, with Richard Haley serving as president and Axel G. Bulow as vice-president. In 1957, the company acquired a new kiln at its Cornwall location, which allowed lumber to be cured in 10 days. Previously, the cross arm lumber was air-dried, a process that could take up to four months (Polk 1954, 1956; Bellingham Herald 1957). The facilities also included a retort, storage tanks for PCP, control room, and some large storage sheds (Ecology and Environment Inc. 1986).

Ralph Stephan, plant manager for R.G. Haley International Corporation, reported that the company stockpiled lumber on concrete pads along the waterfront. Waste waters from the wood-treatment process were released into an unlined seepage pit on the property. Before the plant closed in the 1980s, 5,000 to 6,000 gallons of sludge from the R.G. Haley plant were collected by Crosby and Overton, Inc., which disposed of the material at Chemical Security Systems, Inc. in Arlington, Oregon (Purnell 1991). According to one source, R.G. Haley International Corporation wanted to expand its operations during the 1980s, but the company was unable to secure a shoreline permit to do so (Maury interview 1995). In 1985, the facility closed its operations, and in 1991, G.R. Plume was located at the site (Polk 1991, Ecology and Environment 1986, Dahlgren interview 1995) (Figures 5-8 to 5-11).

5.1.6 Georgia-Pacific Corporation

In 1926, Ossian Anderson founded the San Juan Pulp Company, which established a pulp plant on five acres of tidelands north of the project area. Three years later, the business was reorganized as the Puget Sound Pulp and Timber Company. Anderson served as the new company's first president. By 1938, it had constructed the pulp mill on the tidelands that continues to operate at the present time. In 1941, this operation was enlarged to produce 160,000 tons annually. Encouraged by the war effort, the Defense Plant Corporation built a plant at the site to produce ethyl alcohol from the sugars present in the sulfite waste liquor of the pulp mill. The Puget Sound Pulp and Timber Company later purchased this plant. In 1946 and 1947, the company added a modern log barking and chipping plant and a paperboard manufacturing plant to its operations. Production at the paperboard plant averaged 45 tons per day, until it closed in the early 1980s (Georgia Pacific 1991).

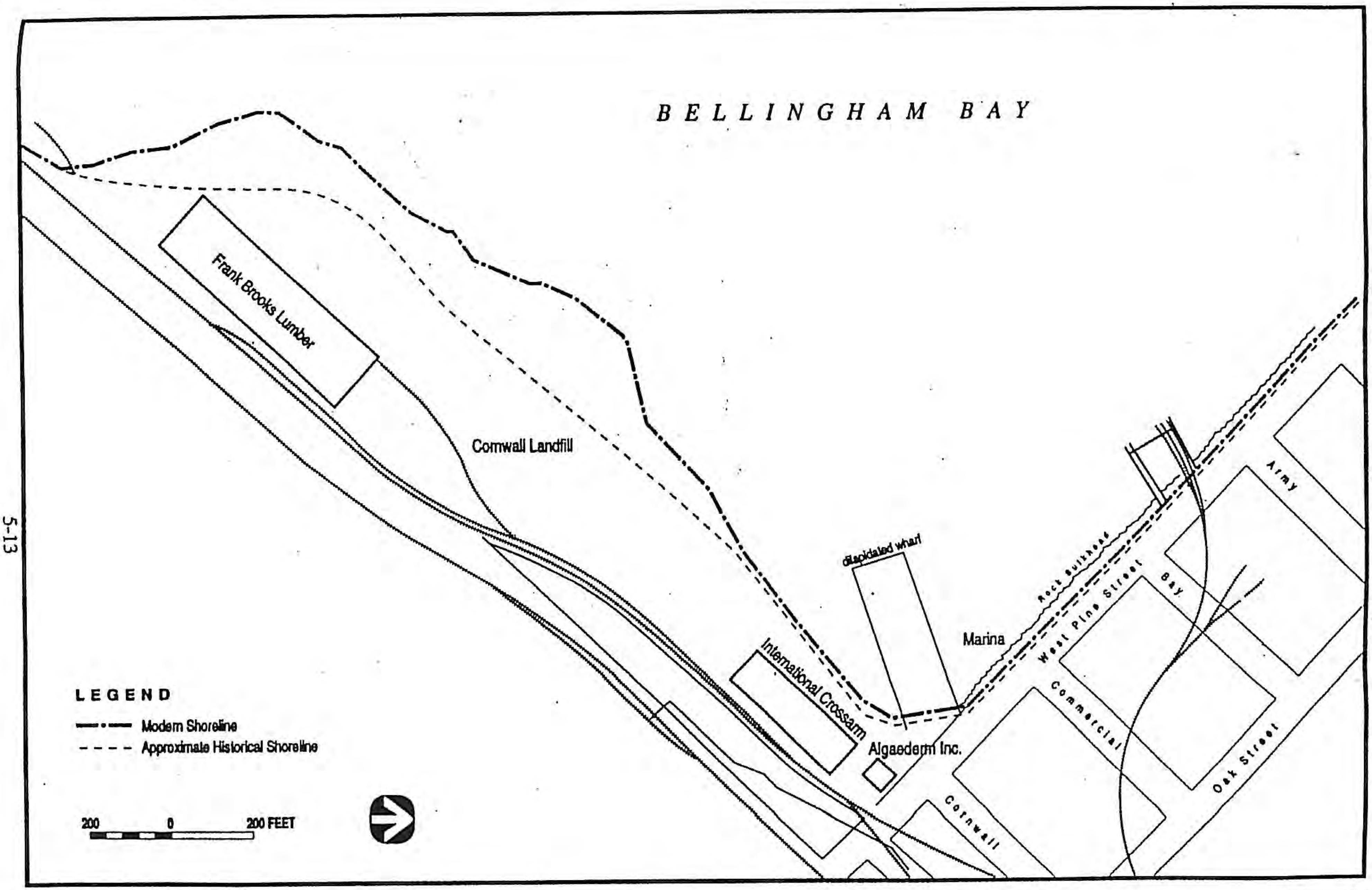


Figure 5-8 Cornwall Landfill Area 1940-1950.

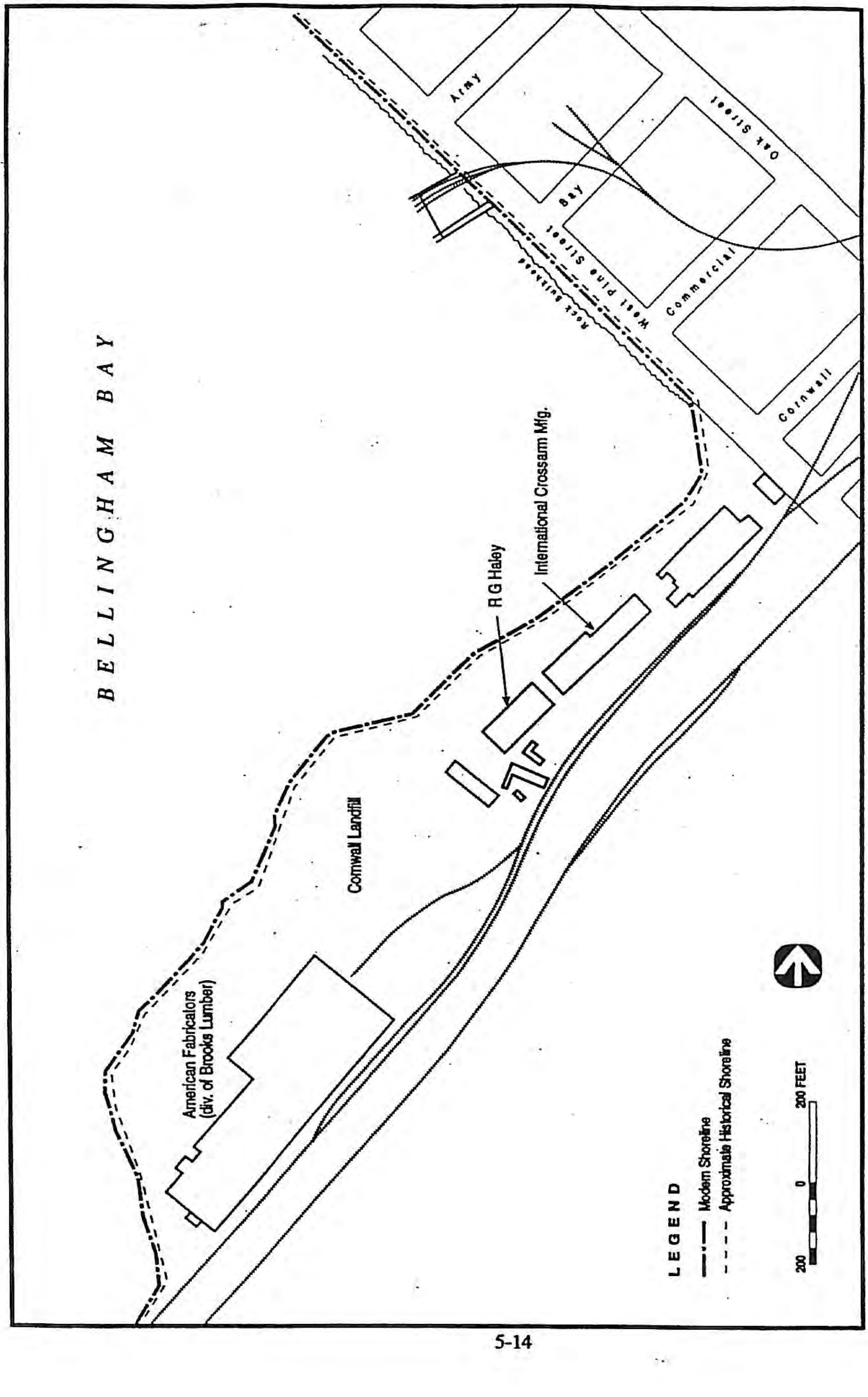


Figure 5-9 Cornwall Landfill Area 1950-1960.

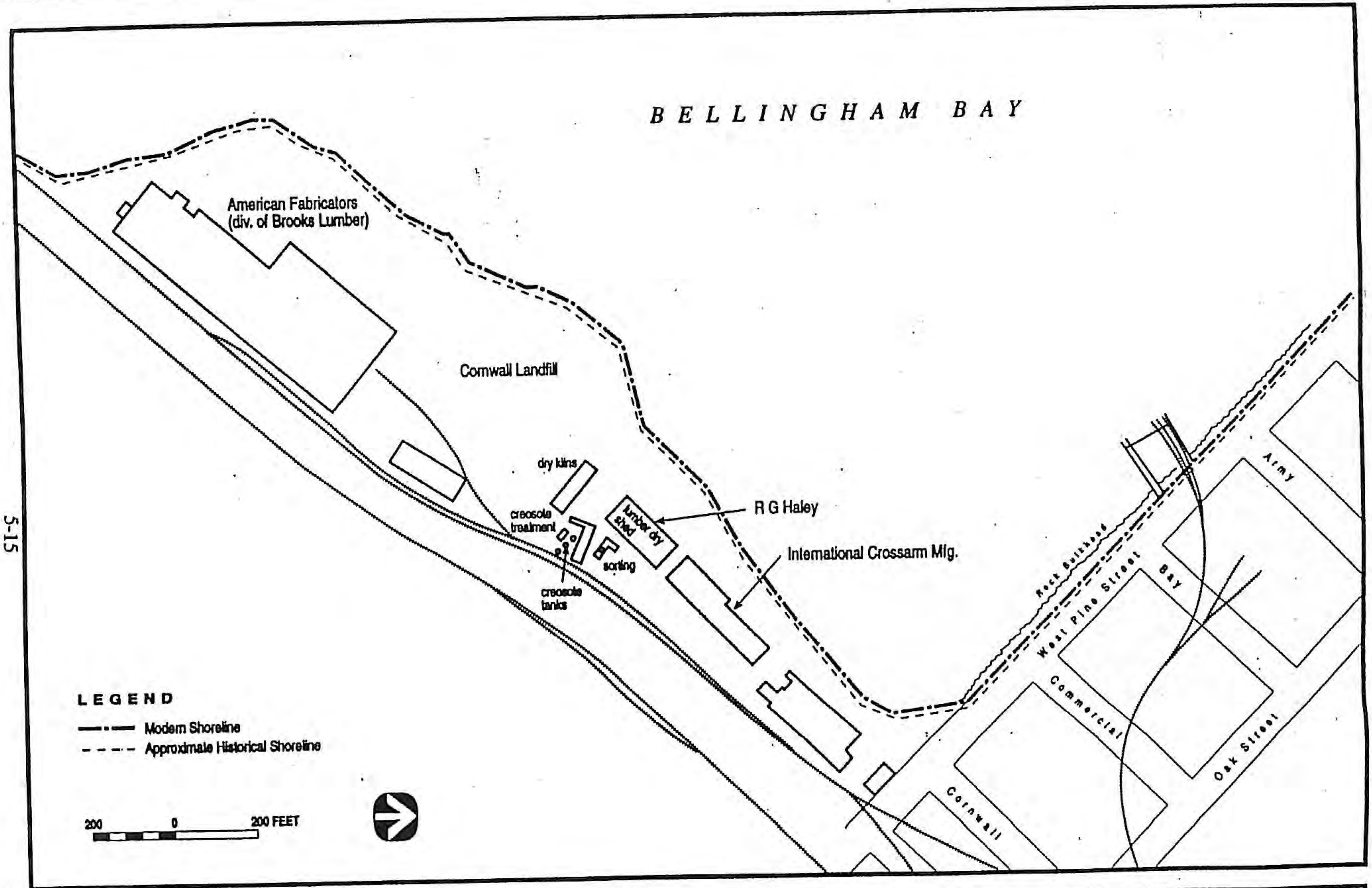


Figure 5-10 Cornwall Landfill Area 1960-1970.

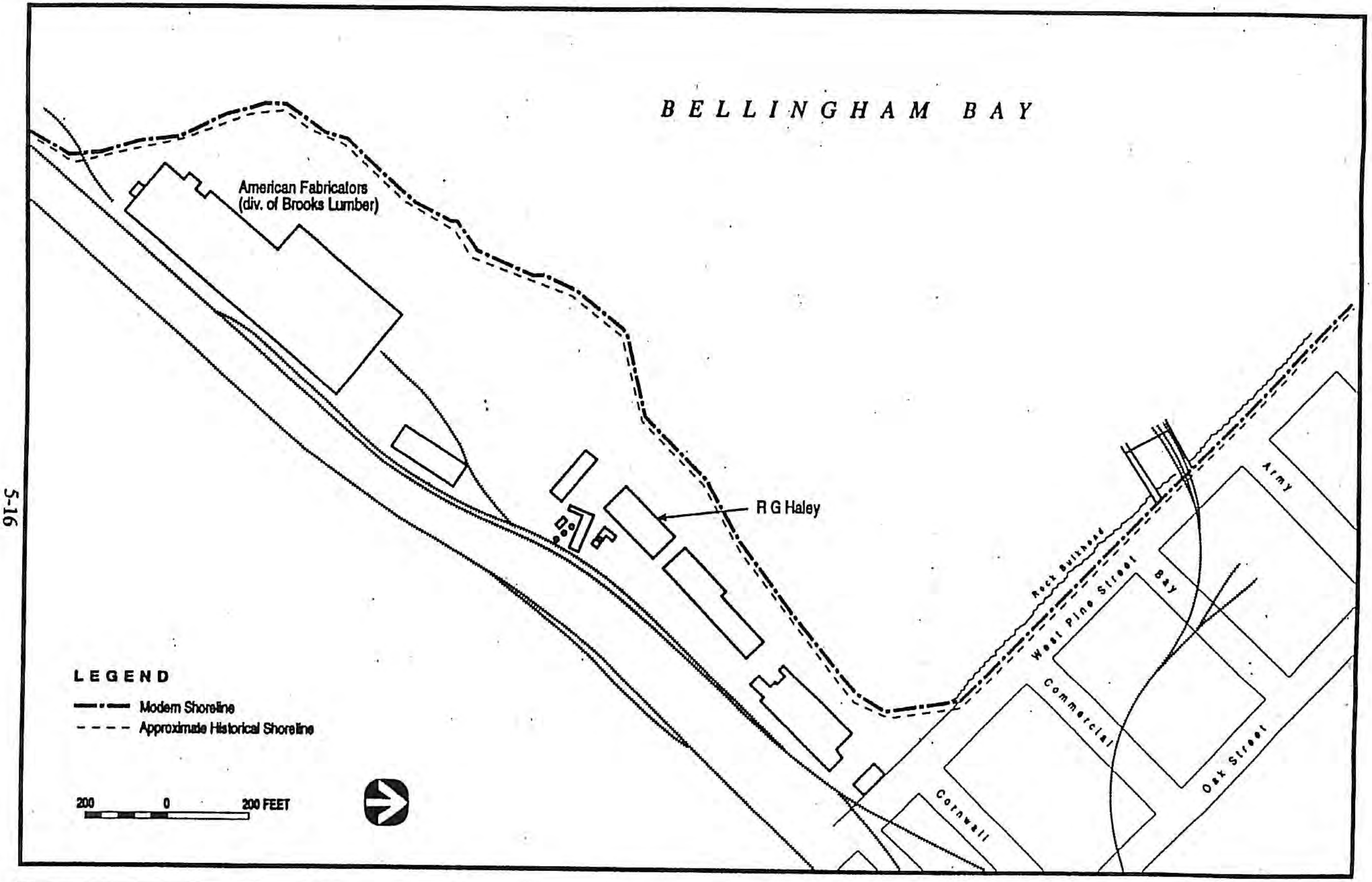


Figure 5-11 Cornwall Landfill Area 1970-1980.

By 1958, the Puget Sound Pulp and Timber Company had acquired the adjacent tissue manufacturing operations of Pacific Coast Paper Mills. In 1963, the company merged with the Georgia-Pacific Corporation, based in Atlanta with headquarters in Portland, Oregon. Georgia-Pacific continued to run the Bellingham plants, and in 1965, the company constructed a chlorine-caustic soda, sulfuric acid, and sodium chlorate plant for its pulp and tissue bleaching operations (Georgia Pacific 1991).

In 1971, Georgia-Pacific leased a portion of the project area, which it purchased from Brooks Manufacturing in 1985 (Dahlgren interview 1995). In 1972, the company added a 600-ton-per-day pulp dryer. Throughout the 1970s and 1980s, Georgia-Pacific Corporation continued to improve its facility, adding a pulp washer, additional digesters, power substations, wood-handling installations, warehousing, by-product expansions, and chip plants. It also provided primary and secondary treatment of its waste water streams (Georgia Pacific 1991).

5.1.7 Sanitary Services Company

Agostino Razore founded City Sanitary Services as a partnership in Bellingham in 1929. At that time, five employees provided refuse collection service to 500 customers. During the mid-1970s, the business incorporated and changed its name to Sanitary Service Company. By the 1990s, the company had employed 50 people, who served approximately 25,000 residential and commercial customers in Bellingham, Ferndale, Birch Bay, and the unincorporated areas of southern Whatcom County (Kenefick, A., personal communication, 1995; Sanitary Service Co. no date; Nikula interview 1995).

According to Joe Razore, municipal garbage was first landfilled in the project area, at the southwest foot of Cornwall Avenue, around 1945 (Purnell 1991). In 1951, Josie Razore and Agostino Razore signed a 10-year contract with the City of Bellingham concerning residential and commercial garbage collection. According to the contract, the company was to "furnish and properly maintain a sufficient number of vehicles suitably manned and equipped to remove all of the garbage, inflammable material and ashes of all persons, buildings and structures within the City limits." The contract also defined "garbage" as "all waste and refuse substances that may be or become a menace to public health or that will ferment or emit a disagreeable odor" (City of Bellingham 1991). For the next 40 years, the City of Bellingham and City Sanitary Services Company signed numerous agreements for garbage service.

In summary, the companies that operated at or near the project area were engaged in activities that might have produced contaminants. In the United States, the wood-preserving process began utilizing chlorinated phenols during the 1930s, and it is possible that the treating facilities of Brooks Manufacturing and R.G. Haley used pentachlorophenol (Hunt and Garratt 1953). The Georgia-Pacific Corporation, as noted, also produced a variety of chemicals in the vicinity. City Sanitary Services accepted waste from a variety of sources, including households and businesses, which could have contributed to contamination at the site.

5.1.8 The Development of the Cornwall Landfill

In 1953, the Port of Bellingham leased a portion of the former Bloedel Donovan Lumber Company site to the City of Bellingham "for the dumping of waste materials of all kinds." The City and its Contractor, which was City Sanitary Services, would remain responsible for coverage of the refuse, and for maintaining the sanitary fill in accordance with the Board of Health regulations (Port of Bellingham 1953). Moreover, the lease, dated September 9, 1953, stated that "Lessee expressly agrees to hold Lessor harmless from any and all damages, or liability to any person whomsoever, arising out of fire or any other cause, resulting from the use of said leased premises by Lessee and/or its Contractor" (Zuanich interview 1995).

The following year, the superintendent of St. Joseph's Hospital complained to the City Council that rats from the garbage dump had invaded the grounds of his facility, endangering children. The City Council agreed to ask the Health Committee to study the need for bulkheading along the water side of the garbage dump (City of Bellingham 1954).

Throughout the 1950s, the Cornwall Landfill remained the city's only garbage dump. Ed Dahlgren, a longtime resident of the area and a consultant to Georgia-Pacific Corporation, recalled standing on the bluff above the dump and throwing his garbage over the edge. "Solid waste wasn't pollution in those days," he reflected (Dahlgren interview 1995).

During the 1950s, dumping was not strongly monitored. In 1954, for example, the Port complained to the City that 30 to 40 automobiles had been dumped at the site, in violation of the terms of the lease (Port of Bellingham 1954). Furthermore, numerous fires at the dump throughout the 1950s threatened adjacent businesses, including American Fabricators. Although the Board of Public Works had required that a watchman be stationed at the dump "at all times" it was open to the public, on several occasions the dump remained unsupervised as the fires burned. Ed Dahlgren also indicated that "it is possible that Sanitary Services contracted with hospitals" for waste disposal (Port of Bellingham 1954, 1955, 1958, 1959).

In 1956, however, the Bellingham and Whatcom County Department of Public Health reported that the garbage at the dump was covered with dirt fill "within a reasonable time," rodents were under control, and few complaints about the odor had been received. Still, this agency recommended installation of a second boom to contain the debris that would sometimes break loose and float into Bellingham Bay (Port of Bellingham 1956).

During the 1950s, officials at the Port of Bellingham regarded "furnishing space for a garbage dump" as "one of the cheapest ways to acquire filled in land" (Port of Bellingham 1959). At that time, this agency planned to develop "the North Side tideland area" as a shipping terminal (Bellingham Herald 1961). In 1958, the Port's Development Plan suggested that the 20-acre area along the extension of Cornwall Avenue would provide about 2,800 feet of deep water frontage on Bellingham Bay. Although water had once covered the 20 acres, approximately 2 had been "reclaimed with sanitary fill." The proposed development would require placing approximately 600,000 cubic yards of fill material on the 18 acres that remained underwater. Providing a structure to retain the placed fill would prove costly, however, and the Plan noted that this development "was not considered to be of high priority for industrial development" (Port of Bellingham 1958). During the early 1960s, the Port further decided not to develop the old Bloedel Donovan site as a terminal (Hitchman 1972).

By 1962, as noted, American Fabricators had agreed to lease 9 1/2 acres to the City of Bellingham for an extension of its garbage dump. The fill, both parties pointed out, "could eventually become valuable for industrial sites" (State of Washington Archives 1962b). On March 13 of that year, the Bellingham and Whatcom County Department of Public Health expressed concern regarding this expansion, notifying the Washington Pollution Control Commission that the dump would operate in "15' to 30' of water much of the time." Although plans called for double booming of the site, no bulkheading had been proposed. "Loss of garbage and rubbish into the bay will continue," the Department of Public Health worried. This agency further claimed that the U.S. Army Corps of Engineers had informed the City that it could not enlarge the dump (State of Washington Archives 1962a). Even so, on March 19, 1962, the City Council passed an ordinance authorizing the extension (City of Bellingham 1962).

The "Refuse Act" of 1899 had grant the U.S. Army Corps of Engineers the authority to regulate activities – including dumping – that could impair the navigability of the nation's waterways (Cowdry 1975). By June of 1962, this agency had concluded that "adequate bulkheading" was required to prevent shoaling in the area immediately adjacent to the fill (Port of Bellingham 1952).

That year, the Port of Bellingham informed the City that it did not want the dumping to continue along the waterfront, owing to pollution of Bellingham Bay and to siltation of the Whatcom Creek Waterway. As early as 1961, the Port Commissioners expressed concern about floating garbage that had broken free of the dump. The agency, however, remained uncertain that it had the authority to close the site (Port of Bellingham 1961, 1962, 1964; Bellingham Herald 1962a). The Port complained as well that the dump had become an eyesore and an embarrassment to local residents. "There's certainly not a more unsightly place in the state," observed one Port official (Bellingham Herald no date).

The Washington State Pollution Commission and the Whatcom County Health Department also protested the dump, noting that it "presents a health hazard." Waste materials from the site could not be contained behind the boom, owing to the depth of the water. Debris "would sluff off as a result of erosion, wind and tidal action," these agencies worried, "thus presenting a menace to navigation and fouling the dredged ship channel" (Washington State Archives 1962b).

On August 21, 1962, the Pollution Commission sent a certified letter stating that the City of Bellingham operated the dump "in violation of the Pollution Control Laws of the State of Washington." This correspondence instructed the City to discontinue the disposal of garbage at the site. According to the Pollution Commission, residents of the area complained about the large numbers of seagulls attracted to the dump as well as "the foul odors which it creates" (Washington State Archives 1962c).

Charles Olson, the City's attorney, informed the Pollution Commission, however, that use of the dump would continue. "We feel that the present site is the best garbage disposal site," he explained in September, 1962, "and that adequate methods are available and within the immediate plans of the city" (Bellingham Herald 1962a,b). Throughout the early 1960s, the Cornwall dump continued to prove controversial. "We've had enough of dumps," concluded one frustrated Health Department official (Bellingham Herald 1964).

Opposition to the garbage dump prompted several City Councilmen to complain in 1963 about $100,000 that the City had granted the Port for construction of a small boat harbor. "There is feeling that the City has received no consideration for the money and they are agitating for repayment," noted one memorandum (Port of Bellingham 1963).

In April, 1965, the Bellingham Port Commission received a request from the City to continue garbage dumping at the Cornwall site until June 1, 1965 "or until such time as the dike is completed." This request was forwarded to the Washington State Department of Resources (DNR), which named the following conditions:

a. proof of a signed contract between the City of Bellingham and Georgia Pacific Corporation for use of property within the proposed new dumping site, and

b. evidence of a contract between the City and a contractor to construct a dike on the offshore edge of the new dumping site.

The DNR required that these conditions be met and confirmed by its district administrator at Deming before April 30, 1965. Should the Port fail to supply the required proof, the DNR warned, its Harbor Area lease "will be subject to cancellation" (City of Bellingham 1965). Shirley Daniels, District Administrator, also noted that the DNR had protested the dump earlier, in part because the Harbor Area was under lease to the Port. "As I have stated on numerous occasions in the past," Daniels wrote the Port Commissioners in 1965, "I would like to remind both the Port of Bellingham and the City of Bellingham that this is an illegal operation on State owned lands and we take a very dim view of the entire operation" (Port of Bellingham 1965).

In the spring of 1965, the city located a new dump site off Roeder Avenue, and by June of that year, City Sanitary Services had placed a layer of dirt over much of the dump, in preparation for closure of the site (Bellingham Herald 1965a). "The changeover was quiet," noted one observer, "amazingly so, when one thinks back to the storms of controversy that marked abortive attempts to evacuate the old site and find a new one" (Bellingham Herald 1965b).

5.1.9 Recent Developments

In 1970, the newly created Department of Ecology assumed the responsibilities of the Department of Water Resources and the Pollution Control Commission. In 1988, this agency identified the Cornwall dump as a site "potentially contaminated with hazardous substances" (DNR 1988). Four years later, a beachcomber discovered medical waste, including blood vials and syringes, at the site. Although its origin remained uncertain, Health Department officials determined that the material appeared on the site after the dump's closure. The Department of Ecology and the City of Bellingham then shared the cost of sampling beach seeps and intertidal sediments. The Health Department, charged with protecting the public from exposure to hazardous materials, ordered Georgia-Pacific Corporation to secure the site with patrols, fencing, and log booms (DNR 1992a). The Department of Natural Resources shared costs for sampling as part of an intertidal investigation and site fencing (DNR 1992b).

The Department of Ecology's initial investigation of the Cornwall Landfill revealed that Georgia-Pacific was using the site for raw log storage. Solid waste was exposed at the southwest corner of the landfill, and samples confirmed that the site could be contaminated. In 1992, the agency informed the Port of Bellingham, City of Bellingham, DNR, and Georgia-Pacific Corporation that, on a scale of 1 to 5, with 1 being the highest, the Cornwall Landfill ranked as a "2" under the Model Toxics Control Act (DNR no date). That year, the Health Department informed a variety of agencies, including the DNR's Division of Aquatic Lands, that "conditions at the site represent a threat to public health," concluding that "timely remediation is necessary" (DNR 1992c).

5.2 CONTAMINANT SAMPLING AT THE CORNWALL AVENUE LANDFILL

Ecology's Site Hazard Assessment reports that between about 1945 and 1964, a tideflat area at the foot of Cornwall Avenue in Bellingham was used as a municipal waste disposal site by the City of Bellingham (Ecology, no date, Site Hazard Assessment Cornwall Avenue Landfill). Ecology also reports that the refuse disposed in the area included household garbage and pulp mill waste.

5.2.1 Site Description

The landfill is estimated to cover approximately 2.4 ha (6 acres) and contain from 2,550-12,750 m^3 (10,000-50,000 yd^3) of waste covered with 15 cm (6 in) or more of uncontaminated soil. Medical wastes have been observed at the toe of the shoreward retaining wall at the southwest corner of the property, presumably derived from the landfill due to erosion or subsidence of the wall. A lens of coal tailings up to 46 cm (18 in) thick was noted near the middle of the northeastern portion of the retaining wall (W.D. Purnell & Associates, Inc. 1991). During an initial investigation conducted by Ecology in April 1992, stained sediments were observed at the toe of the shoreward retaining wall. Drainage emanating from the slope to Bellingham Bay, presumably leachate from the landfill, was also noted.

5.2.2 Site Contaminants

As part of their Site Hazard Assessment, Ecology collected and analyzed four water samples (identified by Ecology as leachate samples) and two marine sediment samples (Pebles, L., 18 June 1992, personal communication; Pebles, L., 25 June 1992, personal communication). Based on Ecology's map of sampling locations, the "leachate" samples appear to be samples of water seeping from intertidal sands, offshore and beyond the retaining wall. These samples will be referred to herein as seep samples and likely represent an admixture of seawater, groundwater, and possibly a dilute portion of leachate from the landfill.

The Georgia-Pacific Corporation contracted with W.D. Purnell & Associates, Inc. (1991) to perform a Phase I Site Assessment of the property. As part of the Phase I assessment, W.D. Purnell & Associates collected and analyzed two subsurface soil samples from a stained area between two concrete pads located on the site. The results of these analyses are summarized below.

5.2.2.1. Sampling conducted by W.D. Purnell & Associates, Inc.. The two soil samples collected by W.D. Purnell & Associates were analyzed for semi-volatile compounds only, including pentachlorophenol and PAHs. The field sampling protocols that were described indicated that proper care was taken to collect representative soil samples from the site. Quality assurance data provided in the W.D. Purnell & Associates report indicate that the data for soil sample S-1 were acceptable. Due to a laboratory extraction and dilution error, the detection limits for soil sample S-2 were elevated and therefore some compounds detected in sample S-1 may have been present in sample S-2 but at concentrations below the reported detection limit. Elevated concentrations of several low molecular weight PAHs and pentachlorophenol in both samples (Table 5-1) indicate that the contamination present in the vicinity of the concrete pads was derived from wood treatment wastes.

TABLE 5-1. RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES COLLECTED AT THE CORNWALL AVENUE LANDFILL BY W.D. PURNELL & ASSOCIATES, INC.

Compound	Sample S-1 Sampling Depth (17-20")	Sample S-2 Sampling Depth (11-14")
Naphthalene	3.1 mg/kg	<81 mg/kg
2-Methylnaphthalene	110 mg/kg	4,300 mg/kg
Acenaphthene	12 mg/kg	490 mg/kg
Dibenzofuran	<0.74 mg/kg	150 mg/kg
Fluorene	14 mg/kg	8,100 mg/kg
Penatchlorophenol	810 mg/kg	59,000 mg/kg
Phenanthrene	87 mg/kg	5,200 mg/kg
Anthracene	4.1 mg/kg	190 mg/kg
Pyrene	3.8 mg/kg	150 mg/kg

Note: There are no Method A Cleanup Levels for these compounds (Table 2, Model Toxics Control Act, WAC-173-340).

*5.2.2.2 **Sampling conducted by Ecology***. Sampling of beach seeps and marine sediments [surface 3 cm (1.2 in)] was conducted by Ecology on 6 May 1992 (Figure 5-12). These samples were analyzed for metals, volatile and semi-volatile organic compounds, chlorinated pesticides and PCBs, and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. No analyses of sediment grain size or TOC were reported for the sediment samples.

Few details have been provided by Ecology regarding methods used to collect the beach seep and marine sediment samples. Seep samples should have been collected from a shallow depression excavated in the beach sand. The water should have been allowed to pool in the depression and allowed to overflow for a sufficient amount of time to exchange the water in the depression at least once. Care should also have been taken to allow suspended material in the excavation to settle prior to collection of the sample. Ecology has stated only that the samples were taken with a clean glass sample jar and that they were not filtered prior to analysis (Pebles, L., 16 July 1992, personal communication). The laboratory case narrative from Analytical Resources indicated that the seep samples received were "...turbid and dark in color" (Pebles, L., 25 June 1992, personal communication).

Quality assurance data provided by Ecology indicate that the data for the seep and sediment sampling were generally acceptable. However, the mercury concentrations reported for the beach seep samples were qualified with a "B" indicating blank contamination. Ecology reported that mercury was detected in two procedural blanks at concentrations of 0.055 and 0.097 μg/L. The seep sample mercury concentrations were reported to range from below the detection limit of 0.050 μg/L (Station #4) to 0.242 μg/L (station #3). Because the reported seep mercury concentrations are less than five times the mean blank concentration (0.076 μg/L), it is probable that the reported concentrations are positively biased due to laboratory contamination. In addition, analytical results for thallium and selenium in seep samples indicates that matrix spike recovery results were not within control limits. Analytical results for antimony, arsenic, cadmium, chromium, selenium, and silver in sediment samples were also qualified with an "N". Therefore, the reported concentrations of mercury in seep samples and arsenic, cadmium, chromium, selenium, and silver in sediment should be viewed with caution.

The metals antimony, beryllium, cadmium, chromium, silver, and thallium were not detected in the beach seep samples and antimony, beryllium, and thallium were not detected in the marine sediment samples that were analyzed. No volatile organic compounds were detected in the beach seep samples and only

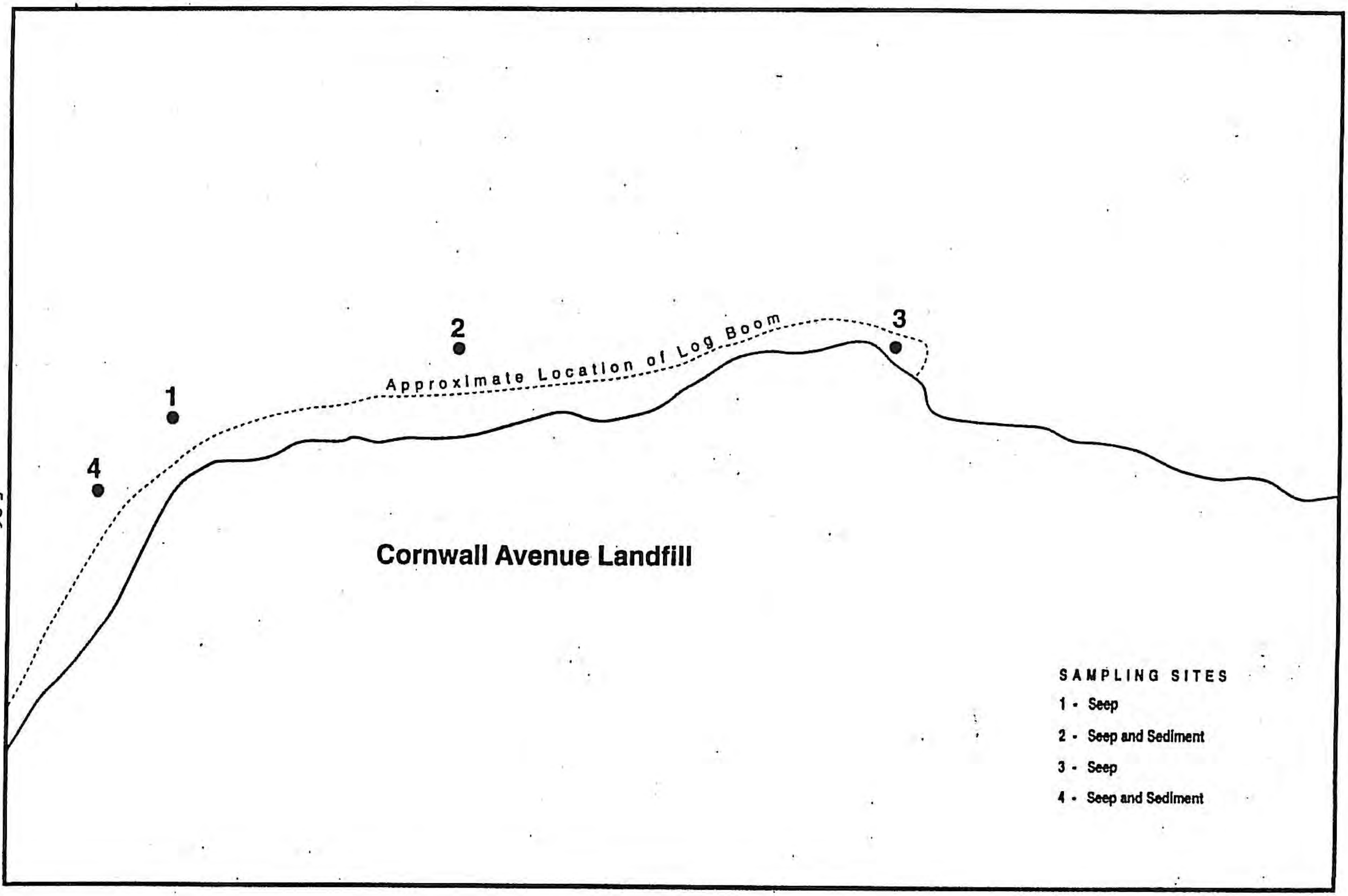


Figure 5-12. Ecology Seep and Sediment Sampling Sites at the Cornwall Avenue Landfill.

one volatile compound (methylene chloride) was detected in one of the two marine sediment samples. In general, few semi-volatile compounds were detected (including pentachlorophenol) in seep or sediment samples. Chlorinated pesticides and Aroclor PCBs were not detected in seep samples but DDT and Aroclor PCBs were detected in one sediment sample. Tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD) was not detected in seep or sediment samples.

The contaminants detected in the beach seep and marine sediment samples are summarized in Tables 5-2 and 5-3, respectively. The beach seep data are also compared to the Method A Cleanup Levels for groundwater and the Washington marine water quality criteria for the protection of organisms from chronic contaminant effects. The Method A Cleanup Levels for groundwater assume that the groundwater at the site is a potential drinking water source. However, Method A Cleanup Levels may not be appropriate for this site because the groundwater is likely to be brackish and already unsuitable for drinking. It should also be noted that the State standards are for dissolved (i.e., filtered) metals (recognizing that the toxic form of the metal is generally the available dissolved form) and that the data reported by Ecology are for total recoverable (i.e., unfiltered) metals. Because a portion of the metals detected in these samples was likely in a particulate form, comparison to the State standards for dissolved metals may be overly conservative.

The marine sediment data are also compared to the Method A Cleanup Levels for soils and to the marine sediment management standards. The Method A Cleanup Levels for soil assume that the site is or could be suitable for residential use. However, it is unlikely that the Cornwall Avenue Landfill site would be considered potentially residential. Comparison of marine sediment management standards to the measured levels of non-ionic organic compounds (e.g., PAHs and PCBs) is complicated by the fact that Ecology did not report measurements of total organic carbon. Sediment standards for non-ionic organic compounds are based on contaminant concentrations normalized to the organic carbon content of the sediments to account for the buffering effect organic carbon has on the toxicity of these compounds. Ecology (1991) recommends that in the absence of organic carbon data, an estimate of 1 percent can be used in screening analyses. Table 5-2, organic contaminant data were normalized using the 1 percent figure for comparison to the sediment standards.

Ignoring the weaknesses in the analytical data noted above, a list of potential problem contaminants can be made based on exceedances of Method A Cleanup Levels, chronic marine water quality criteria, or

TABLE 5-2. CONTAMINANTS DETECTED IN BEACH SEEP SAMPLES COLLECTED BY ECOLOGY IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL, 6 MAY 1992.

	Beach Samples				Method A Cleanup Level Groundwater[a]	Washington Marine Chronic Water Quality Standards[b]
Sample #: Station ID:	92 198040 #1	92 198041 #2	92 198043 #3	92 198044 #4		
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Arsenic	11	2.1P	2.2P	1.5U	5	36
Copper	4,950	5.1P	9.7P	16		2.9[c]
Iron	52,400E	6,620E	16,700E	6,360E		
Lead[d]	185N	11.2N	14.2N	2.8PN		5.8[c]
Lead[d]	220	20U	20U	20U	5	5.8[c]
Mercury	0.209PB	0.074PB	0.242PB	0.05U	5	0.025
Nickel	18	10U	10U	10U	2	7.9[c]
Selenium	4UN	2.2PN	2UN	2UN		71
Zinc	280E	29E	230E	46E		76.6[c]
Cyanide	10	4	2	6		1.0
Semivolatiles						
Total Phenols	2	2	2U	2U		
1,4 Dichlorobenzene	1.4J	1U	1U	1U		
4-Methylphenol	5.5	1U	1U	1U		
Total Petroleum Hydrocarbons						
WTPH-418	2	1U	1U	1U	1,000	
Tentatively Identified Compounds						
Dimethylbenzene isomer						
Sulfur	2J			2500J		
Carbon disulfide	3500J	10J	1100J	5.2		

Note: Shaded values indicate exceedances of cleanup levels and/or water quality standards.

Qualifiers:

B	=	Analyte was also found in the analytical method blank indicating the sample may have been contaminated.
E	=	Reported result is an estimate because of the presence of interference.
J	=	The analyte was positively identified. The associated numerical result is an estimate.
N	=	For metals analytes the spike sample recovery is not within control limits.
P	=	The analyte was detected above the instrument detection limit but below the established minimum quantitiation limit.
U	=	The analyte was not detected at or above the reported result.

[a] Table 1, Model Toxics Control Act, WAC-173-340.

[b] Water Quality Standards, WAC-173-201A-040.

[c] Washington Standards for cadmium, copper, lead, nickel, silver, and zinc are based on the concentration measured after filtering the sample through an 0.45 µm filter.

[d] Two analytical results were reported by the laboratory for lead.

TABLE 5-3. CONTAMINANTS DETECTED IN MARINE SEDIMENT SAMPLES COLLECTED BY ECOLOGY IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL, 6 MAY 1992

(Page 1 of 2)

	Marine sediment samples		Method A Cleanup Level - Soil -^{a}	Marine Sediment Quality Standards^{b}	Marine Sediment Cleanup Screening Levels^{c}
Sample #: Station ID:	92 198042 #2	92 198045 #4			
	mg/kg-dry wt	mg/kg-dry wt	mg/kg-dry wt	mg/kg-dry wt	mg/kg-dry wt
Metals					
Arsenic	3.08N	1.74N	20	57	93
Cadmium	4.2N	1UN	2	5.1	6.7
Chromium	152N	82.4N	100	260	270
Copper	756E	378E		390	390
Iron	75,300	23,600			
Lead	431	887	250	450	530
Mercury	0.34	0.071	1	0.41	0.59
Nickel	87.3	26.8			
Selenium	0.39N	0.2UN			
Silver	2.7PN	1.5UN		6.1	6.1
Zinc	2,140E	313E		410	960
Cyanide	0.52E	0.07E			
	μg/kg-dry wt	μg/kg-dry wt	μg/kg-dry wt	μg/kg-dry wt	μg/kg-dry wt
Volatiles					
Methylene chloride	4.1		1.9	U	U
Semivolatiles					
Phenols	190	60		420	420
Phthalates					
Bis(2-ethylhexyl)phthalate	1,300	42J		d	d
Di-n-butylphthalate	67J	39J		d	d
Low Molecular Weight PAH					
Phenanthrene	44J	68U		d	d
High Molecular Weight PAH					
Benzo(a)anthracene^{e}	53J	68U	1,000^{e}	d	d
Benzo(b,k)fluoranthene^{e}	120	68U	1,000^{e}	d	d
Chrysene^{e}	66J	68U	1,000^{e}	d	d
Fluoranthene	99	68U		d	d
Pyrene	96	68U		d	d
Tentatively Identified Compounds					
Hexadecanoic acid	1,500J				
Chlorinated Pesticides/PCBs					
4,4'-DDD	25	8U	1,000		
4,4'-DDT	31N	8U	1,000		
Aroclor 1242/1016	160	80U	1,000	d	d
Aroclor 1254	160	80U	1,000	d	d
OC-normalized data	mg/kg OC	mg/kg OC		mg/kg OC	mg/kg OC
Phenanthrene	4.4J	6.8U		480	480
Benzo(a)anthracene	5.3J	6.8U		270	270
Benzo(b,k)fluoranthene	12	6.8U		450	450
Chrysene	6.6J	6.8U		460	460
Fluoranthene	9.9	6.8U		1,200	1,200
Pyrene	9.6	6.8U		1,400	1,400
Bis(2-ethylhexyl)phthalate	130	4.2J		78	78
Di-n-butylphthalate	0.7J	3.9J		1,700	1,700
Aroclor 1242/1016	16	8U		12	65
Aroclor 1254	16	8U		12	65

TABLE 5-3. CONTAMINANTS DETECTED IN MARINE SEDIMENT SAMPLES COLLECTED BY ECOLOGY IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL, 6 MAY 1992

(Page 2 of 2)

Note: Shaded values indicate exceedance of soil cleanup level and/or marine sediment management standards. The standard or cleanup exceeded is shown in bold.

Qualifiers:

E	=	Reported result is an estimate because of the presence of interference.
J	=	The analyte was positively identified. The associated numerical result is an estimate.
N	=	For organic analytes there is evidence the analyte is present in this sample. For metals analytes the spike sample recovery is not within control limits.
P	=	The analyte was detected above the instrument detection limit but below the established minimum quantitiation limit.
U	=	The analyte was not detected at or above the reported result.

[a] Table 2, Model Toxics Control Act, WAC-173-340.

[b] Table I. Sediment Management Standards, WAC-173-204.

[c] Table III. Sediment Management Standards, WAC-173-204.

[d] Marine Sediment Standards based on organic carbon-normalized contaminant data for this compound. Organic carbon-normalized value are compared to the standard at the bottom of the table.

[e] Method A Cleanup Level for carcinogenic PAH.

sediment management standards. Exceedances of these screening levels occurred for arsenic, copper, lead, mercury, zinc, and cyanide in beach seep samples, and cadmium, chromium, copper, lead, zinc, bis(2-ethylhexyl)phthalate, and Aroclor PCBs in marine sediments. Based on a more critical screening of the data [i.e., excluding qualified data and using only the most appropriate screening levels (i.e., marine sediment quality standards)] a more conservative list of potential problem contaminants would be identified: copper, zinc, and depending on the actual sediment organic carbon content bis(2-ethylhexyl)-phthalate and Aroclor PCB in marine sediments. However, the more extensive list of potential problem contaminants will be used in the data synthesis Section 6.0, which provides an analysis of the possible sources of identified problem contaminants and identifies data gaps that prevent: 1) confirmation of the problem contaminants at the site, and 2) identification of the sources of these contaminants.

5.3 CONTAMINANT SAMPLING AT THE R.G. HALEY SITE

Ecology conducted a Site Hazard Assessment field investigation at the R.G. Haley site on 9 May 1992 (Ecology, no date, Site Hazard Assessment R.G. Haley International Corporation). Under the Model Toxics Control Act, the site has been ranked 3 on a scale of 1 to 5, where rank 1 is the highest priority for investigation and remedial action. The facility was also the focus of a site inspection conducted for the U.S. EPA in 1985 to determine if the facility warranted federal cleanup action (Ecology and Environment, Inc. 1986).

5.3.1 Site Description

The R.G. Haley site is underlain by fill material (Ecology and Environment, Inc. 1986). The types of material in the fill have been identified include boulders, large timbers, concrete blocks, bricks, and remnants of garbage. It is uncertain whether any portion of the R.G. Haley property was filled with refuse as part of the City of Bellingham's municipal land filling operation.

The wood treatment operation consisted of a building for milling lumber, a drying kiln, a retort, storage tanks for pentachlorophenol, a control room, and some large storage sheds (Ecology and Environment, Inc. 1986). Wood delivered to the facility was milled to specifications and dried in the kiln. Finished wood was loaded into the retort where it was treated with a pentachlorophenol solution in a carrier oil under high temperature and pressure. Following treatment, a vacuum was created in the retort and the moisture in the wood evaporated. This process created an oil/water vapor that was condensed in a heat exchanger using non-contact cooling water. The condensate was directed to an oil/water separator and the oil fraction was reused in the wood treatment process. Wastewater from the oil/water separator was discharged to an unlined seepage pit, approximately 4.3 x 7.3 m (14 x 24 ft), with a depth of 1.5 m (5 ft). The facility was permitted to discharge non-contact cooling water and stormwater runoff to Bellingham Bay.

As part of the plant closure, the seepage pit was filled with gravel and capped with a 15-20 cm (6-8 in) layer of unreinforced concrete (Ecology and Environment, Inc. 1986). Pentachlorophenol-contaminated sludge from the retort and the seepage pit were disposed of at Chem-Security Systems, Inc. in Arlington, OR. However, the investigation conducted by Ecology and Environment, Inc. (1986) indicated that soil and groundwater at the site contained elevated concentrations of pentachlorophenol and PAH. Analytical results summarized by Ecology and Environment, Inc. (1986) and the sampling conducted by Ecology in their May 1992 investigation are reviewed below.

5.3.2 Site Contaminants

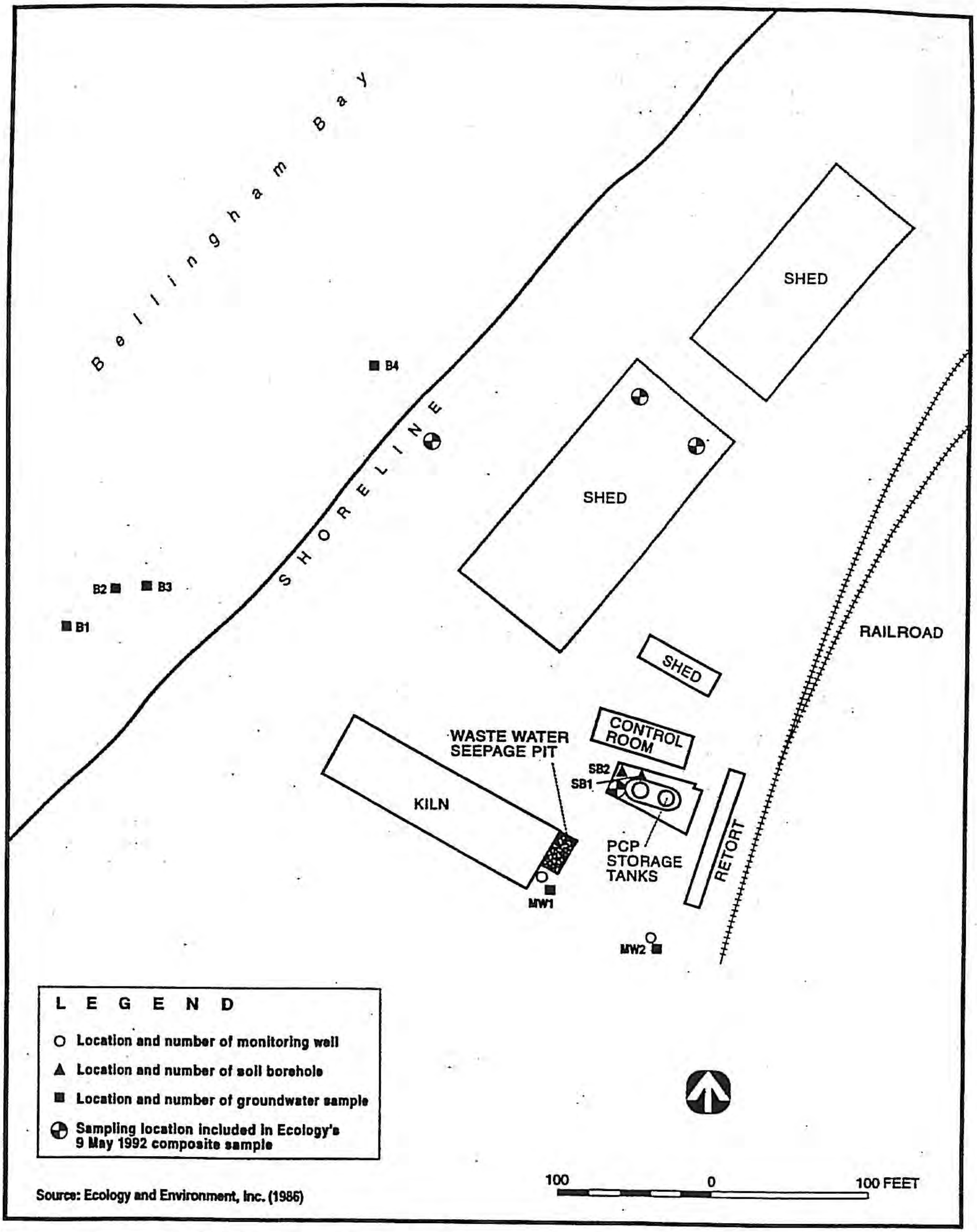
Analysis of soil and groundwater samples at the R.G. Haley site has been limited to semi-volatile organic compounds, including pentachlorophenol and PAHs. No analyses for metals, chlorinated pesticides, or PCB compounds were identified during this review. The laboratory analyses conducted for Ecology and Environment, Inc. and the Washington Department of Ecology were of acceptable quality. Because the contaminants detected in the sampling efforts summarized below are typically found at wood treatment facilities, there is no reason to believe that the compounds were identified in error. However, some analytical interference has been encountered due to the presence of relatively high concentrations of the carrier oil in the samples.

Prior to removal of the seepage pit sludge, soil sampling was conducted for R.G. Haley by Howard Edde, Inc. (Ecology and Environment, Inc. 1986). These samples were analyzed for pentachlorophenol. The highest soil concentrations of pentachlorophenol (approximately 100 mg/kg) were measured at a depth of approximately 1.8 m (6 ft) in the vicinity of the seepage pit and retort. Samples collected at shallow depths contained lower concentrations ranging from 0.6-6.8 mg/kg. Soil concentrations as high as 1.1 mg/kg were detected at locations along the western half of the site near Bellingham Bay. Following removal of the seepage pit sludge, samples were collected from the seepage pit walls and analyzed for pentachlorophenol. A concentration of 14,000 mg/kg of pentachlorophenol was measured in a sample from the side wall of the pit and a concentration of 720 mg/kg was measured in a sample from the bottom.

Sampling conducted by Ecology and Environment, Inc. (1986) included two groundwater monitoring wells installed to characterize subsurface soil and groundwater contamination near the seepage pit and retort, two soil borings to characterize contamination within the bermed area of the pentachlorophenol oil storage tanks, and four intertidal shallow groundwater sampling locations to the west of the site in Bellingham Bay (Figure 5-13). The monitoring wells indicated that the depth to groundwater was 6 to 7 ft and the depth to bedrock (a dark grey, friable siltstone) was approximately 13 to 15 ft. The types of lithology encountered above the bedrock included fill (bricks with variable sized cobbles and gravel in a clay matrix), gravelly silt, silty gravelly sand, sand, and clay layers.

Pentachlorophenol and the carrier oil were detected in soil and groundwater at the monitoring well sites, in soil from the bermed storage tank area, and in one intertidal groundwater sample (Tables 5-4 and 5-5). The highest soil concentration of pentachlorophenol (230 mg/kg) was measured in a soil boring from the bermed tank area at a depth of approximately 2.6-2.7 m (8.5-9 ft). The range of pentachlorophenol concentrations measured in soils sampled during installation of the monitoring wells ranged from 0.7 to 32 mg/kg. Groundwater concentrations of pentachlorophenol in the monitoring wells ranged from 0.17 to 4.4 mg/L. One shallow groundwater sample collected from the intertidal area at station B-4 contained an estimated concentration of 0.021 mg/L of pentachlorophenol.

A number of PAH compounds were also detected in soil and groundwater samples collected by Ecology and Environment, Inc. (1986) and a number of phenolic compounds were detected in soil and groundwater collected from the monitoring wells (Table 5-4 and 5-5). The PAHs identified are predominantly low molecular weight compounds that are likely derived from the carrier oil. Ecology collected and analyzed a single composite sample collected from the site on 9 May 1992. The sample was only analyzed for semi-volatile organic compounds including pentachlorophenol and PAHs. The composite sample consisted of one to two ounces of soil from visibly stained areas on the site shown in Figure 5-13. The sample also included soil from the same stained soil location at the Cornwall Avenue site (an area between two concrete pads) sampled by W.D. Purnell and Associates which was described above.



Source: Ecology and Environment, Inc. (1986)

Figure 5-13. Sample Locations at the R.G. Haley International Corporation Site.

TABLE 5-4. CONCENTRATIONS OF DETECTED PRIORITY POLLUTANT BASE-NEUTRAL/ACID COMPOUNDS IN SOIL SAMPLES AT R.G. HALEY INTERNATIONAL CORPORATION, INC., BELLINGHAM, WASHINGTON (μg/kg)

	Sample Location														
	MW1-A	MW1-B	MW1-C	MW1-D	MW2-A	MW2-B	MW2-C	MW2-D	SB1-A	SB1-B	SB1-C	SB2-A	SB2-B	SB2-C	Method A Cleanu Level-Soil[a]
Phenols															
2 Methylphenol								610							
4 Methylphenol								870							
2,4 Dimethylphenol								910							
2,4,5 Trichlorophenol							15,000	190J						13,000	
Phenol							12,000	3,000							
Pentachlorophenol	2,600		9,800	700J	32,000			8,400	160,000	18,000	150,000	20,000	19,000J	230,000	
Low Molecular Weight PAH															
Naphthalene			270J	73J	10,000	26,000	78,000	1,700		240J	2,100J	300J	13,000	58,000	
2-Methylnaphthalene	63J		1,400	260J	63,000	130,000	160,000	5,200		1,500	25,000	1,600	41,000	240,000	
Anthracene												160J			
Phenanthrene	340		860	83J	23,000	23,000	14,000	1,100		11,000	14,000	2,500		47,000	
Fluorene	89J		380	43J	7,600	8,300J	13,000	650		400J	400J	580		23,000	
Acenaphthylene												110J			
Acenaphthene	34J		250J	5,600J	5,400J	11,000	480				2,300J	140J		13,000	
High Molecular Weight PAH															
Benzo(a)anthracene	100J												330		1,000[b]
Benzo(b)fluoranthene												360			1,000[b]
Benzo(k)fluoranthene												360			1,000[b]
Benzo(a)pyrene			250J	250J								240J			1,000[b]
Fluoranthene												850			
Ideno(1,2,3-cd)pyrene												110J			1,000[b]
Benzo(g,h,i)pyrelene												130J			1,000[b]
Pyrene	96J		150J		3,500J			88J		250J	3,300J	1,300		6,200J	
Chrysene	96J											310J			1,000[b]
Total PAH	718J		3,310J	6,059J	112,500J	198,300J	256,480	8,738J		13,390J	4,710	7,950J	4,000	387,200J	
Miscellaneous Compounds															
Bis(2-ethylhexyl)phthalate	74J					4,200J									
Dibenzofuran					2,300J							290J			
n-Nitrosodiphenylamine						15,000									

Source: Ecology and Environment, Inc. (1986).

J = Estimated concentration. Analytical Quality Control Criteria not completely acceptable or detection at concentrations less than Contract Required Detection Limit (CRDL).

[a] Table 2, Model Toxics Control Act, WAC-173-340.

[b] Method A Cleanup level for carcinogenic PAH. There are no Method A Cleanup levels for the other compounds that were detected.

TABLE 5-5. CONCENTRATIONS OF DETECTED PRIORITY POLLUTANT BASE-NEUTRAL/ACID COMPOUNDS IN GROUNDWATER SAMPLES AT R.G. HALEY INTERNATIONAL CORPORATION, INC., BELLINGHAM, WASINGTON (μg/L)

Compound	Sample Location					
	B-1	B-2	B-3	B-4	MW-1	MW-2
Phenols						
Pentachlorophenol				21J	170	3,400
2-Methylphenol						34
4-Methylphenol						65
2,4-Dimethylphenol						40
2,4-Dichlorophenol						21
2,4,5-Trichlorophenol						54
2,4,6-Trichlorophenol						5J
Dibenzofuran					4J	
n-Nitrosodiphenylamine				77		
Butyl benzyl phthalate				4J		
Total Phenols				21J	170	3,614
Low Molecular Weight PAH						
Naphthalene						170
2-Methylnaphthalene					10	310
Phenanthrene				22	8J	36
Fluorene				26	8J	20
Acenaphthene				20	10	16
High Molecular Weight PAH						
Pyrene				5J		
Total PAHs				73J	28J	552

Source: Ecology and Environment, Inc. (1986).

Note: There are no Method A Cleanup Levels for these compounds (Table 1, Model Toxics Control Act, WAC-173-340).

J = Estimated concentration. Analytical Quality Control Criteria not completely acceptable or detection at concentrations less than Contract Required Detection Limit (CRDL).

Low levels of some of the semi-volatile compounds were detected in the blank. Only concentrations greater than five times the laboratory blank concentration were considered to be present in the soil sample. Because of the relatively high concentrations of some analytes, surrogate spike recoveries could not be accurately determined. Therefore, these sample results should be viewed with caution. However, the detection of pentachlorophenol and low molecular weight PAH (Table 5-6) at relatively high concentrations is consistent with previous sampling at the site that has implicated wood treatment wastes as the source of the contaminants detected.

5.4 SUMMARY

Historical review of activities in the vicinity of the Cornwall Avenue Landfill site indicate a complicated history of commercial and industrial activity beginning as early as the mid-1800s that has led to the filling of the former tidelands at the site. During the period of 1953 to 1964, portions of the area were used as a municipal landfill. It is also possible that the landfill received industrial wastes from operators of the site or other nearby industries. Due to operation of a coal mine and coal shipping wharf at the site during the 1800s and early 1900s, coal tailings are also found in the fill material.

The extent and contents of the landfill are still poorly known, but may extend beneath the R.G. Haley property to the north. Contaminant sampling for a relatively complete suite of metals and organic constituents at intertidal locations in Bellingham Bay offshore of the Cornwall Avenue Landfill site indicated the presence of several metals and possibly PCBs and bis(2-ethylhexyl)phthalate at levels exceeding relatively conservative standards or screening levels. Contaminant sampling at the R.G. Haley site has been limited to semi-volatile organic compounds. Semi-volatile compounds detected in soils and groundwater at this site include a number of low molecular weight PAHs and pentachlorophenol from historical wood treatment activities at the site. Soil contamination with PAHs and pentachlorophenol was also detected at a location between two concrete pads adjacent to the R.G. Haley site. Contamination of soil at this location may have resulted from encroachment of wood treatment activities at the R.G. Haley site.

The area of the Cornwall Avenue Landfill is composed of a heterogeneous fill material an is underlain by bedrock. The fill is covered with a permeable soil layer that could allow infiltration of runoff water. The seaward retaining wall of the landfill does not prevent the exchange of groundwater with Bellingham

6.0 DATA SYNTHESIS, DATA GAPS, AND RECOMMENDATIONS

This section provides an analysis of the possible sources of the identified problem contaminants and identifies data gaps that prevent 1) confirmation of the problem contaminants at the site and 2) the identification of the sources of these contaminants.

6.1 POSSIBLE SOURCES OF THE TENTATIVELY IDENTIFIED PROBLEM CONTAMINANTS

In general, the data provided by Ecology suggest that the beach seeps and marine sediments in the vicinity of the Cornwall Avenue Landfill contain potentially hazardous levels of arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, cyanide, bis(2-ethylhexyl)phthalate, and Aroclor PCBs. Although these contaminants may derive from groundwater contaminated by contact with refuse within the Cornwall Avenue Landfill, it is also possible that they derive at least in part from other sources in the vicinity of the Cornwall site. These other sources could contribute contaminants either via direct discharge to the bay or Whatcom Creek or via contamination of groundwater in the vicinity of the landfill. Potential sources other than the landfill would include both historical and current municipal and industrial activities in the vicinity of the Cornwall site. Based on the review in Section 3.0, the most significant pollutant sources in the vicinity of the site include urban runoff, pulp and paper production facilities, coal mining and processing activities, municipal wastewater discharges, ports and marinas, sawmills, and wood treatment facilities.

The contaminant data summarized in Section 3.0 and general contaminant profiles for these industries summarized by Shineldecker (1992) suggest a number of possible sources other than the landfill of the tentatively identified problem contaminants (Table 6-1). However, with the exception of mercury, these contaminants have not been measured at levels exceeding sediment quality standards at other locations in Bellingham Bay near the Cornwall site (see Section 4.1) as would be expected if other discharges to the bay had contributed significantly to the levels of these contaminants. Therefore, groundwater

TABLE 6-1. CONTAMINANT PROFILES OF HISTORICAL AND EXISTING POLLUTANT SOURCES IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL

(Page 1 of 6)

Contaminant	Method A Cleanup Level		State Marine WQ Standards	State Marine Sediment Management Standards		a Urban Runoff	b Pulp & Paper Industry	c Coal Mining/Processing	d Municipal Wastewater	e Ports/Marinas	f Sawmills	
	Ground water	Soil	Chronic	SQS	CSL							
*Shaded contaminants exceeded at least one of the standards or cleanup levels.	X = Indicates the availability of a State standard or cleanup level. *Shaded cells indicate the standard or screening level exceeded at the Cornwall Avenue Landfill site.					C = Confirmed discharge. S = Suspected discharge.						
Metals												
Antimony						S		S	C			
Arsenic	X	X	X	X	X	C	C	S	S			
Beryllium						S		S				
Cadmium	X	X	X	X	X	C	C	S	C			
Chromium	X	X	X	X	X	C	C	S	C			
Copper			X	X	X	C	C	S	C			S
Lead	X	X	X	X	X	C	C	S	C	S		
Mercury	X	X	X	X	X	C	C	S	C			
Nickel			X			C	C	S	C			
Selenium			X			C	C	S	C			
Silver			X	X	X	C	C	S	C			
Thallium						C	C	S	C			
Zinc			X	X	X	C	C	S	C			S
Organotin Compounds										S		
Cyanide			X			C		S	S			
Total Petroleum Hydrocarbons	X	X				S			S	S		
Volatile Compounds												
Acetone						C			S			
Vinyl Chloride	X	X										
Methylene Chloride	X	X					C	S				
2-Butanone (MEK)						C	C		S			
1,1-Dichloroethane												
Chloroform							C	S	C			
1,1,1-Trichloroethane	X	X				S			S			
Trichloromethane						S			S			
Bromodichloromethane												
trans-1,3-Dichloropropene												
Dibromochloromethane												
Benzene	X	X				C		S	S			

TABLE 6-1. CONTAMINANT PROFILES OF HISTORICAL AND EXISTING POLLUTANT SOURCES IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL

(Page 2 of 6)

Contaminant	Method A Cleanup Level		State Marine WQ Standards	State Marine Sediment Management Standards		a Urban Runoff	b Pulp & Paper Industry	c Coal Mining/Processing	d Municipal Wastewater	e Ports/Marinas	f Sawmills	g Wood Treatment Facilities
	Ground water	Soil	Chronic	SQS	CSL							
*Shaded contaminants exceeded at least one of the standards or cleanup levels.	X = Indicates the availability of a State standard or cleanup level. *Shaded cells indicate the standard or screening level exceeded at the Cornwall Avenue Landfill site.					C = Confirmed discharge. S = Suspected discharge.						
Bromoform												
Tetrachloroethene	X	X				S			C			
Chlorobenzene												
Total xylenes	X	X				C		S	S			
Chloroethane												
1,1-Dichloroethene												
trans-1,2-Dichloroethene												
1,2-Dichloroethane	X	X										
1,2-Dibromoethane (EDB)	X	X										
Carbon tetrachloride												
1,2-Dichloropropane												
Trichloroethene	X	X										
1,1,2-Trichloroethane												
cis-1,3-Dichloropropene												
1,1,2,2-Tetrachloroethane												
Toluene	X	X				C	C	S	C			
Ethylbenzene	X	X				C			S			
Methyl chloride												
Methyl bromide												
Semi-volatile Compounds												
Phenolic compounds												
Phenol				X	X	C	C	S	S	C		C
2-Methylphenol				X	X							C
4-Methylphenol				X	X	C	C		S			C
2,4-Dimethylphenol				X	X	S						C
Pentachlorophenol			X	X	X	C	C		C	C		C
2-Chlorophenol												
4-Chlorophenol												
2,4-Dichlorophenol							C					C
2,6-Dichlorophenol												
2,4-Dinitrophenol							C					C
2-Nitrophenol						S			S			
4-Nitrophenol						S			S			

TABLE 6-1. CONTAMINANT PROFILES OF HISTORICAL AND EXISTING POLLUTANT SOURCES IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL

(Page 3 of 6)

Contaminant	Method A Cleanup Level		State Marine WQ Standards	State Marine Sediment Management Standards		a Urban Runoff	b Pulp & Paper Industry	c Coal Mining/Processing	d Municipal Wastewater	e Ports/Marinas	f Sawmills	Tre nt F ies
	Ground water	Soil	Chronic	SQS	CSL							
*Shaded contaminants exceeded at least one of the standards or cleanup levels.	X = Indicates the availability of a State standard or cleanup level. *Shaded cells indicate the standard or screening level exceeded at the Cornwall Avenue Landfill site.					C = Confirmed discharge. S = Suspected discharge.						
2,4,5-Trichlorophenol												C
2,4,6-Trichlorophenol							C					
Halogenated ethers												
Bis(2-chloroethyl)ether												
Bis(2-chloroethoxy)methane												
Bis(2-chloroisopropyl)ether												
4-Bromophenylphenylether												
4-Chlorophenylphenylether						S			S			
Nitroaromatics												
2,4-Dinitrotoluene												
2,6-Dinitrotoluene												
Nitrobenzene												
Nitrosamines												
N-nitroso-di-n-propylamine												
N-nitrosodiphenylamine				X	X							
N-nitrosodimethylamine						S			S			
Chlorinated Naphthalenes												
2-Chloronaphthalene												
Polynuclear Aromatic Hydrocarbons (PAH)												
Low Molecular Weight PAH												
Acenaphthene	X	X		X	X	C		S	S			C
Acenaphthylene	X	X		X	X	C	C	S	S			
Anthracene	X	X		X	X	C		S	S			
Fluorene	X	X		X	X	C		S	S			C
Naphthalene	X	X		X	X	S	C	S	S			
Phenanthrene	X	X		X	X	C	C	S	S			
High Molecular Weight PAH												
Benz(a)anthracene	X	X		X	X	C			S			
Benzo(a)pyrene	X	X		X	X	C		S	S			
Benzo(g,h,i)perylene	X	X		X	X	C		S	S			
Benzofluoranthenes(b,k)	X	X		X	X	C			S			
Chrysene	X	X		X	X	C		S	S			
Dibenzo(a,h)anthracene	X	X		X	X	C		S	S			
Fluoranthene	X	X		X	X	C	C	S	S			C

TABLE 6-1. CONTAMINANT PROFILES OF HISTORICAL AND EXISTING POLLUTANT SOURCES IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL

(Page 4 of 6)

Contaminant	Method A Cleanup Level		State Marine WQ Standards	State Marine Sediment Management Standards		a Urban Runoff	b Pulp & Paper Industry	c Coal Mining/Processing	d Municipal Wastewater	e Ports/Marinas	f Sawmills	g Wood Treatment Facilities
	Ground water	Soil	Chronic	SQS	CSL							
*Shaded contaminants exceeded at least one of the standards or cleanup levels.	X = Indicates the availability of a State standard or cleanup level. *Shaded cells indicate the standard or screening level exceeded at the Cornwall Avenue Landfill site.					C = Confirmed discharge. S = Suspected discharge.						
Ideno(1,2,3-cd)pyrene	X	X		X	X	C		S	S			
Pyrene	X	X		X	X	C	C	S	S			C
Chlorinated Benzenes												
1,3-Dichlorobenzene												
1,2-Dichlorobenzene								S				
1,4-Dichlorobenzene								S				
1,2,4-Trichloro benzene												
Hexachlorobenzene				X	X	S			S			
Hexachlorinated Compounds												
Hexachlorobutadiene				X	X							
Hexachloroethane												
Hexachlorocyclopentadiene												
Benzidines												
3,3'-Dichlorobenzidine												
Phthalate Esters												
Dimethylphthalate				X	X	C			S			
Diethylphthalate				X	X	S		S	S			
Di-n-butylphthalate				X	X	C		S	S			
Butylbenzylphthalate				X	X	C		S	S			
Bis(2-ethylhexyl)phthalate				X	X	C		S	C			
Di-n-octylphthalate				X	X	C		S	S			
Miscellaneous Extractable Compounds												
Benzoic Acid				X	X	S			S			
Benzyl Alcohol				X	X	S			S			
Dibenzofuran				X	X	C			S			
2-Methylnaphthalene						C		S	S			C
Pesticides												
Aldrin			X									
BHC (Lindane)			X			S			C			
Chlorpyrifos			X									
Dachthal						S			S			
DDT (DDD and DDE)			X									
Dicofol												

TABLE 6-1. CONTAMINANT PROFILES OF HISTORICAL AND EXISTING POLLUTANT SOURCES IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL

(Page 5 of 6)

Contaminant	Method A Cleanup Level		State Marine WQ Standards	State Marine Sediment Management Standards		a Urban Runoff	b Pulp & Paper Industry	c Coal Mining/Processing	d Municipal Wastewater	e Ports/Marinas	f Sawmills	g Wood Treatment Facilitie
	Ground water	Soil	Chronic	SQS	CSL							
*Shaded contaminants exceeded at least one of the standards or cleanup levels.	X = Indicates the availability of a State standard or cleanup level. *Shaded cells indicate the standard or screening level exceeded at the Cornwall Avenue Landfill site.					C = Confirmed discharge. S = Suspected discharge.						
Dieldrin			X			S			S			
Endosulfan (I and II)			X			S			S			
Endosulfan sulfate												
Endrin			X									
Endrin aldehyde												
Heptachlor			X			S			S			
Heptachlor epoxide												
Isophorone												
Malathion												
Methoxychlor												
Methyl parathion												
Mirex (dechlorane)												
Parathion												
Chlordane			X			S			S			
Toxaphene			X									
Polychlorinated Biphenyl Compounds (PCB)												
Aroclor 1016			X									
Aroclor 1221			X									
Aroclor 1232			X									
Aroclor 1242			X									
Aroclor 1248			X									
Aroclor 1254			X							S		
Aroclor 1260			X						C			
Aroclor 1262			X									
Aroclor 1268			X									
Total PCB			X	X	X				C	S		
Dioxins and Furans												
2,3,7,8-TCDD							S					
1,2,3,7,8-PeCDD												
1,2,3,4,7,8-HxCDD												
1,2,3,6,7,8-HxCDD												
1,2,3,7,8,9-HxCDD												

TABLE 6-1. CONTAMINANT PROFILES OF HISTORICAL AND EXISTING POLLUTANT SOURCES IN THE VICINITY OF THE CORNWALL AVENUE LANDFILL

(Page 6 of 6)

Contaminant	Method A Cleanup Level		State Marine WQ Standards	State Marine Sediment Management Standards		a Urban Runoff	b Pulp & Paper Industry	c Coal Mining/Processing	d Municipal Wastewater	e Ports/Marinas	f Sawmills	g Wood Treatment Facilities
	Ground water	Soil	Chronic	SQS	CSL							
*Shaded contaminants exceeded at least one of the standards or cleanup levels.	X = Indicates the availability of a State standard or cleanup level. *Shaded cells indicate the standard or screening level exceeded at the Cornwall Avenue Landfill site.					C = Confirmed discharge. S = Suspected discharge.						
1,2,3,4,6,7,8-HpCDD												
Octachlorodibenzo-p-dioxin (OCDD)												
2,3,7,8-TCDF							C					
1,2,3,7,8-PeCDF												
2,3,4,7,8-PeCDF												
1,2,3,4,7,8-HxCDF												
1,2,3,6,7,8-HxCDF												
2,3,4,6,7,8-HxCDF												
1,2,3,4,6,7,8-HpCDF												
1,2,3,4,7,8,9-HpCDF												
Octachlorodibenzofuran (OCDF)												

Note: Shaded area indicates contaminants of potential concern in marine sediment or groundwater at the Cornwall Avenue Landfill site and the standard or screening level that was exceeded.

X = Available standard or cleanup screening level.

SQS = Sediment Quality Standard.

CSL = Sediment Cleanup Screening Level.

C = Confirmed based on available sampling data in the vicinity of the Cornwall Avenue Landfill or Whatcom Creek Waterway summarized in Section 3.0 of this report.

S = Suspected based on available sampling data for other Bellingham Bay or other Puget Sound locations and general industry profile information provided in Shineldecker (1992).

a Based on the Phase I and II storm drain studies conducted in the vicinity of the Cornwall Avenue Landfill and Whatcom Creek Waterway (PTI Environmental Services 1991; Cubbage 1994).

b Based on sampling conducted of the Georgia-Pacific effluent reported in Hallinan and Ruiz (1990).

c Based on profiles of coal mining and processing industries in Pucknat (1981), U.S. EPA (1981), and Shineldecker (1992).

d Based on sampling conducted of Post Point WWTP effluent reported by CH2M Hill (1984). Suspected contaminants identified based on confirmed or suspected presence in urban runoff.

e Based on sampling conducted at the Maritime Contractors Shipyard (Cubbage 14 October 1993) and general information in Shineldecker (1992).

f No profile information identified.

g Based on sampling conducted at the R.G. Haley site (Ecology and Environment, Inc. 1986).

migrating through the Cornwall Avenue Landfill is the probable source of these contaminants. However, it is still possible that some of these contaminants are present at elevated levels in groundwater upgradient of the landfill.

The potential pollutant sources identified in Table 6-1 could have also contributed directly to the contaminants measured by Ecology via disposal of wastes in the landfill. However, the sources of wastes disposed in the landfill would likely include a larger number of commercial and industrial operations than those summarized in Table 6-1. These sources would have included municipal solid waste such as newspapers, magazines, yard clippings, and household hazardous wastes (e.g., cleansers, paints, solvents, pesticides, and pharmaceutical). The general sources of the potential problem contaminants at the Cornwall Avenue Landfill site identified in Table 6-1 are summarized below. The information summarized below provides only a general overview of the domestic and industrial products and processes that might generate these contaminants and therefore it may not include all possible sources of these contaminants. Some of the potential sources identified below also may not exist, or may not have contributed contaminants to the site. The information provided below was summarized from Toxicological Profiles prepared by the U.S. Public Health Service (1989 and 1990) and the U.S. Department of Health and Human Services (1992a,b,c,d,e,f; 1993a,b; 1994) and Contaminant Hazard Reviews prepared by the U.S. Fish and Wildlife Service (Eisler 1986a,b; 1987; 1988a,b; 1991).

6.1.1 Metals

Metals occur as a natural component of the earth's crust, and therefore, metals can be found in water and sediment in locations that are not influence by human waste input. However, due to their usefulness in a wide variety of applications, metals have been mined, concentrated, and then released by humans in a variety of waste products. An overview of the predominant human sources of the potential problem metals identified at the Cornwall Avenue Landfill is provided below.

6.1.1.1 Arsenic. Arsenic compounds have been used in wood treating plants due to their toxic effects on wood boring insects. It is not known if arsenic has been used in wood treatment operations in the vicinity of the Cornwall Avenue Landfill. Arsenic is also present in coal and other fossil fuels and is released during combustion; it can be leached from coal tailings. Smelting of metallic ores can also result in the release of arsenic. Historically, the largest source of arsenic in Puget Sound was the ASARCO smelter in Tacoma, Washington approximately 100 miles south of Bellingham. Arsenic is also used in dyes and glass manufacture and is present in domestic laundry detergents.

6.1.1.2 Cadmium. Cadmium is used in nickel-cadmium batteries, metal plating, pigments, plastics and synthetics, alloys, and phosphate fertilizers. Cadmium is also released from the combustion of fossil fuels including coal, and can be leached from coal tailings. Cadmium associated with zinc can also be released during the zinc smelting process.

6.1.1.3 Chromium. Chromium has been used as a wood preservative, but it is not known if chromium was used in wood treating operations near the Cornwall site. Chromium is released during the combustion of coal or oil and may be leached from coal tailings. Chromium is also used in metal plating, dyes, pigments, photocopying toner, leather tanning, and treatment of cooling tower water as a rust and corrosion inhibitor. Chromium contamination has also been associated with cement plants, rubber production, ship and boat building, drilling muds, and stainless steel welding.

6.1.1.4 Copper. Copper, in conjunction with chromate (i.e., chromium) has been used to treat wood. However, it is not known if copper was used at the wood treatment operation near the Cornwall site. Copper has also been used as an algicide, fungicide, and in fabric dyes, electrical wiring, and water pipes. Copper may also be released during mining and smelting operations.

6.1.1.5 Lead. Lead has been used in a variety of products including gasoline additives, lead-acid batteries, metal finishing products, ceramic glaze, ammunition, paints, pigments, caulking, lead-arsenate pesticides, and plumbing solder. Lead may also be found in oil filters and crankcase oil.

6.1.1.6 Mercury. A significant source of mercury waste in the vicinity of Cornwall Avenue is the Georgia-Pacific chlor-alkali plant. However, this plant initiated operation at about the time the Cornwall Avenue landfill was closed. Mercury has also been used by pulp and paper mills to control bacterial slimes in the organic rich process streams. No data are currently available on the types of slimicides used by pulp mill operations near the site. Additional sources of mercury include batteries, fluorescent light bulbs, pharmaceutical, medical and dental equipment, electrical switches, plastics, and anti-fouling paints. Mercury waste is also associated with smelting, ink manufacture, leather tanning, electroplating, and textile manufacture.

6.1.1.7 Nickel. Nickel has been used in a variety of products including nickel-cadmium batteries, metal alloys, plumbing, heat exchangers, pumps, welding electrodes, stainless steel, tableware, electrical contacts, cast iron, ceramics, pigments, and catalysts. Nickel is also released during mining and smelting operations.

6.1.1.8 Zinc. Zinc is primarily used as a protective coating of other metallic objects (e.g., galvanized iron). Zinc is also a component of brass and bronze alloys, common electrical apparatus, and pharmaceuticals.

6.1.2 Cyanide

Cyanide in the form of organic cyanides is the basis for the manufacture of synthetic fibers, resins, plastics, dyestuffs, vitamins, solvents, elastomers, agricultural insecticides, and high pressure lubricants. Sodium cyanide is used to clean silverware and other precious metals and is generally used in industry as a metal cleaner. Cyanide has been used to extract gold and silver during mining operations. Cyanide has also been used in the electroplating industry and in the manufacture of synthetic rubber, fumigants, rodenticides, insecticides, predator control agents, rocket fuels, paints and paint finishes, paper, nylon, pharmaceutical, photographic chemicals, mirrors, cement, perfume, bleaches, soaps and detergents, fertilizers, and herbicides. Cyanide is present in the wastestreams of many industrial wastewaters including electroplating, paint, aluminum, plastics, metal finishing, coal gasification, certain mine operations, and petroleum refiners.

6.1.3 Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate is a synthetic compound added to plastics to make them more flexible. Therefore, this compound may be found in rainwear, footwear, upholstery, imitation leather, shower curtains, food packaging, floor tiles, children's toys, flexible tubing, plastic bags, and plastic medical products. It is also used in erasable inks, cosmetics, paints, adhesives, and coatings, in paper and paperboard production, and as a component of dielectric fluids in transformers and switches.

6.1.4 Aroclor PCBs

Aroclor PCBs were produced in the U.S. between 1929 and 1977 and have been used in a number of products that require good insulating properties. PCBs have been used as heat transfer agents, lubricants, dielectric agents in transformers and capacitors, flame retardants, wax extenders, dedusting agents, plasticizers, and as waterproofing material.

6.2 DATA GAPS AND RECOMMENDATIONS

Additional research on the development of regulatory agencies, including the Washington State Pollution Commission, Department of Ecology, and the DNR could reveal information about the responsibilities as well as the actions of these agencies. Further investigation of specific companies, such as Brooks Manufacturing, could fill historical gaps in this report. The Secretary of State has not yet provided certain records requested last spring. It is possible that the Articles of Incorporation will provide information about the history of this and other companies discussed in this report.

An in-depth review of the industrial processes occurring in the vicinity could yield more information about possible contamination. Also, it could be useful to obtain more specific information about the waste that was collected and dumped at the site.

Because of the qualification of a number of the analytical results reported by Ecology, the limited number of samples collected, and the lack of analysis of filtered water samples and sediment organic carbon, it is not possible to confirm the problem contaminants at the site, except for sediment concentrations of copper and zinc. Because the elevated sediment concentrations are likely due to oxidation and precipitation of metals in the seep water and subsequent deposition at the sediment surface, it is likely that elevated metals levels in the sediments are confined to the immediate area of the seeps. Additional sampling is necessary to confirm this. Additional spatial sampling of sediments, both upgradient-downgradient and inshore-offshore, would also confirm that the measured contaminants are derived from the seeps and not from other sources near the landfill.

If it is confirmed that the seeps are the source of the identified contaminants, then monitoring wells should be established at upgradient, downgradient, and landfill locations to establish which contaminants are derived from the landfill. A characterization of the contaminants present in groundwater and subsurface soils at the site would provide a data base that would allow a better identification of the types of wastes present in the landfill and the potential contributors of these wastes.

In summary the identified data gaps include:

- Development of regulatory agencies
- Specific corporate historical records
- Historical information regarding industrial activities and wastes disposed at the site
- Dissolved metals concentrations in beach seeps
- Sediment organic carbon content
- Spatial gradients of sediment contaminant concentrations
- Groundwater samples from within the landfill and upgradient locations to confirm sources of identified contaminants

The recommendations for further investigation include:

- Additional historical research to address data gaps regarding government agencies, corporations, and industrial activities.

- Resampling of beach seeps and sediments following a well designed sampling plan that includes filtering of beach seep samples, measuring sediment total organic carbon, and collecting upgradient-downgradient and inshore-offshore sediment samples to confirm the problem contaminants and their source (i.e., seeps vs. offsite contributions).

- Installation and sampling of upgradient, downgradient, and landfill monitoring wells to identify the upgradient levels of contaminants in groundwater and the contaminants present within the landfill, and establish the connection between groundwater within the landfill and groundwater emanating from beach seeps near the landfill.

APPENDIX A

DATA SOURCES

A1: HISTORICAL RESOURCES

A2: TECHNICAL RESOURCES

APPENDIX A-1

HISTORICAL RESOURCES

This Appendix contains an overview of the historical research process conducted at Olympia, Seattle, and Bellingham, followed by a list of specific references.

OLYMPIA, WASHINGTON

During March, project personnel visited the Washington State Archives, where they requested the Articles of Incorporation for the Bellingham Bay Improvement Company, Frank Brooks Manufacturing, R.G. Haley, International Cross Arm, and Sanitary Service Company. They copied records pertaining to the Bellingham Bay Improvement Company and American Fabricators. They also reviewed records pertaining to the Cornwall Landfill listed under Department of Ecology, Water Pollution Control Branch.

HRA researchers contacted the Secretary of State to request the Articles of Incorporation for companies not located in the Washington State Archives, including R.G. Haley, International Cross Arm, and Sanitary Service Company.

Next, project personnel visited the Washington State Library, where they examined a number of secondary histories that provided context for the Bellingham Bay area. They also researched newspaper clippings files and historical maps at this location.

At the Department of Natural Resources, HRA and Tetra Tech researchers examined records pertaining to the Cornwall Landfill, including leases, correspondence, reports, and historical maps.

SEATTLE, WASHINGTON

During March and April, project personnel visited the Special Collections Division at the University of Washington, where they examined secondary histories and newspaper articles that provided context for the Bellingham Bay area. They did not find archival records pertaining to the companies associated with the Cornwall Landfill and vicinity.

At the University of Washington, HRA researchers examined the historical maps and aerial photographs at the Map Collection, and reviewed historical maps in microfilm. At the Forestry Library, they examined the proceedings of the American Wood-Preservers' Association, which provided information on wood treating activities at the site.

HRA researchers reviewed finding aids at the Manuscripts and University Archives at the University of Washington, where they did not find information pertaining to the companies associated with the Cornwall Landfill and vicinity.

BELLINGHAM, WASHINGTON

During March and June, HRA and Tetra Tech researchers visited a variety of repositories in Bellingham. First, they consulted the Whatcom County Assessor and Clerk and Recorder's Office, where they examined records pertaining to ownership and leases relevant to the property. Their initial investigation revealed that much of the project area has been residential – a point confirmed by subsequent interviews. Because a chain-of-title on the property would likely prove very time-consuming without yielding useful information on the activities of relevant businesses, the Washington Attorney General and Tetra Tech agreed that HRA would focus on records – such as historical maps and photographs – that would reveal information about businesses that operated in the vicinity.

At the Whatcom County Assessors Office, HRA researchers examined aerial photographs that demonstrated the progression of the land fill from the 1950s through the 1980s.

Project personnel also examined records at a variety of repositories located at the City of Bellingham, including the Public Works Department, where they reviewed miscellaneous solid waste files; the Planning and Community Development Department, where they investigated zoning ordinances and historical maps; the Central Services Division, where they located comprehensive plans; and the Finance Department, where they researched city council meeting minutes and resolutions.

Next, HRA researchers consulted the Port of Bellingham, where they copied a number of Resolutions pertaining to the project area. They also submitted a Public Disclosure Request for Information, which, by mid-June, had yielded numerous documents pertaining to the Cornwall Landfill.

At Western Washington University, HRA and Tetra Tech researchers visited the Washington State Archives, where they examined records pertaining to the Bellingham Bay Improvement Company, an entity that operated near the site during the early twentieth century. They also visited the Center for Pacific Northwest Studies, where they obtained a variety of secondary histories, including a master's thesis concerning the development of Bellingham Bay. They consulted Special Collections at the Wilson Library, where they found few primary records pertaining to the site.

At the Bellingham Public Library, project personnel copied a variety of historical maps and photographs, as well as secondary histories pertaining to Bellingham Bay. They also examined the newspaper clippings files relevant to the Cornwall Landfill, and they reviewed the Polk Directories for Bellingham and Whatcom County, to obtain listings of relevant businesses.

Lastly, they visited the Whatcom County Museum, which offered historical maps and photographs of the project area and vicinity.

The materials obtained from these repositories provided documentation for the history of the project area.

REFERENCES

Books, Articles, Pamphlets, Reports, and Miscellaneous

American Wood-Preservers Association. 1910-1990. Proceedings.

Anonymous. 1902. Bellingham Bay History. The Coast 3, July 1902, pp. 182-190.

Batchelor, C.F. 1982. Subsidence Over Abandoned Coal Mines: Bellingham, Washington. Master's Thesis, Western Washington University.

Bellingham Herald. 1961. Can City and Port Work Together for Dual Purpose Fill? 2 July 1961.

Bellingham Herald. 1962a. Garbage Disposal. 6 March 1962.

Bellingham Herald. 1962b. City to Stick to Present Garbage Dump. 14 September 1962.

Bellingham Herald. 1964. Health Officer Considers New Site for Gargae Dump as Excellent. 22 April 1964.

Bellingham Herald. 1965a. New and Old in Fill Sites. 2 June 1965.

Bellingham Herald. 1965b. Few Mourners at Passing of the Old Dump. 3 June 1965.

Bellingham Herald. No date. Port to Attend Fill Meeting, Stand Unchanged.

Blake, E.G. 1925. The Seasoning and Preservation of Timber. Van Nostrand Company, New York.

Chamber of Commerce, Bellingham, Washington. 1921. The Lumber Industry of Whatcom County. The Show Window, Volume II.

Clark, D.H. 1969. Eighteen Men and A Horse. Craftsman Press, Seattle, WA.

Cowdry, A.E. 1975. Pioneering Environmental Law: The Army Corps of Engineers and the Refuse Act, on Pacific Historical Review. August 1975. pp. 332-336.

Darby, O. 1991 (ed.). A 65-Year Legacy of Environmental Leadership. Puget Parade 1 Fall, pp. 16-17.

Department of Natural Resources (DNR). 1988. Letter, C. Fleskes to Sanitary Service Co., 29 December 1988.

Department of Natural Resources (DNR). 1992a. Letter, F. James to J. Isdell, 3 April 1992.

Department of Natural Resources (DNR). 1992b. Letter, J. Isdell to R. Delahunt, 1 October 1992.

Department of Natural Resources (DNR). 1992c. Letter, R. Delahunt to J. Isdell, 29 December 1992.

Department of Natural Resources (DNR). No. date. Site Hazard Assessment, Cornwall Avenue Landfill, Foot of Cornwall Avenue, Bellingham, WA.

Ecology and Environment, Inc. 1986. Site Inspection Report, R.G. Haley International Corporation, Inc., Bellingham, Washington.

Edson, L.J. No date. The Fourth Corner: Highlights from the Early Northwest.

Georgia-Pacific Corporation. 1961-1991. Puget Parade. Annual Report.

Heller, R. 1984. Sell 'Em Low - Send and Get More: A Centennial History of Morse Hardware Company. Bellingham, WA.

Hitchman, J.H. 1972. The Port of Bellingham, 1920-1970. Center for Pacific Northwest Studies, Western Washington University, Occasional Paper No. 1.

Hunt, G.M., and G.A. Garratt. Wood Preservation. New York: McGraw-Hill Book Company, Inc, 1953.

Koert, D., and G. Biery. Looking Back, 2 vols. Lynden Tribune, Lynden, Washington. 1980.

Kraig, B. 1981. A Slow Game: The Bellingham Bay Improvement Company and the Economic Development of Bellingham, 1900-1912. Master's Thesis, Western Washington University.

Kraig, B. 1989. The Bellingham Bay Improvement Company: Boomers or Boosters? In: Pacific Northwest Quarterly 80 (October, 1989).

Moen, W.S. 1969. Mines and Mineral Deposits of Whatcom County, Washington. Department of Natural Resources, Bulletin No. 57.

Olson, S.H. 1971. The Depletion Myth: A History of Railroad Use of Timber. Harvard University Press. Cambridge, Massachusetts.

R.L. Polk and Company. 1920-1991. Bellingham and Whatcom County Directory.

Port of Bellingham. 1953. Lease Agreement with the City of Bellingham.

Port of Bellingham. 1954-1963. Records, Letters, and Memoranda. Port of Bellingham Records.

Prosser, W.F. 1903. A History of The Puget Sound Country: Its Resources, Its Commerce and Its People. The Lewis Publishing Company, New York.

W.D. Purnell & Associates, Inc. 1991. Environment Site Assessment, Phase I, Georgia Pacific Corporation, December 12, 1991.

Roth, L.R. 1926. History of Whatcom County, 2 vols. Seattle: Pioneer Historical Publishing Company.

Sanitary Service Company. No date. Recycling and Refuse Collection, Residential/Commercial. Eco Print. Bellingham, WA.

Scott, J.W., and D.E. Turbeville, III. 1980. Early Industries of Bellingham Bay and Whatcom County: A Photographic Essay. Fourth Corner Registry. Bellingham.

Snowden, C.A. 1909. History of Washington: The Rise and Progress of an American State, 4 vols. The Century History Company. New York, NY.

GOVERNMENT DOCUMENTS

City of Bellingham. Record of Proceedings of City Council.

Port of Bellingham Commission. 1958. Development Plan, June, 1958.

United States House of Representatives. 1897. 55th Congress, 1st Session, House of Representatives Document No. 80, Bellingham Harbor.

United States House of Representatives. 1908. 60th Congress, 2d Session, House of Representatives Document No. 1161, Bellingham Harbor.

United States House of Representatives. 1928. 70th Congress, 1st Session, House of Representatives Document No. 187, Bellingham Harbor.

United States House of Representatives. 1951. 82d Congress, 2d Session, House of Representatives Document No. 558, Bellingham Harbor, Washington, 20 March 1951.

United States Senate. 1953. 85th Congress, 1st Session, Senate Document No. 46, Bellingham Harbor, Washington, 24 July 1953.

State of Washington. 1925. Lease Agreement with Bloedel Donvan Lumber Mills. April 24, 1925.

State of Washington. 1994. Revised Code of Washington, Volume 4, Title 43.

State of Washington Archives. 1962a. Letter, G.F. Hallman to C.Ott. 13 March 1962.

State of Washington Archives. 1962b. Memorandum, C. Ott to J.C. Christiansen. 14 May 1962.

State of Washington Archives. 1962c. Letter, C.Ott to J. Westeford. 21 August 1962.

HISTORICAL MAPS AND AERIAL PHOTOS

B.B. Abstract and Title Insurance Company. Bellingham Waterfront, Bellingham Washington, November, 1904.

Bellingham, Whatcom County, Washington. Station Map: Lands, Tracks, and Structures, Bellingham and Northern Railway.

Bellingham, Whatcom County, Washington. Station Map: Lands, Tracks, and Structures, Chicago, Milwaukee, St Paul Railway.

Bellingham, Whatcom County, Washington. Station Map: Tracks and Structures, Northern Pacific Railway, V-26 (5A), (6), (6A), and (6B).

Bellingham, Whatcom County, Washington. Township and Range Map: V-17 (15), (S-16A), (S-16B), and (S-16C).

Bellingham, Whatcom County, Washington. Index Map: Bellingham & Northern Ry Main Line.

Bellingham, Whatcom County, Washington. 1950-1960. Aerial photograph, Cornwall landfill Area, 1950-60.

Bellingham, Whatcom County, Washington. 1977. Aerial photograph, City of Bellingham Marine Shore Line, Cornwall Landfill, June, 1977, scale 1:600

Fairhaven and Southern R.R. 1890. Map of Right of Way, New Whatcom, April 1890.

Harbor Line Commission, State of Washington. 1891. Map of New Whatcom Harbor in Bellingham Bay.

Metsker, Charles F. 1942. Metsker's Atlas - Whatcom County. Seattle, Washington.

Sanborn Map Company. 1904. Bellingham (formerly Whatcom-Fairhaven), Washington. Broadway, New York. Reel 1; map key and Frames 16, 20, 21, 22, 52.

Sanborn Map Company. 1891. New Whatcom, Washington. Broadway, New York. Reel 1; Frames 10, 15.

Sanborn Map Company. 1897. New Whatcom, Washington. Broadway, New York. Reel 1; Frame 21.

Sanborn Map Company. 1913. Bellingham (formerly Whatcom-Fairhaven), Washington. Broadway, New York. Reel 1; Frames 73, 74, 78.

Sanborn Map Company. 1933. Bellingham, Washington.

Sanborn Map Company. 1944 and 1948. Bellingham (formerly Whatcom-Fairhaven), Washington. Broadway, New York. Reel 1; Frames 73, 74.

Sanborn Map Company. 1962. Bellingham, Washington.

Scott, J.W., and D.E. Turbeville, IV. 1983. Whatcom County in Maps, 1832-1937. Bellingham, Washington. Center for Pacific Northwest Studies and the Fourth Corner Registry.

U.S. Army Corps of Engineers. Chart of Bellingham, Washington, January 1897; April 1906; February 1908.

Washington Surveying and Rating Bureau. 1966. Bellingham and Vicinity Earthquake Map.

State of Washington, Department of Highways. 1929. Map of Whatcom County. Olympia, Washington (revised June 9, 1937).

Whatcom County. 1891. Appraiser's Map of New Whatcom County Tidelands.

Whatcom County Aerial Photos:
1950 TWP 38 R 2 - 3
1961 TWP 37-38 N - R 2E
1975 TWP 37-38 N R 2E
1986 T 38 R 1E - 2E, 36-38-2E

INTERVIEWS

Cameron, E. 1995. Telephone Interview with Lisa Mighetto. Seattle and Bellingham, May 17, 1995.

Dahlgren, E., consultant to Georgia Pacific, Bellingham. 1995. Interview with Lisa Mighetto and Daniel Gallacher. Bellingham, March 8, 1995.

Dahlgren, E., consultant to Georgia Pacific, Bellingham. 1995. Interview with John Warner. Bellingham, June 8, 1995.

Garrett, N. 1995. Personal Communication with Lisa Mighetto. Bellingham and Seattle, June 14, 1995.

Isdell, J., Lease Manager, Department of Natural Resources, Olympia. 1995. Interview with Lisa Mighetto. Olympia, March 1, 1995.

Kenefick, A. 1995. Personal Communication with Lisa Mighetto. Seattle, June 20, 1995.

Kotwicke, P., Administrative Assistant, Department of Natural Resources, Olympia. 1995. Interview with Lisa Mighetto. Bellingham, March 1, 1995.

Mowry, W., Environmental Control Officer, Georgaia Pacific, Bellingham. 1995. Telephone Interview with Lisa Mighetto. Bellingham, March 8, 1995.

Nikula, E., Chief Financial officer, Sanitary Service Company, Bellingham. 1995. Interview with Lisa Mighetto and Linda Stutzman. Bellingham, March 9, 1995.

Tweit, G., Historian, Fairhaven Pharmacy, Bellingham. 1995. Interview with Lisa Mighetto and Daniel Gallacher. Bellingham, March 8, 1995.

Wood, C., Section Manager, Department of Natural Resources, Bellingham. 1995. Interview with Lisa Mighetto. Olympia, March 1, 1995.

Zuanich, P., Port Commissioner, Bellingham. 1995. Interview with Lisa Mighetto. Bellingham, March 10, 1995.

APPENDIX A-2

TECHNICAL RESOURCES

Research for this project included review and reproduction of data files, correspondence, reports, books, and published articles relevant to characterizing the contaminant sources to Bellingham Bay and contaminant levels measured in the vicinity of the Cornwall Avenue Landfill and within Bellingham Bay. Sources of this information included current National Pollution Discharge Elimination System (NPDES) permits for major dischargers, data reports compiled by the U.S. Environmental Protection Agency (EPA), Washington Department of Ecology (Ecology), Washington Department of Natural Resources (DNR), and relevant information published in scientific journals and university technical reports. Files at DNR, Ecology, and in the office of the Attorney General were also reviewed for relevant information. Additional information was obtained from two elevtonic databases [SEDQUAL and Water Quality Permit Life Cycle System (WQPLCS)] managed by the Washington Department of Ecology. Four State offices were visited by Mr. Curtis DeGasperi of Tetra Tech to identify and collect relevant information. These visits were as follows:

26 April 1995	Washington Department of Natural Resources, Olympia, Washington
26 April 1995	Washington Attorney General, Olympia, Washington
4 May 1995	Washington Department of Ecology, Northwest Regional Office, Olympia, Washington
8 May 1995	Washington Department of Ecology, Industrial Section, Olympia, Washington

Relevant files were marked and photocopied at the Department of Natural Resources and at the Attorney General's office. At the Washington Department of Ecology the relevant files were marked for photocopying and the marked files were later copied by Ecology staff and forwarded to Tetra Tech. Additional visits were made to the Univerity of Washington, National Oceanic and Atmospheric Administration, and U.S. Environmental Protection Agency libraries to obtain additional published information.

REFERENCES

Andersen, J.L. 9 March 1992. Personal Communication (letter to E. Atkinson, Department of Ecology, Northwest Regional Office, Bellevue, WA). Environmental Control Director, Georgia-Pacific Corporation, Bellingham, WA. [Washington Department of Natural Resources, Olympia, WA]

Anonymous. no date. Preliminary summary of suspected contaminated sites in Bellingham Bay. [Washington Department of Natural Resources, Olympia, WA]

Atkinson, E.P. 15 October 1992. Personal Communication (letter and data report to J. Isdell, Washington Department of Natural Resources, Olympia, WA). Washington Department of Ecology, Bellevue, WA. [Includes data from Site Hazard Assessment of Cornwall Avenue Landfill. [Washington Attorney General, Olympia, WA]

Babcock, R.S. and N.I. Kolby. 1973. Distribution of mercury in sediments of the Nooksack River drainage. Northwest Science 47:180-184. [University of Washington library, Seattle, WA]

Battelle. 1986. Reconnaissance survey of eight bays in Puget Sound. Volumes I and II. EPA 910/9-87-161. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, WA. Battelle, Pacific Northwest Division, Marine Research Laboratory, Sequim, WA. 230 pp. [Tetra Tech files, Redmond, WA]

Bothner, M.H. 1973. Mercury: Some aspects of its marine geochemistry in Puget Sound, Washington. Ph.D. Thesis, Department of Oceanography, University of Washington, Seattle, WA. 126 pp. [University of Washington library, Seattle, WA]

Bothner, M.H., R.A. Jahnke, M.L. Peterson, and R. Carpenter. 1980. Rate of mercury loss from contaminated estuarine sediments. Geochim. Cosmochim. Acta 44:273-285. [University of Washington library, Seattle, WA]

Broad, A.C., A.B. Benedict, and J.R. Mayer. 1984. Infaunal macrobenthos and sediment, characteristics in Bellingham and Samish bays. Prepared for U.S. Environmental Protection Agency, Region 10. Western Washington University, Bellingham, WA. [U.S. Environmental Protection Agency, Region X library, Seattle, WA]

CH2M Hill. 1984. Application for variance from secondary treatment requirements section 301(h) Clean Water Act - City of Bellingham, WA. Prepared for U.S. Environmental Protection Agency, Seattle, WA. CH2M Hill, Bellevue, WA. [Copy incomplete]

Chapman, P.M., R.N. Dexter, J. Morgan, R. Fink, D. Mitchell, R.M. Kocan, and M.L. Landolt. 1984. Survey of biological effects of toxicants upon Puget Sound biota - III. Tests in Everett Harbor, Samish and Bellingham Bays. NOAA Technical Memorandum NOS OMS 2. National Oceanic and Atmospheric Administration, Seattle, WA. 48 pp. [not seen-as cited in PTI Environmental Services 1089]

Cottingham, K. 10 March 1995. Personal Communication (letter regarding potential liability at the Cornwall Landfill site to Mr. Michael J. Gallagher, Toxics Cleanup Program, Northwest Regional Office, Washington Department of Ecology, Bellevue, WA). Supervisor, Washington Department of Natural Resources, Olympia, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Creahan, K. 1988. Whatcom County watershed ranking final report. Whatcom County Council of Governments, Bellingham, WA. 42 pp. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Crecelius, E.A., M.H. Bothner, and R. Carpenter. 1975. Geochemistries of arsenic, antimony, mercury, and related elements in sediments of Puget Sound. Environ. Sci. Technol. 9:325-333. [University of Washington library, Seattle, WA]

Cubbage, J. 1991. Bioaccumulation of contaminants in crabs and clams in Bellingham Bay. Prepared for Puget Sound Estuary Program, U.S. EPA Region 10 and Washington Department of Ecology, Northwest Regional Office. Washington State Department of Ecology, Environmental Investigations and Laboratory Services, Olympia, WA. 29 pp. [Washington Department of Natural Resources, Olympia, WA]

Cubbage, J. 7 June 1993. Metals results from Bellingham Bay. Memo to Lucy Pebles, Northwest Regional Office, Washington Department of Ecology. 2 pp. + attachments. [Washington Department of Natural Resources, Olympia, WA]

Cubbage, J. 14 October 1993. Priority pollutant analyses of sediments within Maritime Contractors shipyard in Bellingham Bay. Memo to Lucy Pebles, Northwest Regional Office, Washington Department of Ecology. 11 pp. + appendix. [Washington Department of Natural Resources, Olympia, WA]

Cubbage, J. 20 May 1994. Personal Communication (facsimile to L. Pebles containing map and sampling results for Boulevard Park sampling conducted by Ecology, Washington Department of Ecology, Bellevue, WA). Washington Department of Ecology, Olympia, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Cubbage, J. 1994. Drainage basin tracing study: Phase II chemicals found in storm drains, Whatcom Creek and Squalicum Harbor in Bellingham, Washington. Washington Department of Ecology, Environmental Investigations and Laboratory Services Program, Olympia, WA. Publ. No. 94-90. 49 pp. [Washington Department of Natural Resources, Olympia, WA]

Dahlgren, E. 11 September 1990. Personal Communication (letter to P. Skyllingstad, Washington State Department of Ecology, Olympia, WA). Environmental Control Director, Georgia-Pacific Corporation, Bellingham, WA. [Washington Department of Natural Resources, Olympia, WA]

Delahunt, R.A. 29 December 1992. Personal Communication (letter to J. Isdell, Washington Department of Natural Resources, Olympia, WA). Environmental Health Supervisor, Whatcom County Health Department, Bellingham, WA. [Washington Department of Natural Resources, Olympia, WA]

Dirkx, J.M. 28 September 1994. Personal Communication (letter and report on the July 1994 Georgia-Pacific-Bellingham Class II Inspection to Mr. J. Andersen, Environmental Control Director, Georgia-Pacific Corporation, Bellingham, WA). Washington Department of Ecology, Olympia, WA. [Washington Department of Ecology, Industrial Section, Olympia, WA]

Douglas, T. 24 March 1995. Personal Communication (letter to M. Gallagher regarding potential liability for Cornwall Avenue Landfill, Washington Department of Ecology, Bellevue, WA). Mayor, City of Bellingham, Bellingham, WA. [Washington Department of Natural Resources, Olympia, WA]

Ecology. Miscellaneous Ecology/DNR correspondence regarding the Cornwall Avenue Landfill site. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. Miscellaneous Ecology/Port of Bellingham correspondence regarding the Cornwall Avenue Landfill site. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Miscellaneous permit information for the City of Bellingham - Post Point wastewater treatment plant. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Miscellaneous permit information for the City of Bellingham - Post Point wastewater treatment plant. [Washington Department of Ecology, Industrial Section, Olympia, WA]

Ecology. Miscellaneous information regarding the Cornwall Avenue Landfill site. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Miscellaneous permit information for the Encogen NW Cogeneration Facility. [Washington Department of Ecology, Industrial Section, Olympia, WA]

Ecology. no date. Miscellaneous information from the Georgia-Pacific Bellingham permit files. [Washington Department of Ecology, Industrial Section, Olympia, WA]

Ecology. no date. Miscellaneous permit information for the Georgia-Pacific-Bellingham pulp and paper mill. [Washington Department of Ecology, Industrial Section, Olympia, WA]

Ecology. Miscellaneous information regarding the R.G. Haley International Corp., Inc. site. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. Miscellaneous information regarding the Whatcom Creek Waterway site. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Site File Schema for Whatcom Waterway. Washington Department of Ecology, Northwest Regional Office, Belleveue, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Site File Schema for Bellingham Bay Action Program. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Site File Schema for Cornwall Avenue Landfill. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Site Hazard Assessment Cornwall Avenue Landfill foot of Cornwall Avenue, Bellingham, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Site Hazard Assessment R.G. Haley International Corporation foot of Cornwall Avenue, Bellingham, Washington. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. no date. Summary Hazard Ranking Score Sheet for Georgia Pacific Corporation, Bellingham, WA. Washington Department of Ecology. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. 1984. Potential hazardous waste site preliminary assessment for Georgia-Pacific mercury waste landfill, Bellingham, Washington. Summary memorandum. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. 3 June 1992. Summary Hazard Ranking Score Sheet for Cornwall Avenue Landfill. [Obtained from J. Gurish, A.G.]. Washington Department of Ecology.

Ecology. 1994. Map of results of sediment quality values comparison for credible evidence review for Lucy Peebles, Northwest Regional Office, Bellevue, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Ecology. Revised 9 May 1994. Confirmed & Suspected Contaminated Sites Report (Whatcom County - pages 162 and 169). Washington Department of Ecology, Olympia, WA. [Tetra Tech files, Redmond, WA]

Ecology and environment, Inc. 1986. Site inspection report R.G. Haley International Corporation, Inc. Bellingham, Washington. Prepared for U.S. Environmental Protection Agency, Seattle, WA. Ecology and environment, Inc., Seatlle, WA. [Washington Attorney General, Olympia, WA]

Ecology and environment, Inc. 1987. Site inspection report for Georgia-Pacific Biotreatment Lagoon, Bellingham, Washington. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Eisler, R. 1986a. Chromium hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service Biological Report 85(1.6). 60 pp. [Tetra Tech files, Redmond, WA]

Eisler, R. 1986b. Polychlorinated biphenyl hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service, Biological Report 85(1.7). 72 pp. [Tetra Tech files, Redmond, WA]

Eisler, R. 1987. Mercury hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service, Biological Report 85(1.10). 90 pp. [Tetra Tech files, Redmond, WA]

Eisler, R. 1988a. Arsenic hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service, Biological Report 85(1.12). 92 pp. [Tetra Tech files, Redmond, WA]

Eisler, R. 1988b. Lead hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service, Biological Report 85(1.14). 134 pp. [Tetra Tech files, Redmond, WA]

Eisler, R. 1991. Cyanide hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service, Biological Report 85(1.23). 55 pp. [Tetra Tech files, Redmond, WA]

Ellis, D. 24 June 1991. Personal Communication (letter to P. Hertzog regarding Whatcom Waterways/Pier Rehabilitation, Port of Bellingham, Bellingham, WA). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

England, M. 17 May 1995. Personal Communication (letter and diskettes to Mr. Curtis DeGasperi, Tetra Tech, Inc.). Public Disclosure Coordinator, Washington Department of Ecology, Olympia, WA.

ENSR. 29 June 1994. draft RI for Georgia-Pacific Corporation. ENSR Consulting and Engineering. [Washington Department of Natural Resources, Olympia, WA - copy incomplete]

Environmental Data Resources, Inc. 6 December 1994. The EDR-Radius Map® Report-Cornwall Avenue Landfill, Cornwall Ave, Bellingham, WA. Environmental Data Resources, Inc., Southport, CN. [Tetra Tech files, Redmond, WA]

Faigenblum, J. 1988. Chemicals and bacteriological organisms in recreational shellfish. Washington Department of Social and Health Services, Olympia, WA. 109 pp. + appendices. [University of Washington library, Seattle, WA]

Gallagher, M. 21 August 1991. Personal Communication (letter to G. Gideon regarding Summary Ranking Score for Whatcom Waterway, Washington Department of Natural Resources, Olympia, WA). Supervisor, Toxics Cleanup Program, Washington State Department of Ecology, Bellevue, WA. [Washington Department of Natural Resources, Olympia, WA]

Galvin, D.V. and R.K. Moore. 1982. Toxicants in urban runoff. Metro toxicant report no. 2. Municipality of Metropolitan Seattle, Seattle, WA. [University of Washington library, Seattle, WA]

Garner, J.M. 9 January 1995. Personal Communication (letter L. Pebles, Washington Department of Ecology, Bellevue, WA). Director of Public Works, City of Bellingham, WA. [Washington Department of Natural Resources, Olympia, WA]

Golding, S. 1994. Georgia-Pacific Corporation (Bellingham) April 1993, Class II Inspection. Washington Department of Ecology, Olympia, WA. [Washington Department of Ecology, Industrial Section, Olympia, WA]

Gorton, L. and P. O'Flaherty. 20 May 1993. Personal Communication (letter to K.D. Thomas, Assistant Director of Public Works for Operations, City of Bellingham, Bellingham, WA). CH2M Hill, Bellevue, WA. 9 pp. + attachments. [Washington Department of Natural Resources, Olympia, WA]

Gurish, J. 13 March 1995. Personal Communication (letter to Dr. Lisa Mighetto regarding information enclosed, Historical Research Associates, Seattle, WA). Assistant Attorney General, Olympia, WA. [Washington Attorney General, Olympia, WA]

Hallinan, P. and C.E. Ruiz. 1990. Georgia Pacific, Bellingham Class II Inspection. Washington Department of Ecology, Environmental Investigations and Laboratory Services Program, Olympia, WA. 49 pp. [Washington Department of Natural Resources, Olympia, WA]

Herrenkohl, M. 22 May 1991. Personal Communication (facsimile to P. Hertzog regarding sediment analytical results for Whatcom International Shipping Pier, Washington Department of Natural Resources, Olympia, WA). Landau Associates, Inc., Edmonds, WA. [Washington Department of Natural Resources, Olympia, WA]

Hertzog, P.J. 9 July 1991. Personal Communication (letter to Mr. Don Ellis, Director of Operations, Port of Bellingham). Supervisor, Sediment Management Section, Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Hertzog, P. 11 June 1991. Personal Communication (letter to D. Ellis regarding DNR interpretation of sediment samples collected below Whatcom International Shipping Pier and recommendations, Port of Bellingham, Bellingham, WA). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Hertzog, P. 30 September 1991. Personal Communication (letter to J. Darling regarding sediment contamination at Whatcom International Shipping Terminal, Director of Operations, Port of Bellingham, Bellingham, WA). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Hertzog, P. 26 June 1992. Personal Communication (letter to L. Pebles regarding Cornwall Avenue Landfill, Washington Department of Ecology, Bellevue, WA). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Hertzog, P. 7 December 1992. Memo to file regarding Cornwall Landfill Site Inspection, November 4, 1992. Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Hertzog, P. 12 March 1993. Memorandum to G. Revelas regarding Bellingham Bay and Port Gardner dredged material sites. Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Hockett, J.M. 16 December 1992. Personal Communication (letter to T. Michelsen regarding response to Information Request - Sediment Hazard Assessment for Bellingham Bay, Washington State Department of Ecology, Olympia, WA). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Holt, L.J. 30 May 1995. Personal Communication (letter and 1943 photo-mosaic of Bellingham Bay to Mr. Steve Ellis, Tetra Tech, Inc.). Washington Department of Natural Resources, Olympia, WA.

Hurst, J.A. 15 December 1992. Memo to file regarding Cornwall Landfill Site Inspection -- November 4, 1992. Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Isdell, J.F. 19 April 1991. Personal Communication (letter to H.M. McDowell regarding Site-Hazard Assessment for Lease 22-002706, Georgia Pacific Corporation, Bellingham, WA). Lease Administrator, Division of Aquatic Lands, Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Isdell, J. 20 May 1992. Personal Communication (memorandum to Christa Thompson regarding Georgia Pacific Landfill liability and legal obligations of Lease No. 22-002353). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Isdell, J. 22 June 1992. Personal Communication (memorandum to Ann Essko regarding preliminary report on Georgia Pacific Landfill Site). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Isdell, J.F. 26 June 1992. Personal Communication (letter to L. Bardy regarding Early Notice Letter No. N-37-5031-000 Landfill Site at Cornwall Avenue, Washington State Department of Ecology, Bellevue, WA). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Jantzen, C.D. and L.B. Elsner. 1993. Marine Water Column Ambient Monitoring Program: Annual Report for Wateryear 1991. Final report. Washington State Department of Ecology, Olympia, WA. Pub. No. 93-13. [University of Washington library, Seattle, WA - copy incomplete]

Kendra, W. 1988. Investigation of recurrent coho salmon mortality at the Maritime Heritage fish hatchery in Bellingham WA. Washington State Department of Ecology, Olympia, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Landau Associates, Inc. 1989. Final report. Assessment of Alaska Ferry Terminal development on marine sediments, Bellingham, Washington. Prepared for Huckell/Weinman Associates, Inc., Kirkland, WA. Landau Associates, Inc., Edmonds, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Lee, R.A. 1971. Report of mercury sampling and analysis, State of Washington, during the period Spring 1970 - Spring 1971. Washington State Department of Ecology, Office of Technical Services, Olympia, WA. [University of Washington library, Seattle, WA]

Malins, D.C., B.B. McCain, D.W. Brown, A.K. Sparks, H.O. Hodgins, and S-L. Chan. 1982. Chemical contaminants and abnormalities in fish and invertebrates from Puget Sound. NOAA Technical Memorandum OMPA-2. National Oceanic and Atmospheric Administration, Seattle, WA. 168 pp. [Tetra Tech files, Redmond, WA]

Mearns, A., R. Swartz, J. Cummins, D. Dinell, P. Plesha, and P. Chapman. 1986. Inter-laboratory comparison of a sediment toxicity test using the marine amphipod *Rhepoxynius abronius*. Mar. Environ. Res. 19:13-37.

Miles, M.B., W.D. Wiggins, G.P. Ruppert, R.R. Smith, L.L. Reed, L.E. Hubbard, and M.L. Courts. 1994. Water Resources Data - Washington. Water Year 1993. U.S. Geological Survey Water-Data Report WA 93-1.

Melcher, S. 1987. City of Bellingham Public Works Department Combined Sewer Overflow Study. City of Bellingham, Department of Public Works, Bellingham, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Moen, W.S. 1969. Mines and mineral deposits of Whatcom County, Washington. Washington Department of Natural Resources, Division of Mines & Geology. Bulletin No. 57. 134 pp. + plates. [University of Washington library, Seattle, WA]

Morgan, A.J. 26 August 1991. Personal Communication (memo to R. Harper, Information and Education Director and P. Summerville, Director, Public Affairs regarding Whatcom Creek Waterway Site: Ecology Hazardous Waste Site). Washington Department of Natural Resources, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

National Oceanic and Atmospheric Administration (NOAA). 1989. National Status & Trends Program for marine environmental quality. Progress Report. A Summary of data on tissue contamination from the first three years (1986-1988) of the Mussel Watch Project. NOAA Technical Memorandum NOS OMA 49. National Oceanic and Atmospheric Administration, Rockville, MD. [Tetra Tech files, Redmond, WA]

National Oceanic and Atmospheric Administration (NOAA). 1991. National Status & Trends Program for marine environmental quality. Progress Report. Second summary of data on chemical contaminants in sediments from the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 59. National Oceanic and Atmospheric Administration, Rockville, MD. [Tetra Tech files, Redmond, WA]

Nelson, J.M. J. Andrews, G. Graves, K. Holm, H. Jones, J. Samples, J. Specker, J. Vecchione, and T. Holzman. 1974. Mercury in the benthos of Bellingham Bay. Western Washington University, Bellingham, WA. 55 pp. + appendices. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Parametrix and SAIC. 1991. Site Hazard Assessment summary report for Whatcom Waterway Bellingham, Washington. Prepared for Washington Department of Ecology, Olympia, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Pebles, L.T. 18 June 1992. Personal Communication (letter to B. Hager, Port of Belligham; D. Bader, Whatcom County Health Department; B. McCourt, City of Bellingham; J. Andersen, Georgia Pacific; J. Isdell, Department of Natural Resources regarding Cornwall Avenue Landfill analytical results). Washington Department of Ecology, Bellevue, WA. [Washington Department of Natural Resources, Olympia, WA]

Pebles, L. 25 June 1992. Personal Communication (letter to B. Hager, Port of Belligham; D. Bader, Whatcom County Health Department; B. McCourt, City of Bellingham; J. Andersen, Georgia Pacific; J. Isdell, Department of Natural Resources regarding Cornwall Avenue Landfill complete analytical results). Washington Department of Ecology, Bellevue, WA. [Washington Department of Natural Resources, Olympia, WA]

Pebles, L.T. 16 July 1992. Personal Communication (letter to P. Hertzog containing response to June 26th letter requesting additional information on Cornwall Avenue sampling effort, Washington Department of Natural Resources, Olympia, WA). Washington State Department of Ecology, Bellevue, WA. [Washington Department of Natural Resources, Olympia, WA]

Pebles, L. 28 April 1995. Personal Communication (facsimile to Mr. Curtis DeGasperi, Tetra Tech, Inc.). Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Pebles, L. and M. Turvey. 17 February 1995. Personal Communication (Memo regarding January 11, 1995 Action Team Meeting Minutes to the Bellingham Bay Action Team). Washington Department of Ecology, Northwest Regional Office, Bellevue, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

PTI Environmental Services. 1989. Bellingham Bay Action Program: Initial data summaries and problem identification. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, WA. PTI Environmental Services, Bellevue, WA. 124 pp. + appendices. [Tetra Tech files, Redmond, WA]

PTI Environmental Services. 1991. Drainage basin source tracing study. Phase 1 technical memorandum. Prepared for U.S. Environmental Protection Agency, Seattle, WA. PTI Environmental Services, Bellevue, WA. 37 pp. + attachments. [Washington Department of Natural Resources, Olympia, WA]

Pucknat, A.W. (ed). 1981. Health Impacts of Polynuclear Aromatic Hydrocarbons. Noyes Data Corporation, Park Ridge, NJ. [Tetra Tech files, Redmond, WA]

Rasmussen, L.F. and D.C. Williams. 1975. The occurrence and distribution of mercury in marine organisms in Bellingham Bay. Northwest Science 49:87-94. [University of Washington library, Seattle, WA]

Reif, D. 1988. Bellingham Post Point pollution control plan class II inspection. Washington Department of Ecology, Water Quality Investigations, Olympia, WA. 55 pp. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Roesijadi, G., A.S. Drum, and J.R. Bridge. 1981. Mercury in mussels of Bellingham Bay, Washington (U.S.A.): The occurrence of mercury-binding proteins. pp. 357-376. In: Biological Monitoring of Marine Pollutants. F.J. Vernberg, A. Calabrese, F.P. Thurberg, and W.B. Vernberg, eds. Academic Press, New York. [University of Washington library, Seattle, WA]

SAIC. 1989. Summary technical memorandum review of Georgia Pacific Pulp Mill, Bellignham 304(l) Technical Assistance (Region 10). Prepared for U.S. Environmental Protection Agency, Seattle, WA. Science Applications International Corporation, Bellevue, WA. 22 pp. + attachments. [Washington Department of Natural Resources, Olympia, WA]

SAIC. 1991. PSDDA 1990 guidelines for the evaluation of crab body burden data from Bellingham Bay. Final report. Prepared for Washington State Department of Natural Resources, Olympia, WA. Science Applications Internation Corporation, Bothell, WA. 9 pp. [Washington Department of Natural Resources, Olympia, WA]

SAIC. 1991. PSDDA 1990 crab bioaccumulation survey of Bellingham Bay. Final report. Prepared for Washington State Department of Natural Resources, Olympia, WA. Science Applications Internation Corporation, Bothell, WA. 14 pp. + appendices. [Washington Department of Natural Resources, Olympia, WA - copy incomplete]

SAIC. 1991. PSDDA 1991 monitoring program Port Gardner benchmark station observations, tissue chemistry of invertebrates from Port Gardner and Bellingham Bay, and bioaccumulation guidelines assessment. Final report. Prepared for Washington State Department of Natural Resources, Olympia, WA. Science Applications Internation Corporation, Bothell, WA. 14 pp. + appendices. [Washington Department of Natural Resources, Olympia, WA - copy incomplete]

Seeger, F.J. 10 March 1995. Personal Communication (letter to Mr. Michael Gallagher, Section Manager, Toxic Cleanup Program, Northwest Regional Office, Washington Department of Ecology, Bellevue, WA). Director of Facilities, Port of Bellingham, Bellingham, WA. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA]

Shineldecker, C.L. 1992. Handbook of environmental contaminants: A guide for site assessment. Lewis Publishers, Inc., Chelsea, MI.

Stanley, R.F. 1980. Water quality conditions in the Bellingham Bay area, 1979-1980. Washington Department of Ecology, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA - copy incomplete]

Striplin, B. 18 July 1991. Personal Communication (letter and comment copy to J. Cubbage regarding 'Bioaccumulation of contaminants in crabs and clams in Bellingham Bay', Washington Department of Natural Resources, Olympia, WA). Washington State Department of Ecology, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Sternberg, D.W. 1967. Recent sediments in Bellingham Bay, Washington. Nortwest Science 41:63-79. [University of Washington library, Seattle, WA]

Strong, D. 15 June 1992. Personal Communication (memo to L. Pebles, Washington Department of Ecology, Bellevue, WA. Includes map and sample analysis results for Cornwall Avenue Landfill). Washington Department of Ecology, Olympia, WA. [Washington Department of Natural Resources, Olympia, WA]

Swartz, R.C., W.A. DeBen, K.A. Sercu, and J.O. Lamberson. 1982. Sediment toxicity and the distribution of amphipods in Commencement Bay, Washington, U.S.A. Mar. Pollut. Bull. 13:359-364.

Tetra Tech. 1990. Puget Sound Ambient Monitoring Program 1989. Marine sediment monitoring. Final report. Prepared for Washington Department of Ecology, Olympia, WA. Tetra Tech, Inc., Bellevue, WA. 262 pp. [Tetra Tech files, Redmond, WA]

Tetra Tech. 1991. Puget Sound sediment reconnaissance survey, 1991. Volume 1: Summary report. Prepared for Washington Department of Natural Resources. Tetra Tech, Inc., Bellevue, WA. 24 pp. + appendices. [Tetra Tech files, Redmond, WA]

Thompson, C.L. 24 August 1994. Memo to file. Assistant Attorney General regarding review of Bellevue-Ecology files on Whatcom Waterway and Cornwall Avenue Landfill). [Washington Attorney General, Olympia, WA]

Tollefson, R. 1962. Basic biological productivity - Bellingham Bay. Prepared for Puget Sound Pulp and Timber Co., Bellingham, WA. Consulting Biologist, Toledo, OR. 128 pp. [University of Washington library, Seattle, WA]

Torve, T. 17 March 1970. Personal Communication (memorandum from Marv Bowler). [Washington Department of Natural Resources, Olympia, WA]

U.S. Army Corps of Engineers (U.S. ACOE). 19 April 1995. Public Notice - U.S. Army Corps of Engineers and Port of Bellingham, maintenance dredging at Squalicum Creek Waterway, Bellingham Harbor, Washington. Seattle District, U.S. ACOE, Seattle, WA. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1992a. Toxicological Profile for arsenic. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 175 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1992b. Toxicological Profile for cadmium. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 163 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1992c. Toxicological Profile for chromium. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 195 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1992d. Toxicological Profile for cyanide. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 121 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1992e. Toxicological Profile for di(2-ethylhexyl)-phthalate. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 131 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1992f. Toxicological Profile for nickel. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 141 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1993a. Toxicological Profile for lead. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 307 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1993b. Toxicological Profile for selected PCBs (Aroclor-1260, -1254, -1248, -1242, -1232, -1221, and -1016). U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 209 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of Health and Human Services. 1994. Toxicological Profile for mercury. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. 357 pp. + appendices. [Tetra Tech files, Redmond, WA]

U.S. Department of the Interior (U.S. DOI). 1967. Pollutional effects of pulp and paper mill wastes in Puget Sound. U.S. DOI, Northwest Regional Office, Portland, OR. 207 pp. [Washington Department of Ecology, Northwest Regional Office, Bellevue, WA - copy incomplete]

U.S. Environmental Protection Agency (U.S. EPA). 1981. Development document for proposed effluent limitations guidelines new source performance standards, and pretreatment standards for the coal mining point source category. EPA 440/1-81/057-b. U.S. EPA, Effluent Guidelines Division, Washington, D.C. 429 pp. [Tetra Tech files, Redmond, WA]

U.S. Public Health Service. 1989. Toxicological Profile for zinc. U.S. Public Health Service, Agency for Toxic Substances and Disease Registry. 113 pp. [Tetra Tech files, Redmond, WA]

U.S. Public Health Service. 1990. Toxicological Profile for copper. U.S. Public Health Service, Agency for Toxic Substances and Disease Registry. 135 pp. [Tetra Tech files, Redmond, WA]

Vu, Tuan. 26 April 1995. Personal Communication (SEDQUAL data for Bellingham Bay, diskettes and letter to Mr. Curtis DeGasperi, Tetra Tech, Inc., Redmond, WA). Washington Department of Ecology, Sediment Management Section, Olympia, WA.

Vu, T. 30 May 1995. Personal Communication (facsimile to Mr. Curtis DeGasperi, Tetra Tech, Inc.). Washington Department of Ecology, Environmental Review and Sediment Section, Olympia, WA.

W.D. Purnell & Associates, Inc. 1991. Environmental Site Assessment Phase I. Prepared for Georgia-Pacific Corporation, Bellingham Division, Bellingham, WA. W.D. Purnell & Associates, Inc., Bellingham, WA. 19 pp. + appendices. [Washington Department of Natural Resources, Olympia, WA]

Weber, H.H. 1978. Studies on intertidal and subtidal benthos, fish and water quality in Bellingham Bay. Prepared for U.S. Army Corps of Engineers. Western Washington University, Huxley College of Environmental Sciences, Bellingham, WA. 78 pp. [not seen - as cited in PTI Environmental Services 1989].

Yake, B. 15 October 1979. Personal Communication (Memorandum to Bruce Johnson and Roger Stanley regarding Georgia Pacific, Bellingham, Class II Inspection). Washington Department of Ecology, Olympia, WA. [sent to Tetra Tech by Bill Yake at the request of Mr. Curtis DeGasperi, Tetra Tech, Redmond, WA]

APPENDIX B

Test Pit Logs, Boring Logs, and Well Construction Details

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS [2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)	▨	**GW**	Well-graded gravel; gravel/sand mixture(s); little or no fines
			▨	**GP**	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)	▨	**GM**	Silty gravel; gravel/sand/silt mixture(s)
			▨	**GC**	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)	▨	**SW**	Well-graded sand; gravelly sand; little or no fines
			▨	**SP**	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)	▨	**SM**	Silty sand; sand/silt mixture(s)
			▨	**SC**	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)		▨	**ML**	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
			▨	**CL**	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
			▨	**OL**	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)		▨	**MH**	Inorganic silt; micaceous or diatomaceous fine sand
			▨	**CH**	Inorganic clay of high plasticity; fat clay
			▨	**OH**	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL		▨	**PT**	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT	■ ▨	**AC** or **PC**	Asphalt concrete pavement or Portland cement pavement
ROCK	▨	**RK**	Rock (See Rock Classification)
WOOD	▨	**WD**	Wood, lumber, wood chips
DEBRIS	▨	**DB**	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
> 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

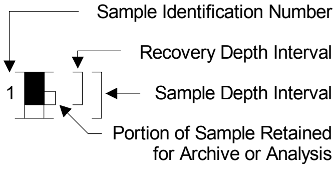
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	2.50-inch O.D., 2.00-inch I.D. WSDOT
h	3.00-inch O.D., 2.375-inch I.D. Mod. California
i	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Vibrocore (Rotosonic/Geoprobe)
5	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽	Approximate water level at time of drilling (ATD)
▼	Approximate water level at time other than ATD

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Soil Classification System and Key

Figure
B-1

MW-11D

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

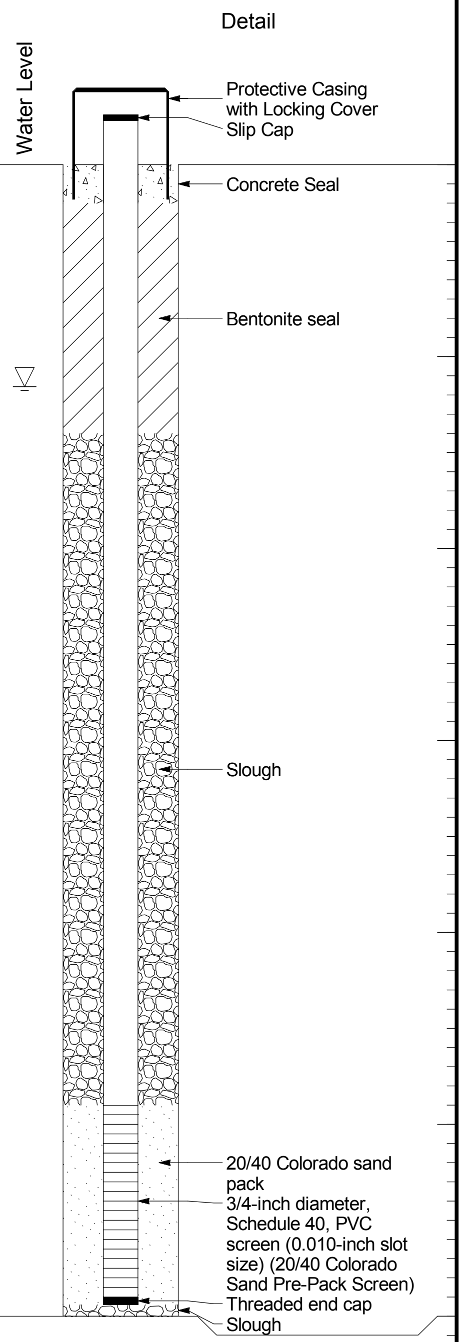
Drilling Method: Geoprobe™

Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
0				
	S-1	i4		
5	S-2	i4		
10	S-3	i4		
	S-4	i4		
15				
	S-5	i4		
20				
	S-6	i4		
25				
	S-7	i4		
30				
35				

USCS Symbol	Description
GP/GM	Gray brown, fine to coarse sandy GRAVEL with silt (loose, moist) (FILL)
SM	Gray, silty, gravelly, fine to medium SAND (loose, moist to wet) (FILL)
SM	Mottled brown and yellow brown, gravelly, very silty, fine SAND (medium dense, damp) (FILL)
SM	Gray brown, gravelly, silty, fine to medium SAND with trace refuse (glass and wood) (medium dense, wet) (FILL)
SM	Black to dark gray, very silty, fine to medium SAND with trace refuse (blue and brown glass, plastic lid, and wood) (loose, wet) (FILL)
SM	Mottled brown and yellow brown, gravelly, silty, fine to medium SAND with abundant refuse (newspaper, glass, and wood) (medium dense, wet) (FILL)
	- Drilling More Difficult 16 to 24 Feet - (No Recovery 16 to 30 Feet) Difficult to interpret fill/native contact. Bottom of well screen set at 30 feet as per Ecology recommendation.



Boring Completed 07/18/12
Total Depth of Boring = 30.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. **Generalized log of MW-11D and MW-11S is shown here.**

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

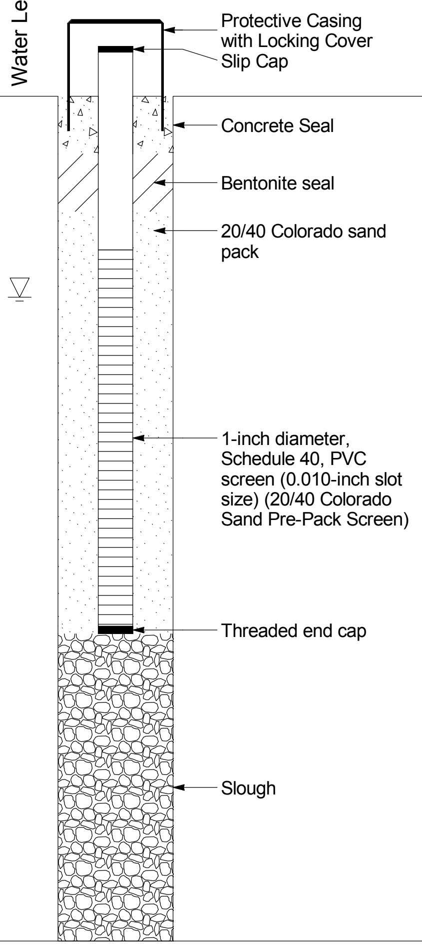
Log of MW-11D

Figure
B-2

MW-11S

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Northwest Probe and Drilling	Water Level
0								
	S-1	i4					See Generalized Soil Description on MW-11D Boring Log	
5								▽
	S-2	i4						
10	S-3	i4						
	S-4	i4						
15								
	S-5	i4						
20								
	S-6	i4						

Detail



Boring Completed 07/16/12
Total Depth of Boring = 22.0 ft.

25

30

35

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-11S

Figure
B-3

MW-12D

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	i4		
S-2	i4		
S-3	i4		
S-4	i4		
S-5	i4		
S-6	i4		
S-7	i4		
S-8	i4		

Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35

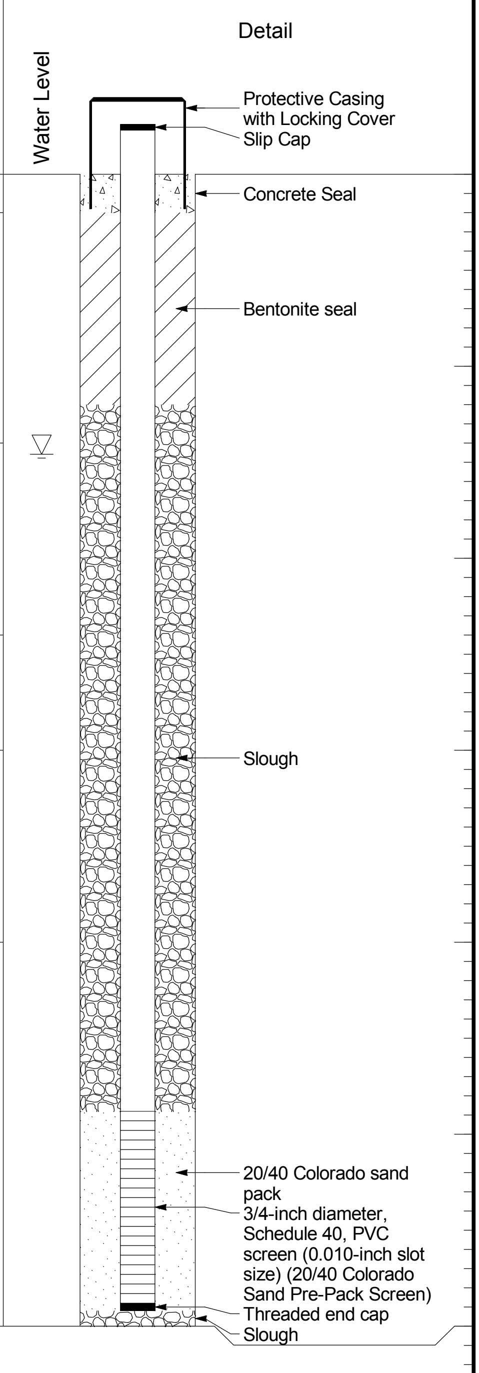
SOIL PROFILE

Drilling Method: Geoprobe™
Ground Elevation (ft):
Drilled By: Northwest Probe and Drilling

USCS Symbol	Description
GP/ GM	Gray brown, fine to coarse sandy GRAVEL with silt (loose, moist) (FILL)
SM	Brown to gray, silty, fine to medium SAND with gravel and abundant wood (loose, moist) (FILL) - with abundant refuse (wood, plastic, glass, and metal)
ML	Black to gray, sandy SILT with interbedded wood (soft to medium stiff, moist to wet) (FILL)
WD	Black, WOOD debris with abundent glass and trace gravel and sand (loose, wet) (FILL)
SP	Black to brown, fine to medium SAND with abundant refuse (wood and glass) (loose, wet) (FILL)
WD	Black, WOOD debris with trace refuse (glass, shell fragment, and painted pottery?) (loose, wet) (FILL) - with trace sand and gravel Difficult to interpret fill/native contact. Bottom of well screen set at 30 feet as per Ecology recommendation.

Boring Completed 07/18/12
Total Depth of Boring = 30.0 ft.

GROUNDWATER



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. **Generalized log of MW-12D and MW-12S is shown here.**

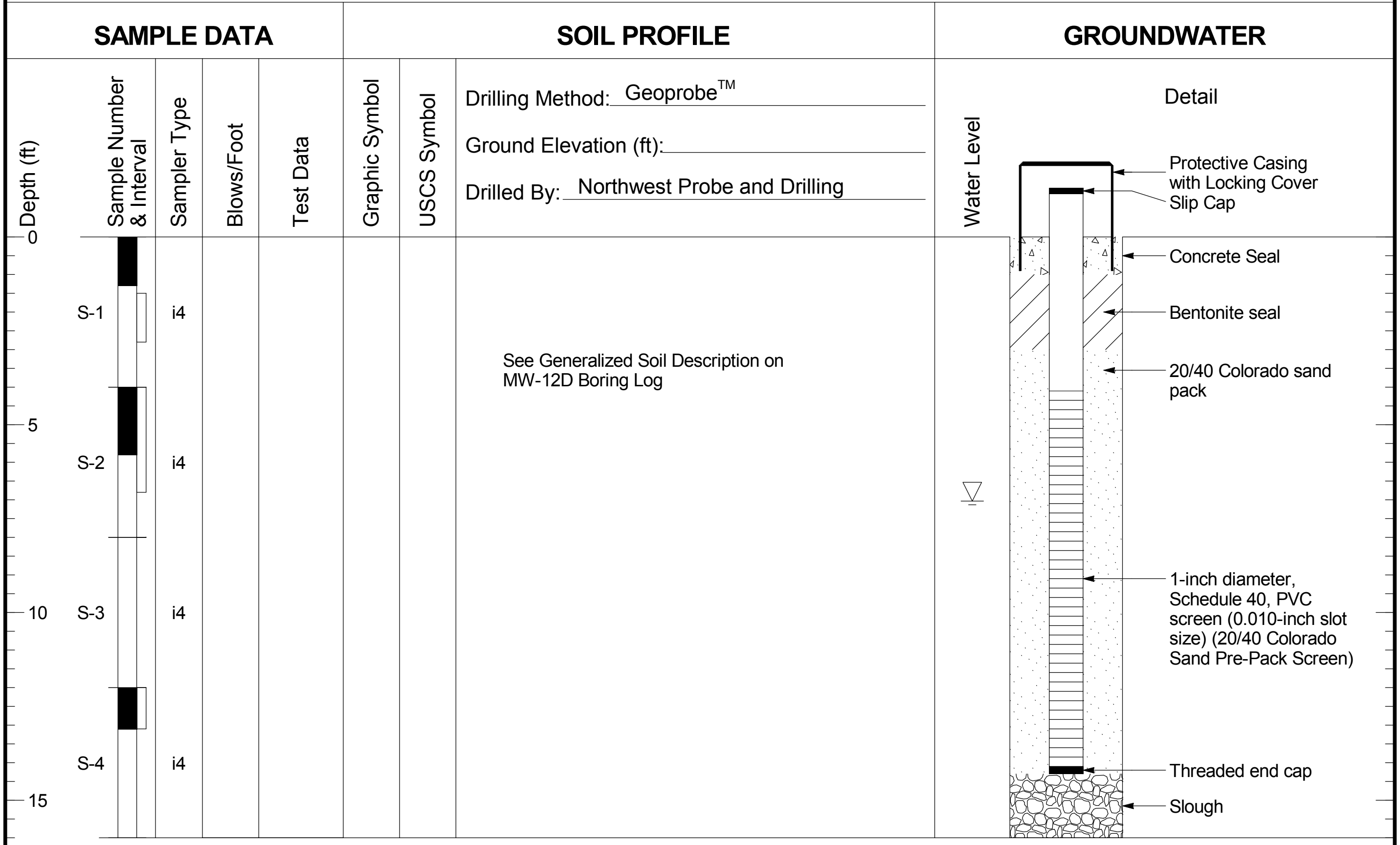
LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-12D

Figure
B-4

MW-12S



Boring Completed 07/18/12
Total Depth of Boring = 16.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Cornwall Avenue Landfill Bellingham, WA	Log of MW-12S	Figure B-5

MW-13D

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Drilling Method: Geoprobe™

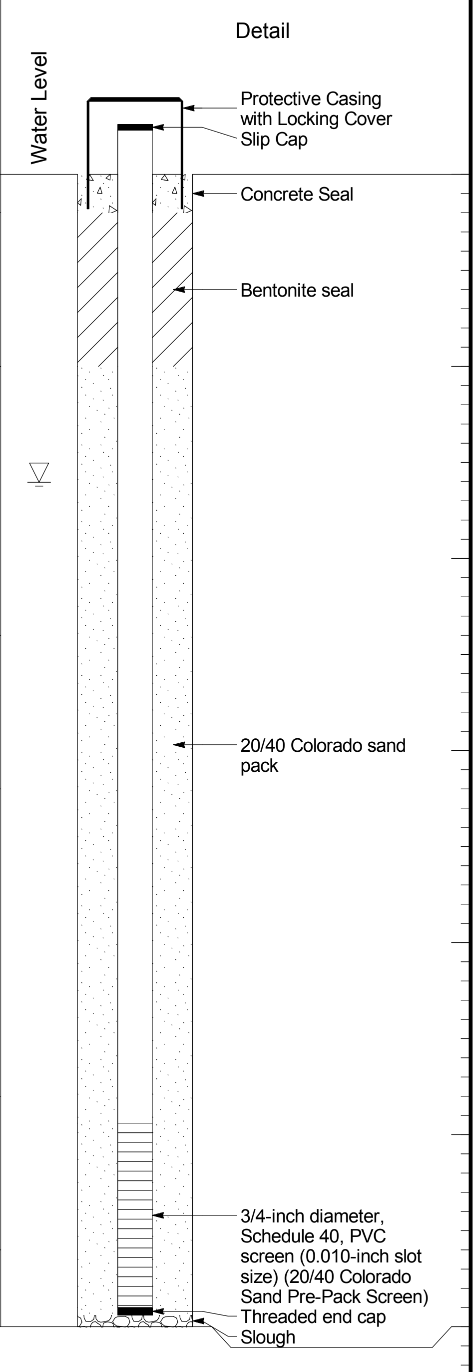
Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
2	S-1	i4		
6	S-2	i4		
10	S-3	i4		
14	S-4	i4		
18	S-5	i4		
22	S-6	i4		
26	S-7	i4		
29	S-8	i4		

Depth (ft)	USCS Symbol	Description
0	GP/ GM	Gray brown, fine to coarse sandy GRAVEL with silt (loose, damp) (FILL)
1	GM	Dark gray brown, silty, sandy GRAVEL with some wood debris (medium dense, moist) (FILL)
5	GM	Brown, gray, and light brown interbedded sandy, silty GRAVEL and silty, gravelly SAND with some wood debris (medium dense, moist to wet) (FILL) - with refuse (brown glass and plastic)
12		- No Recovery 12 to 16 Feet
16	WD	Black, WOOD and sawdust debris with interbedded fine gravelly, silty, fine to medium SAND with trace refuse (red rubber, clear plastic, and clear glass) (loose, wet) (FILL)
24	WD	Yellow and light brown, PAPER refuse (news print or phone book) and trace silty fine to medium SAND to sandy SILT interbeds (loose, wet) (FILL)
28		- No Recovery Below 28 Feet Difficult to interpret fill/native contact. Bottom of well screen set at 30 feet as per Ecology recommendation.

Boring Completed 07/16/12
Total Depth of Boring = 30.0 ft.



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. **Generalized log of MW-13D and MW-13S is shown here.**

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-13D

Figure
B-6

MW-13S

SAMPLE DATA				SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Water Level	Detail

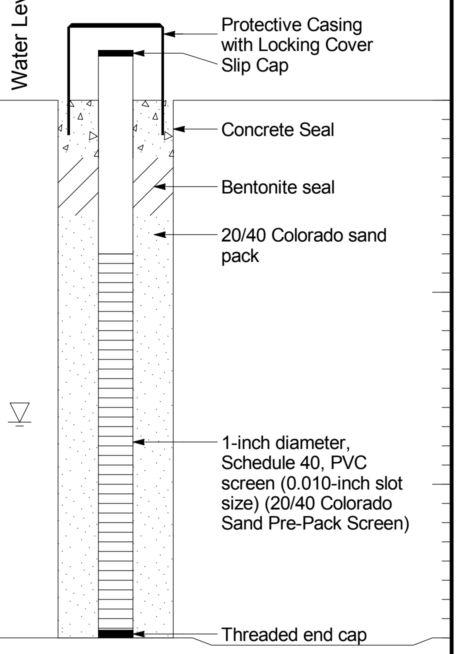
Drilling Method: Geoprobe™

Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35

See Generalized Soil Description on MW-13D Boring Log



Boring Completed 07/16/12
Total Depth of Boring = 14.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1020.400.510 2/1/13 N:\PROJECTS\1020.400.510.GPJ WELL LOG

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Cornwall Avenue Landfill
Bellingham, WA

Log of MW-13S

Figure
B-7

MW-14D

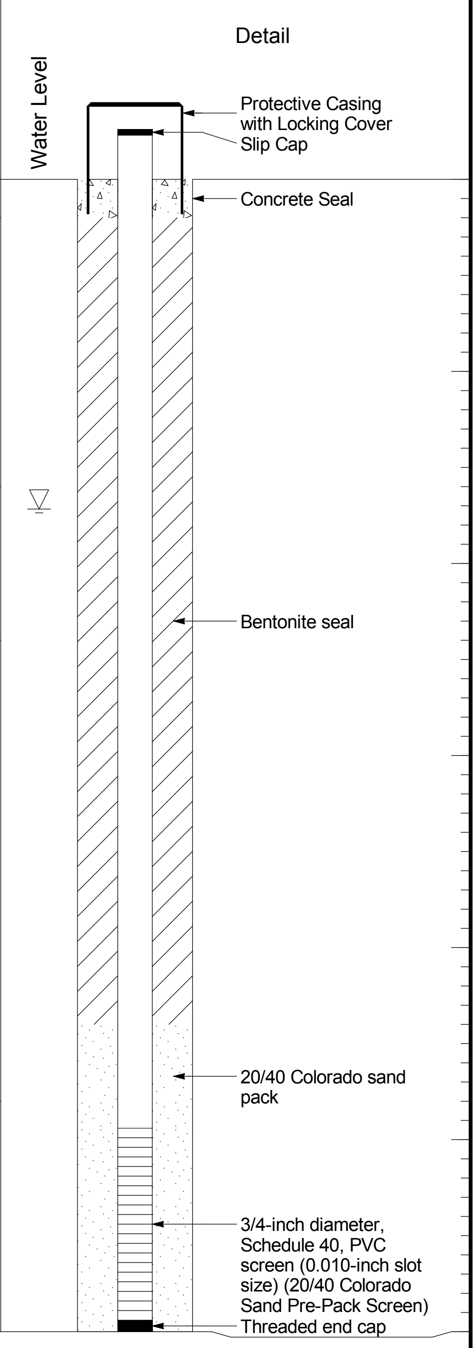
SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Drilling Method: Geoprobe™

Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Description
0					GP/ GM	Gray brown, fine to coarse sandy GRAVEL with silt (loose, damp) (Recent FILL)
	S-1	i4			SM	Black to brown, silty SAND with trace gravel and sandy SILT with abundant wood debris with some brick (loose and medium stiff, moist to wet) (FILL)
5	S-2	i4				
					ML	Gray to black, sandy SILT with abundant refuse (glass, wood, and metal shavings)
10	S-3	i4				- Drilling Refusal at 9 Feet (moved and re-drilled)
	S-4	i4				
15						- No Recovery 12 to 24 Feet
	S-5	i4				
20						
	S-6	i4				
25					SM	Black, silty, fine to medium SAND with trace gravel with abundant refuse (wood, glass, fabric, newpaper, and charcoal) (loose, wet) (FILL)
	S-7	i4				Difficult to interpret fill/native contact. Bottom of well screen set at 30 feet as per Ecology recommendation.
30						
35						



Boring Completed 07/17/12
Total Depth of Boring = 30.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. **Generalized log of MW-14D and MW-14S is shown here.**

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-14D

Figure
B-8

MW-14S

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Drilling Method: Geoprobe™

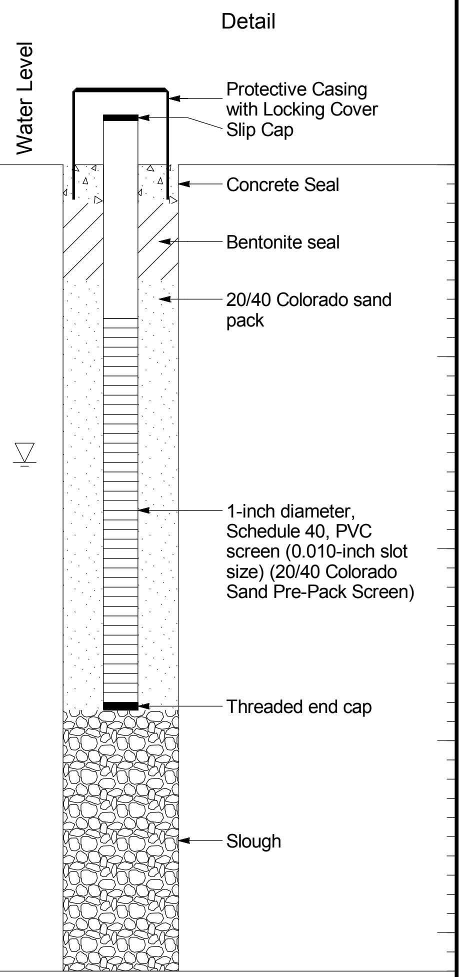
Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol
S-1	i4				
S-2	i4				
S-3	i4				
S-4	i4				
S-5	i4				

See Generalized Soil Description on MW-14D Boring Log

- Drilling Refusal at 4 Feet (moved and re-drilled)



Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35

Boring Completed 07/17/12
Total Depth of Boring = 21.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Cornwall Avenue Landfill
Bellingham, WA

Log of MW-14S

Figure
B-9

MW-15D

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	i4		
S-2	i4		
S-3	i4		
S-4	i4		
S-5	i4		
S-6	i4		

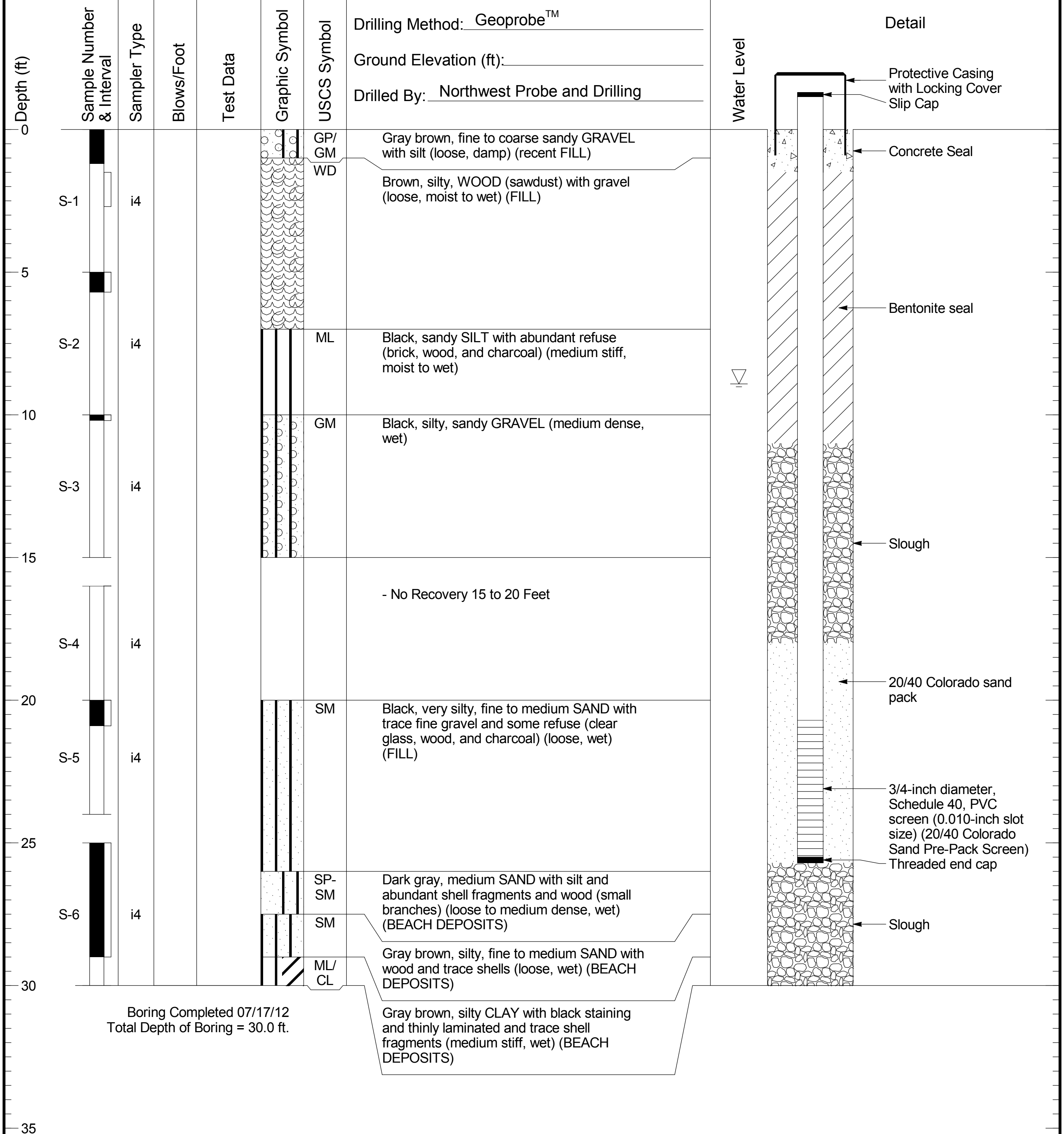
Boring Completed 07/17/12
Total Depth of Boring = 30.0 ft.

SOIL PROFILE

Drilling Method: Geoprobe™
Ground Elevation (ft):
Drilled By: Northwest Probe and Drilling

USCS Symbol	Description
GP/ GM	Gray brown, fine to coarse sandy GRAVEL with silt (loose, damp) (recent FILL)
WD	Brown, silty, WOOD (sawdust) with gravel (loose, moist to wet) (FILL)
ML	Black, sandy SILT with abundant refuse (brick, wood, and charcoal) (medium stiff, moist to wet)
GM	Black, silty, sandy GRAVEL (medium dense, wet)
	- No Recovery 15 to 20 Feet
SM	Black, very silty, fine to medium SAND with trace fine gravel and some refuse (clear glass, wood, and charcoal) (loose, wet) (FILL)
SP- SM	Dark gray, medium SAND with silt and abundant shell fragments and wood (small branches) (loose to medium dense, wet) (BEACH DEPOSITS)
SM	Gray brown, silty, fine to medium SAND with wood and trace shells (loose, wet) (BEACH DEPOSITS)
ML/ CL	Gray brown, silty CLAY with black staining and thinly laminated and trace shell fragments (medium stiff, wet) (BEACH DEPOSITS)

GROUNDWATER



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. **Generalized log of MW-15D and MW-15S is shown here.**

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-15D

Figure
B-10

MW-15S

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol

Drilling Method: Geoprobe™

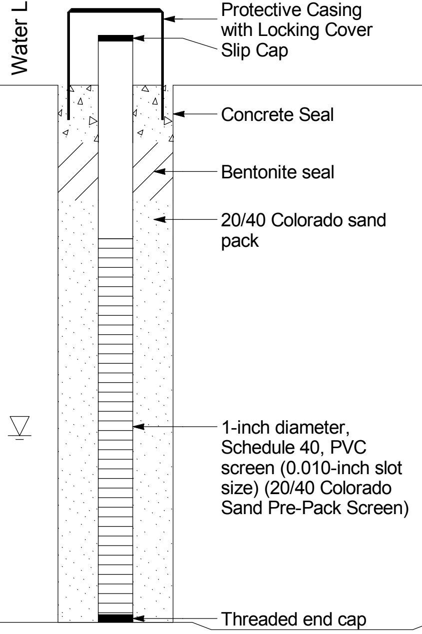
Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

See Generalized Soil Description on MW-15D Boring Log

Water Level

Detail



0
5
10
15
20
25
30
35

Boring Completed 07/16/12
Total Depth of Boring = 14.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1020.400.510 2/1/13 N:\PROJECTS\1020.400.510.GPJ WELL LOG

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-15S

Figure
B-11

MW-16D

SAMPLE DATA

SOIL PROFILE

Drilling Method: Geoprobe™

Ground Elevation (ft):

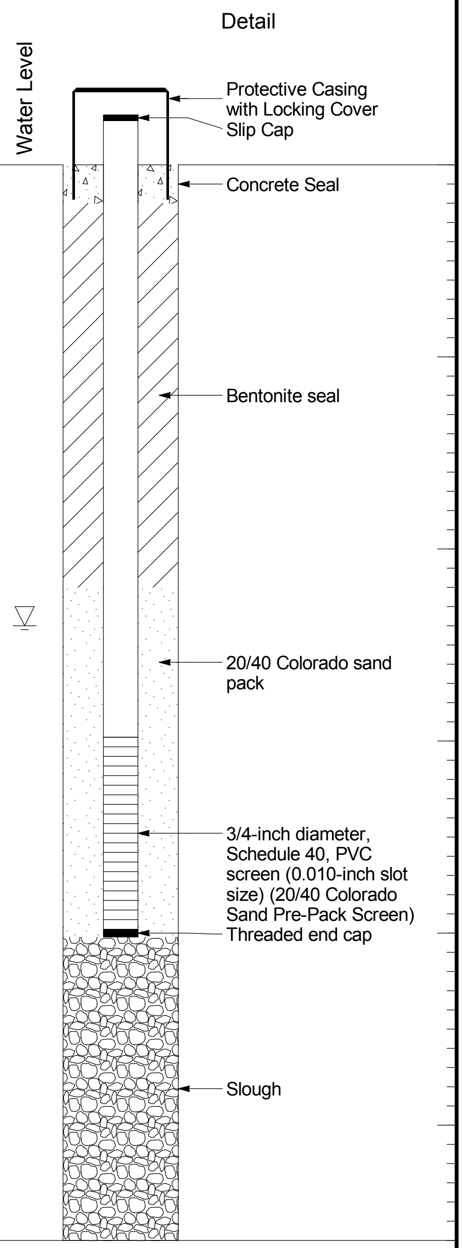
Drilled By: Northwest Probe and Drilling

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
0				
	S-1	i4		
5				
	S-2	i4		
10	S-3	i4		
	S-4	i4		
15				
	S-5	i4		
20				
	S-6	i4		
25				
	S-7	i4		

USCS Symbol	
ML	Brown and gray, SILT with sand and gravel; and fine to medium SAND with silt (soft and loose, moist to wet) (Recent FILL)
ML	Brown, SILT with sand and gravel (soft to medium stiff, moist to wet) (FILL)
ML	Gray brown, SILT with trace sand and gravel with abundant wood debris (medium stiff, wet) (FILL)
SM	Gray to black, fine to medium SAND with silt and abundant refuse (wood, nails, brick?) (loose, wet) (FILL)
ML	Black, sandy SILT with abundant wood debris and shell fragments (loose, wet) (FILL)
SP	Gray to black, SAND with abundant shells (loose, wet) (BEACH DEPOSITS)
CL-ML	Gray brown, silty CLAY with trace shell fragments (medium stiff, wet) (BEACH DEPOSITS) - No Recovery 20 to 24 Feet
SP	Black, fine to medium SAND with trace shell fragments (loose to medium dense, wet) (BEACH DEPOSITS)

Boring Completed 07/17/12
Total Depth of Boring = 28.0 ft.

GROUNDWATER



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. **Generalized log of MW-16D and MW-16S is shown here.**

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, WA

Log of MW-16D

Figure
B-12

MW-16S

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Drilling Method: Geoprobe™

Ground Elevation (ft):

Drilled By: Northwest Probe and Drilling

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol
0						
	S-1	i4				
5						
	S-2	i4				
10	S-3	i4				
	S-4	i4				
15						
	S-5	i4				
20	S-6	i4				
25						
30						
35						

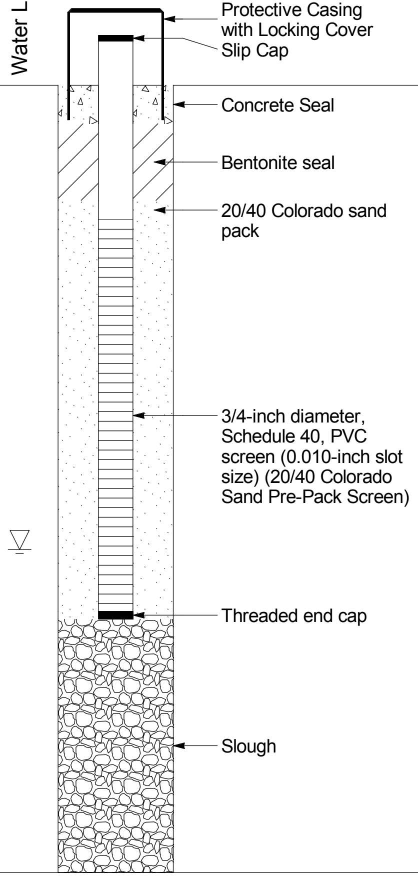
See Generalized Soil Description on MW-16D Boring Log

- Drilling Refusal at 20.5 Feet

Boring Completed 07/17/12
Total Depth of Boring = 20.5 ft.

Water Level

Detail



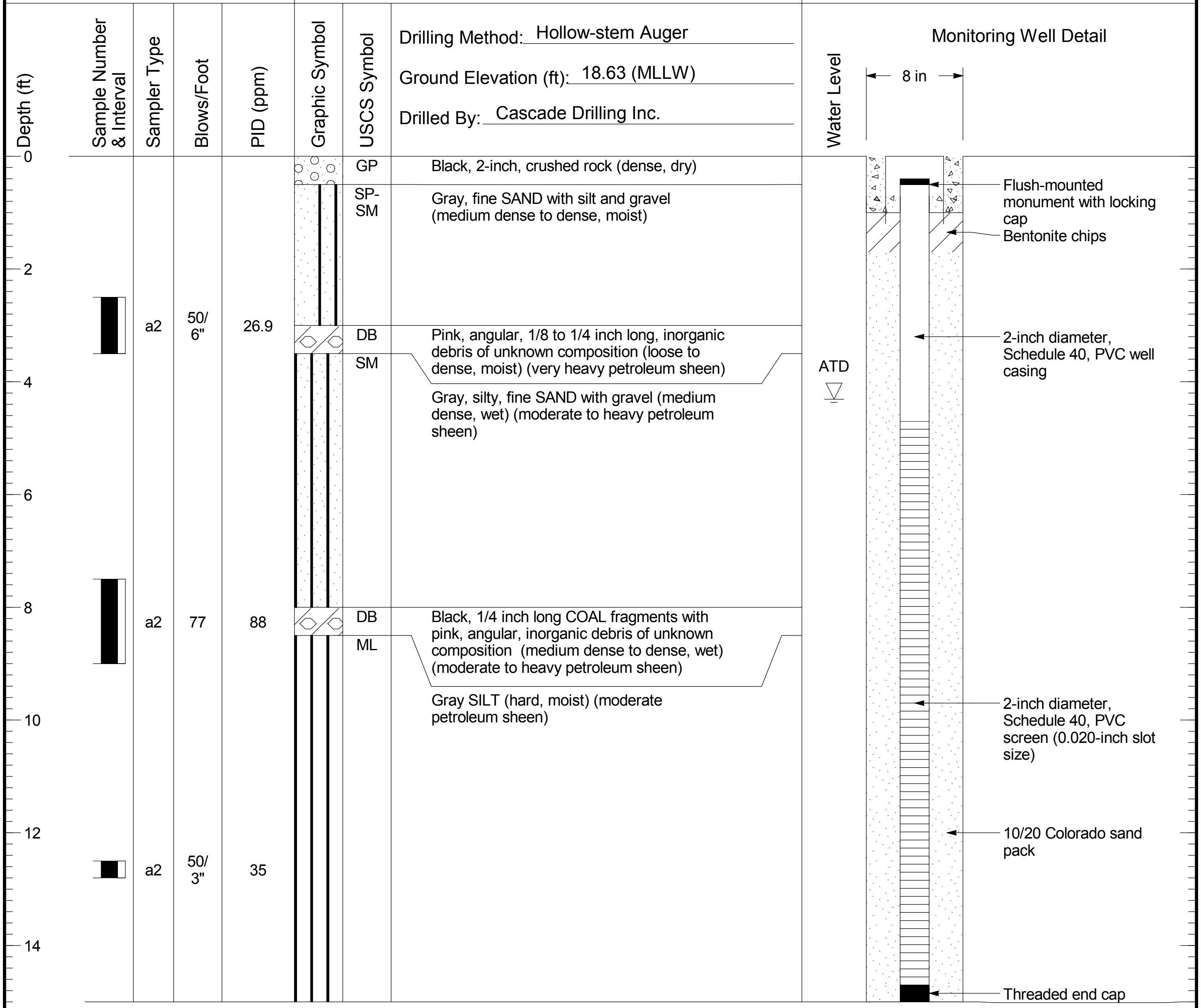
Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

MW-6

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 18.63 (MLLW)

Drilled By: Cascade Drilling Inc.



Sampler Type	Blows/Foot	PID (ppm)
a2	50/ 6"	26.9
a2	77	88
a2	50/ 3"	35

USCS Symbol	Description
GP	Black, 2-inch, crushed rock (dense, dry)
SP-SM	Gray, fine SAND with silt and gravel (medium dense to dense, moist)
DB	Pink, angular, 1/8 to 1/4 inch long, inorganic debris of unknown composition (loose to dense, moist) (very heavy petroleum sheen)
SM	Gray, silty, fine SAND with gravel (medium dense, wet) (moderate to heavy petroleum sheen)
DB	Black, 1/4 inch long COAL fragments with pink, angular, inorganic debris of unknown composition (medium dense to dense, wet) (moderate to heavy petroleum sheen)
ML	Gray SILT (hard, moist) (moderate petroleum sheen)

Boring Completed 06/27/02
Total Depth of Boring = 15.0 ft.

Monitoring Well Completed 06/27/02
Elevation at Top of Monitoring Well Casing = 18.42 ft.

16

18

20

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Log of Monitoring Well MW-6

Figure
B-14

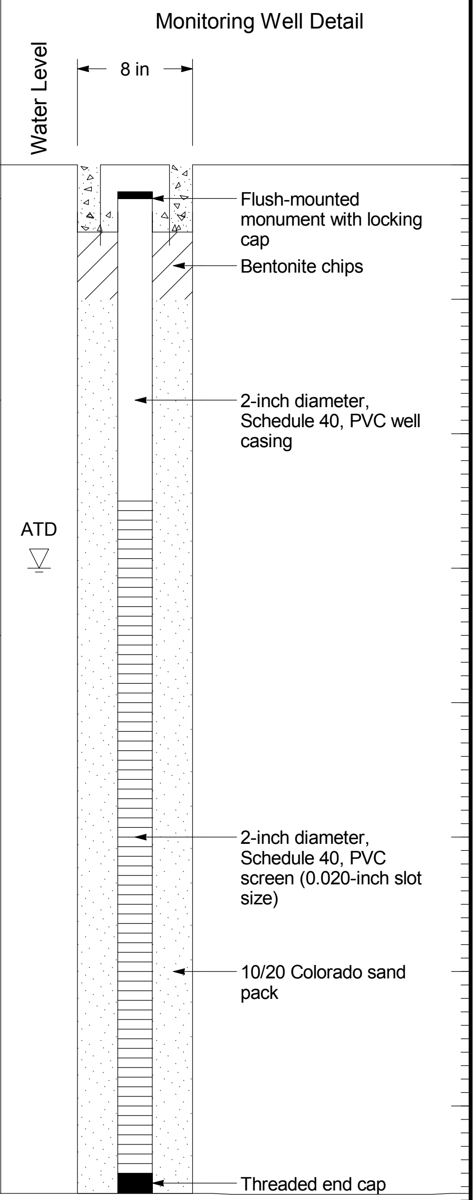
MW-7

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): 18.74 (MLLW)
Drilled By: Cascade Drilling Inc.

Sample Type	Blows/Foot	PID (ppm)
a2	50/ 6"	
a2	50/ 6"	
a2	24	39.1
a2	37	5.2

USCS Symbol	Description
GP	Black, 1/4-inch, crushed rock (dense, moist)
SP	Light brown-gray, fine SAND with trace gravel (medium dense to dense, moist)
SP	Dark gray, fine SAND with wood debris (medium dense to dense, moist)
DB	Dark brown, silty, fine SAND and refuse (loose to medium dense, wet) (very slight, refuse-associated petroleum sheen)



Boring Completed 06/27/02
Total Depth of Boring = 15.3 ft.

Monitoring Well Completed 06/27/02
Elevation at Top of Monitoring Well Casing = 18.37 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

LANDAU ASSOCIATES

Cornwall Avenue Landfill
Bellingham, Washington

Log of Monitoring Well MW-7

Figure
B-15

MW-8

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

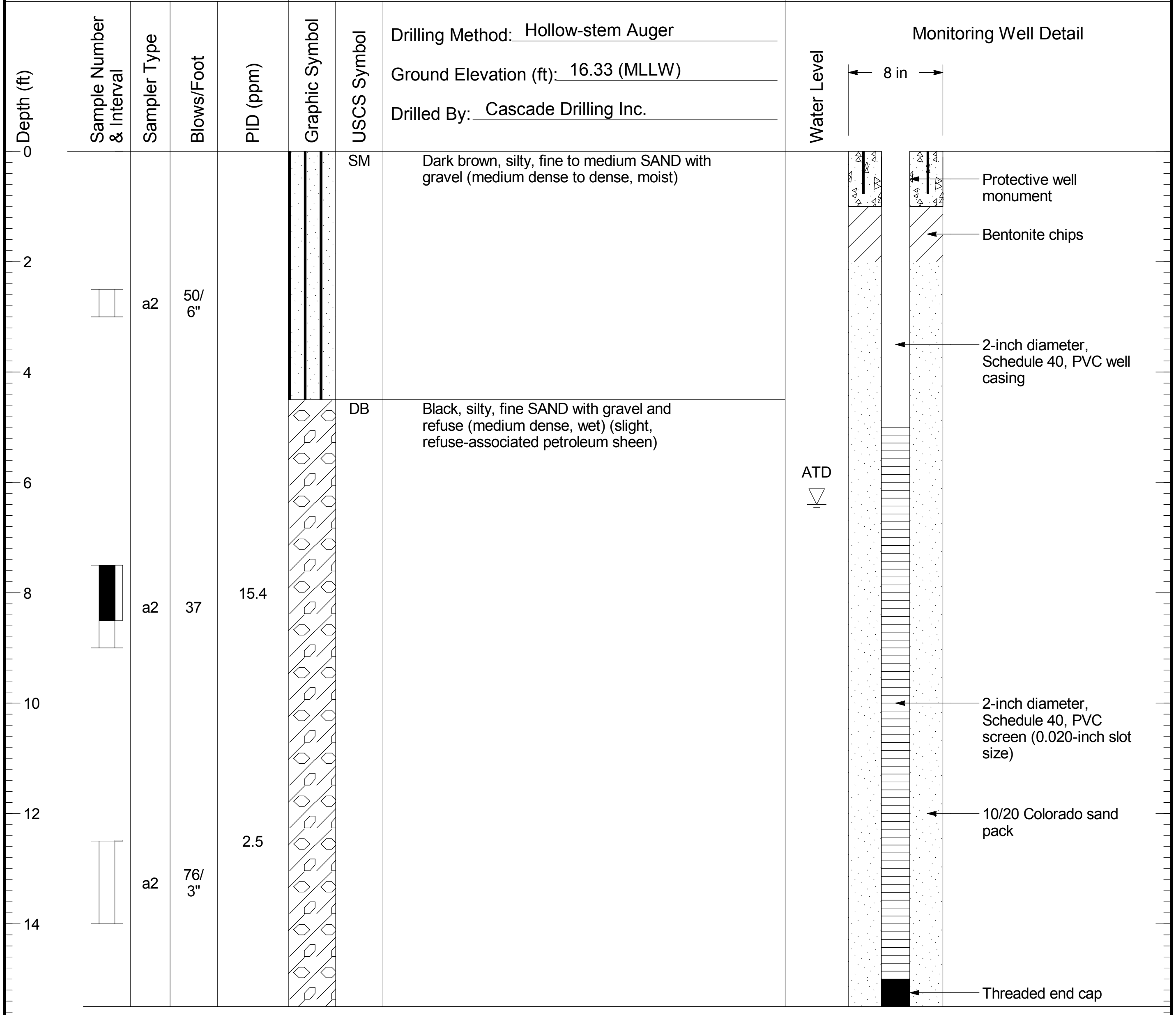
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 16.33 (MLLW)

Drilled By: Cascade Drilling Inc.

Sampler Type	Blows/Foot	PID (ppm)
a2	50/ 6"	
a2	37	15.4
a2	76/ 3"	2.5

USCS Symbol	Description
SM	Dark brown, silty, fine to medium SAND with gravel (medium dense to dense, moist)
DB	Black, silty, fine SAND with gravel and refuse (medium dense, wet) (slight, refuse-associated petroleum sheen)



Boring Completed 06/27/02
Total Depth of Boring = 15.5 ft.

Monitoring Well Completed 06/27/02
Elevation at Top of Monitoring Well Casing = 18.53 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Monitoring Well MW-8

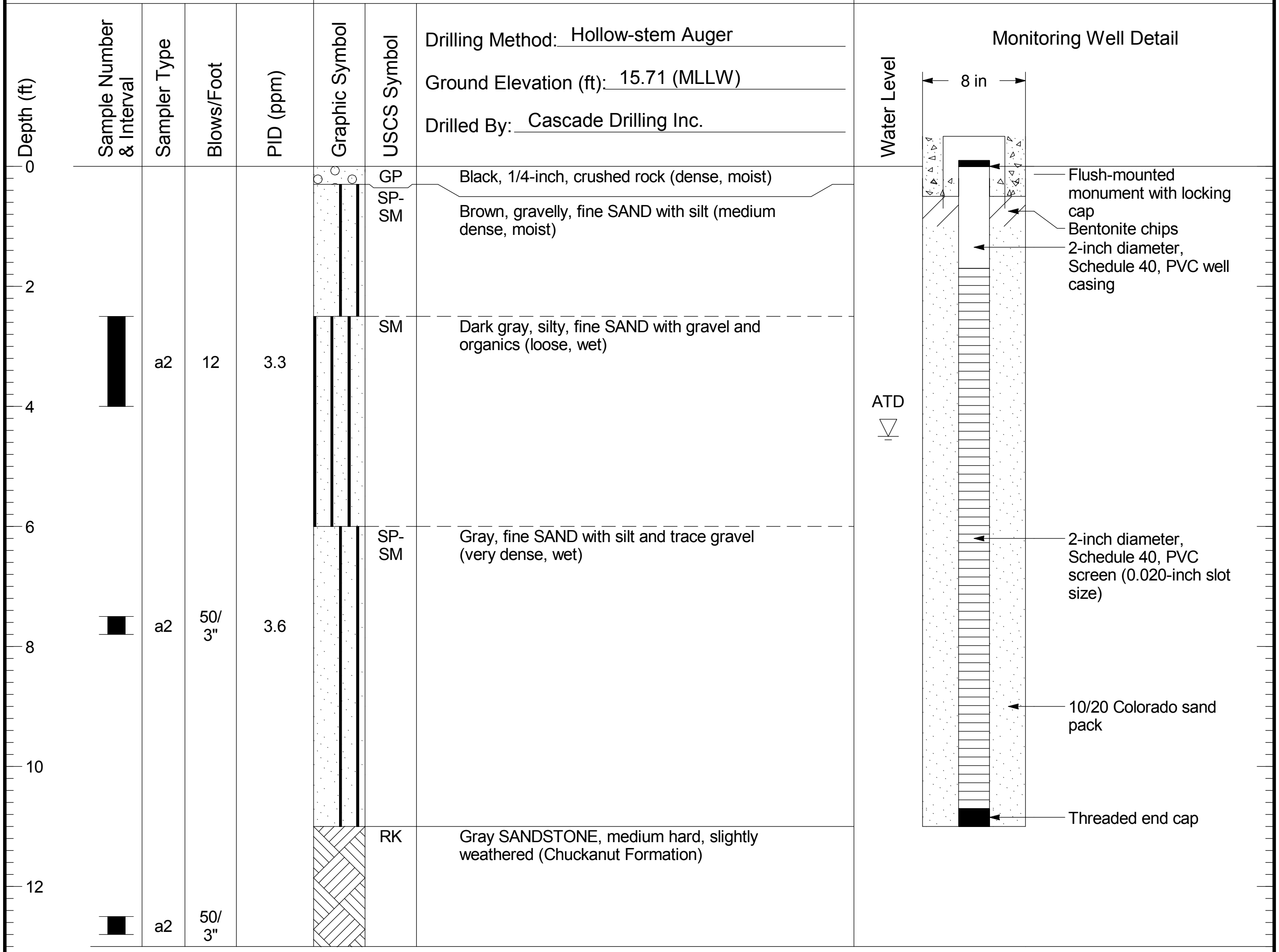
Figure
B-16

MW-9

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 15.71 (MLLW)

Drilled By: Cascade Drilling Inc.



Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Description
				GP	Black, 1/4-inch, crushed rock (dense, moist)
				SP-SM	Brown, gravelly, fine SAND with silt (medium dense, moist)
	a2	12	3.3	SM	Dark gray, silty, fine SAND with gravel and organics (loose, wet)
	a2	50/3"	3.6	SP-SM	Gray, fine SAND with silt and trace gravel (very dense, wet)
				RK	Gray SANDSTONE, medium hard, slightly weathered (Chuckanut Formation)
	a2	50/3"			

Boring Completed 06/28/02
Total Depth of Boring = 13.0 ft.

Monitoring Well Completed 06/28/02
Elevation at Top of Monitoring Well Casing = 15.34 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Monitoring Well MW-9

Figure
B-17

MW-10

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Water Level

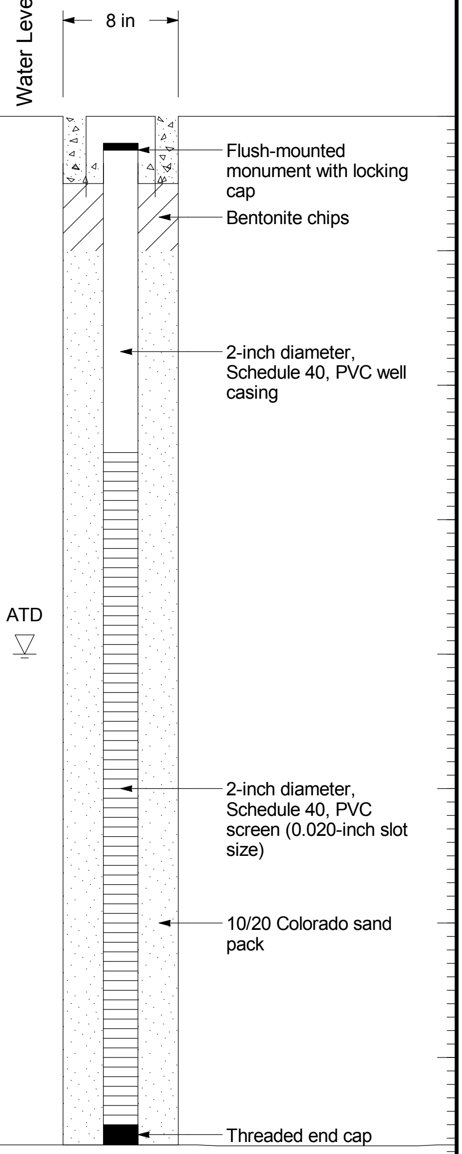
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 16.21 (MLLW)

Drilled By: Cascade Drilling Inc.

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Description	Water Level
0					SM	Dark brown, silty, fine SAND with wood debris and refuse (medium dense, moist)	
2.5	I	a2	50/ 4"				
4					DB	REFUSE (glass, plastic, wood, metal)	
7.3		a2	50/ 0"				ATD ▽
15		a2	50/ 0"				

Monitoring Well Detail



Boring Completed 06/27/02
Total Depth of Boring = 15.3 ft.

Monitoring Well Completed 06/27/02
Elevation at Top of Monitoring Well Casing = 15.92 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Monitoring Well MW-10

Figure
B-18

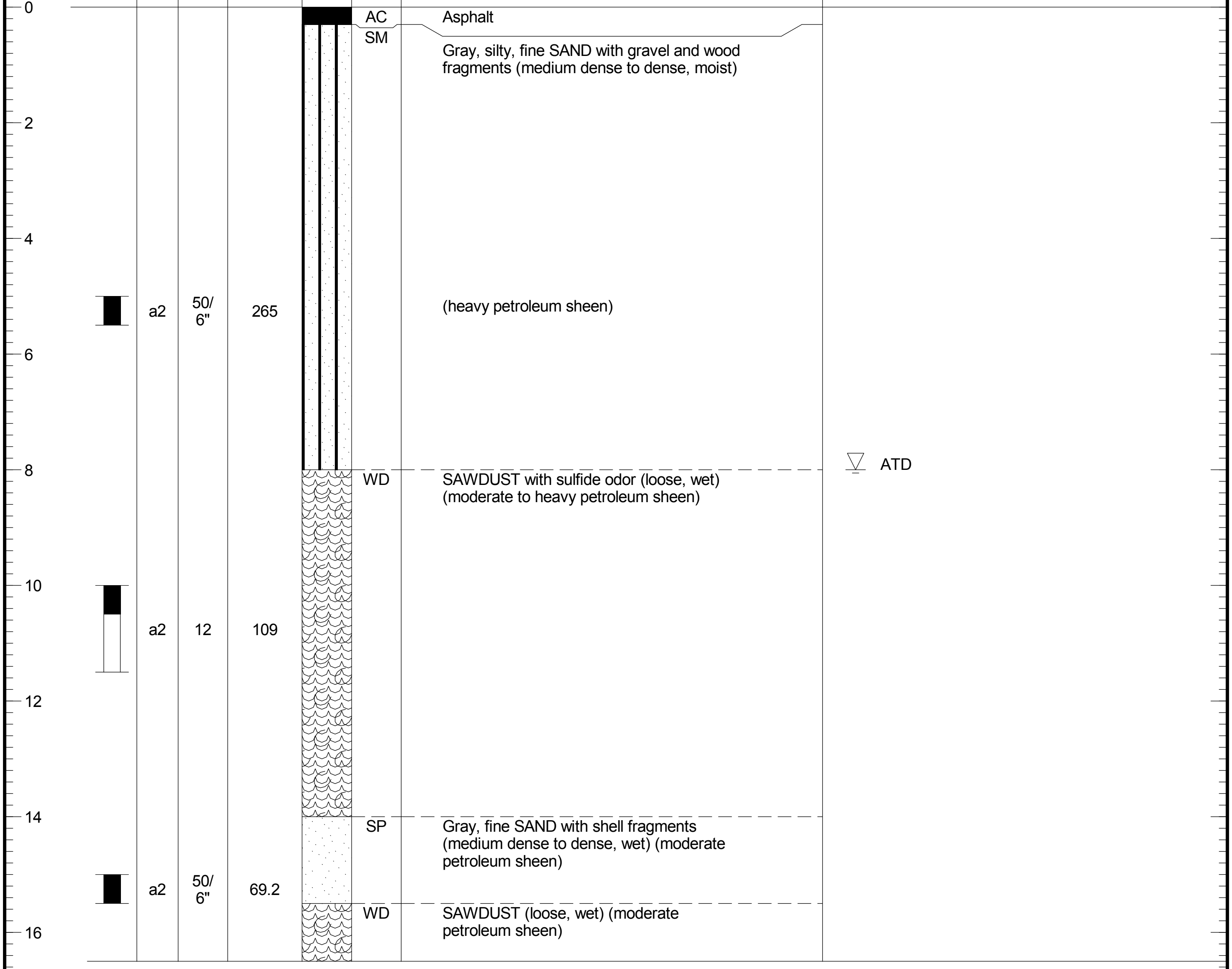
RISB-1

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Description	Water Level
					AC	Asphalt	
					SM	Gray, silty, fine SAND with gravel and wood fragments (medium dense to dense, moist)	
	a2	50/ 6"	265			(heavy petroleum sheen)	
					WD	SAWDUST with sulfide odor (loose, wet) (moderate to heavy petroleum sheen)	∇ ATD
	a2	12	109				
					SP	Gray, fine SAND with shell fragments (medium dense to dense, wet) (moderate petroleum sheen)	
	a2	50/ 6"	69.2				
					WD	SAWDUST (loose, wet) (moderate petroleum sheen)	

Drilling Method: Hollow-stem Auger

Ground Elevation (ft):

Drilled By: Cascade Drilling Inc.



Boring Completed 06/27/02
Total Depth of Boring = 16.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Boring RISB-1

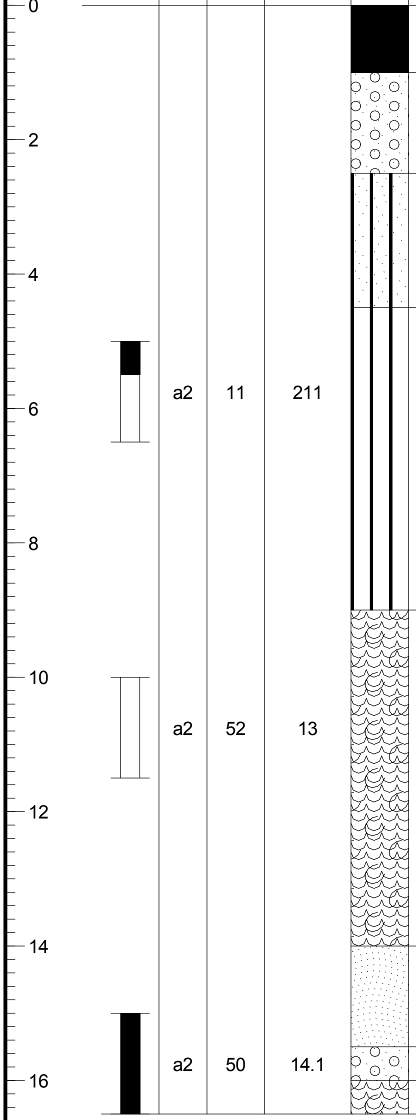
Figure
B-19

RISB-2

Drilling Method: Hollow-stem Auger

Ground Elevation (ft):

Drilled By: Cascade Drilling Inc.



SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Description	Water Level
				AC	Asphalt	
				GP	Gray, GRAVEL and COBBLES (dense, moist)	
				SM	Dark gray, silty, fine SAND with trace gravel and petroleum odor (medium dense, moist)	
				ML	Gray, sandy SILT with trace gravel and petroleum odor (medium stiff, wet) (heavy petroleum sheen)	
	a2	11	211			
						⊽ ATD
				WD	SAWDUST (medium dense, wet) (slight petroleum sheen)	
	a2	52	13			
				SW	Black, fine to coarse SAND with gravel (medium dense, wet)	
	a2	50	14.1	GP	Brown, 1/4-inch, sandstone fragments (medium dense, wet)	
				WD	SAWDUST (loose, wet)	

Boring Completed 06/27/02
Total Depth of Boring = 16.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Boring RISB-2

Figure
B-20

RISB-3

Drilling Method: Hollow-stem Auger

Ground Elevation (ft):

Drilled By: Cascade Drilling Inc.

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol		
0						AC	Asphalt	
						SM/ML	Gray, silty, fine SAND to sandy SILT with sandstone debris (dense, moist to wet)	Groundwater not encountered.
2								
4								
		a2	50/ 6"	0			Wet at 5 feet	
6								
8								
		a2	50/ 1"	0				
10								
12								
14								
16								
18								
20								

Boring Completed 06/27/02
Total Depth of Boring = 9.2 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

RISB-4

Drilling Method: Hollow-stem Auger
Ground Elevation (ft):
Drilled By: Cascade Drilling Inc.

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Description	Water Level
0						AC	Asphalt	
						SM	Dark gray, silty, fine SAND with gravel (medium dense, moist)	
2						SM	Gray, silty, fine SAND with gravel (dense to very dense, wet) (heavy petroleum sheen)	
	▮	a2	50/ 5"	156				
								∇ ATD

Boring Completed 06/27/02
Total Depth of Boring = 7.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

RITP- 1

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Excavated By: Custom Backhoe Logged By: KJR	
0				SM	Gray, gravelly, silty SAND (dense, moist)	
2			22.1			
4			52.4	SM	Dark gray, silty, fine SAND with gravel (dense, moist)	
				DB	Slight petroleum sheen at 4 feet REFUSE with silty sand, roots, and creosoted wood fragments (dense, moist)	
6						
8			170		Slight petroleum sheen at 8 feet	∇ ATD groundwater seepage encountered at 8.5 ft.
10						

Test Pit Completed 06/25/02
Total Depth of Test Pit = 9.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

1020.22 2/1/13 N:\PROJECTS\001020.GPJ SINGLE TEST PIT LOG

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Bellingham, Washington

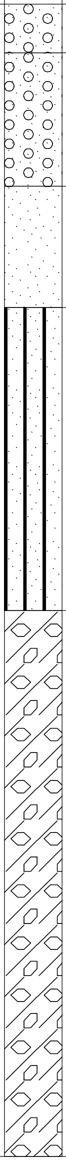
Log of Test Pit RITP- 1

Figure
B-23

RITP- 2

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR



Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	USCS Symbol	Description	Groundwater
0				GP	Black, crushed rock (dense, moist)	
				GP	Light gray, limestone rock spalls with crushed limestone powder (dense, moist)	
2				SP	Brown, fine to medium SAND with trace dark gray sand (medium dense, moist)	
4			13.9	SM	Dark brown to black, silty, fine SAND with trace glass, brick fragments, and sandstone boulders (medium dense to dense, moist)	
6 8				DB	REFUSE with soil and wood pulp/sawdust (medium dense, moist)	
			33.7		Slight petroleum sheen at 8.5 feet	
			29.9		Heavy petroleum sheen at 9 feet	∇ ATD groundwater seepage encountered at 9.0 ft.
10						

Test Pit Completed 06/25/02
Total Depth of Test Pit = 9.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Bellingham, Washington

Log of Test Pit RITP- 2

Figure
B-24

RITP- 3

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Excavated By: Custom Backhoe Logged By: KJR	
0					GP	Light gray, limestone rock spalls (dense, moist)	
2 4					SM	Dark gray to black, silty, fine SAND with gravel and trace refuse (medium dense, moist)	
6 8					DB	REFUSE and dark gray, silty, fine SAND (medium dense, moist to wet) Slight, non-petroleum sheen at 5 feet Slight, non-petroleum sheen at 8 feet Slight non-petroleum sheen at 9.5 feet	▽ ATD groundwater seepage encountered at 9.0 ft.
10							

Test Pit Completed 06/25/02
Total Depth of Test Pit = 10.0 ft.

12

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
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Log of Test Pit RITP- 3

Figure
B-25

RITP- 4

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Description	Groundwater
0					GP	Light gray, limestone rock spalls (dense, moist)	
2					DB	Dark brown, silty, fine SAND with refuse and wood debris (medium dense to dense, moist)	
						Slight, refuse-associated petroleum sheen at 3 feet	
4							
						Slight, refuse-associated petroleum sheen at 5.5 feet	
6							
8							∇ ATD groundwater seepage encountered at 8.0 ft.
10							

Test Pit Completed 06/25/02
Total Depth of Test Pit = 9.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Log of Test Pit RITP- 4

Figure
B-26

RITP- 5

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Excavated By: Custom Backhoe Logged By: KJR	
0				○	GP	Black, crushed rock (dense, moist)	
2				▥	SM	Dark gray-brown, silty, fine SAND (medium dense, moist) Heavy petroleum sheen, strong gasoline odor at 2.5 feet	
				▥	SM	Blue/gray, silty, fine to coarse SAND with gravel (medium dense, moist)	
4 6				∴	SP	Brown, fine to coarse SAND with gravel and brick fragments (medium dense, moist to wet) Heavy petroleum sheen and strong gasoline odor at 4.5 feet	∇ ATD groundwater seepage encountered at 5.5 ft.

Test Pit Completed 06/25/02
Total Depth of Test Pit = 7.0 ft.

8

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Bellingham, Washington

Log of Test Pit RITP- 5

Figure
B-27

RITP- 6

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol		
0					GP	Black, crushed rock (dense, moist)	Groundwater not encountered.
					SP	Brown, fine to coarse SAND (medium dense, moist)	
					SM	Dark gray, silty, fine SAND with brick fragments (dense, moist)	
2							
4						Test pit met refusal on concrete slab	
6							

Test Pit Completed 06/25/02
Total Depth of Test Pit = 4.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Test Pit RITP- 6

Figure
B-28

RITP- 7

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Excavated By: Custom Backhoe Logged By: KJR	
0					GP	Black, crushed rock (dense, moist)	
					SP-SM	Light gray, fine SAND with silt (medium dense, moist)	
					SM	Tan, silty, fine SAND with trace gravel (medium dense, moist)	
2					SM	Dark brown, silty, fine SAND with metal fragments, wood debris, and logs (medium dense, moist)	
			5.3		SM	Gray, silty, fine SAND with trace gravel (medium dense, moist to wet)	
4							
			440			Heavy petroleum sheen and strong diesel/gasoline odor at 5 feet	
						Free product on water surface at 5.5 feet	∇ ATD groundwater seepage encountered at 5.5 ft.
6							

Test Pit Completed 06/26/02
Total Depth of Test Pit = 6.5 ft.

8

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

RITP- 8

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR

Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	USCS Symbol	Description	Groundwater
0				GP	Black, crushed rock (dense, moist)	
				SM	Dark gray, silty, fine SAND with trace refuse (medium dense, moist)	
2						
			41			
				DB	REFUSE and gray silty, fine SAND with brick fragments (medium dense, moist)	
4						
6			4.6			
				SP	Gray, fine SAND (dense, moist to wet)	
8						
			17.3		Moderate petroleum sheen at 8.5 feet	
			133		Heavy petroleum sheen and strong gasoline/diesel odor at 9.5 feet	∇ ATD groundwater seepage encountered at 9.5 ft.
10						
12						

Test Pit Completed 06/26/02
Total Depth of Test Pit = 10.0 ft.

1020.22 2/1/13 N:\PROJECTS\001020.GPJ SINGLE TEST PIT LOG

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Test Pit RITP- 8

Figure
B-30

RITP- 9

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol		
0					SM	Brown, silty, fine SAND with gravel and roots (loose, moist)	
2					DB	Brown, silty, fine SAND and REFUSE (medium dense, dry to moist)	
4					DB	Dark gray, silty, fine SAND with refuse, logs, and asphalt shingles (medium dense, moist)	
			2.9				
6							
			3.0				
8							
10			1.3				▽ ATD groundwater seepage encountered at 10.5 ft.
					ML	Gray SILT (very stiff, moist to wet)	
12							
14							

Test Pit Completed 06/26/02
Total Depth of Test Pit = 12.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

RITP-10

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Excavated By: Custom Backhoe Logged By: KJR	
0				SM	Gray, gravelly, silty, fine SAND (medium dense to dense, moist)	
2						
				SM	Gray, silty, fine SAND with gravel and logs (medium dense, moist to wet)	
4			0.0			
6						
			0.0			▽ ATD groundwater seepage encountered at 7.5 ft.
8						
			0.0			
10						

Test Pit Completed 06/26/02
Total Depth of Test Pit = 9.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Test Pit RITP-10

Figure
B-32

RITP-11

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Excavated By: Custom Backhoe Logged By: KJR	
0					GP	Black, crushed rock (dense, moist)	
					SM	Brown, silty, fine SAND with wood fragments and gravel (medium dense, moist)	
2					DB	Dark gray to black, silty, fine SAND with gravel and refuse (dense, moist)	
4							
			2.6				
6							
			8.4				▽ ATD groundwater seepage encountered at 7.5 ft.
8							

Test Pit Completed 06/26/02
Total Depth of Test Pit = 8.5 ft.

10

1020.22 2/1/13 N:\PROJECTS\001020.GPJ SINGLE TEST PIT LOG

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Test Pit RITP-11

Figure
B-33

RITP-12

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol		
0					GP	Black, crushed rock (dense, moist)	Groundwater not encountered.
					GP	Tan, sandstone, rock spalls and wood debris (dense, moist)	
					SM	Dark gray to black, silty, fine SAND with refuse (medium dense, moist)	
2							
						2 to 6 inches of black, non-petroleum free product on a wood-bottomed structure at 4 feet	
4							

Test Pit Completed 06/26/02
Total Depth of Test Pit = 4.0 ft.

6

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

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Cornwall Avenue Landfill
Bellingham, Washington

Log of Test Pit RITP-12

Figure
B-34

RITP-13

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	Graphic Symbol	USCS Symbol		
0				▥	SM	Brown, silty, fine SAND with gravel and trace gravel-sized, yellow sulfur pieces (medium dense, moist)	
1				▨	DB	Dark gray to black, silty, fine SAND with organic matter, refuse, and wood fragments (loose, moist)	
2			0.7	░	SP	Blue-gray SAND (dense, moist)	
3				▨	DB	Brown WOOD DEBRIS with refuse, silty sand, and gravel (loose to medium dense, moist)	
7.5			15.1			Moderate, refuse-associated petroleum sheen at 7.5 feet	∇ ATD groundwater seepage encountered at 7.5 ft.

Test Pit Completed 06/26/02
Total Depth of Test Pit = 8.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

LANDAU ASSOCIATES

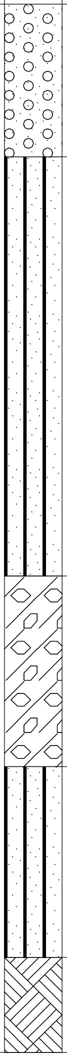
Cornwall Avenue Landfill
Bellingham, Washington

Log of Test Pit RITP-13

Figure
B-35

RITP-14

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft):
Excavated By: Custom Backhoe
Logged By: KJR



SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	PID (ppm)	USCS Symbol		
0				GP	Brown GRAVEL (medium dense, moist)	Groundwater not encountered.
2			0	SM	Gray to black, silty, fine SAND with gravel (medium dense, moist)	
			0	DB	Pink and gray, angular, 1/8 to 1/4 inch long, inorganic DEBRIS of unknown composition with silt (loose, wet) Heavy petroleum sheen and solvent/paint odor at 3.5 feet	
4				SM	Gray, silty, fine SAND with gravel (dense, moist)	
				RK	Gray SANDSTONE, medium hard, slightly weathered (Chuckanut Formation)	
6						

Test Pit Completed 06/26/02
Total Depth of Test Pit = 5.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.
4. Densities in units containing refuse are based on drilling action instead of blow counts. Refuse over represented unit density at point of sampling.

LANDAU ASSOCIATES	Cornwall Avenue Landfill Bellingham, Washington	Log of Test Pit RITP-14	Figure B-36

MW-1

SAMPLE DATA			
Sample Number & Interval	Sampler Type	Blows/Foot	
1	b2	26	21.1
2	b2	50/ 4"	0.0

SOIL PROFILE

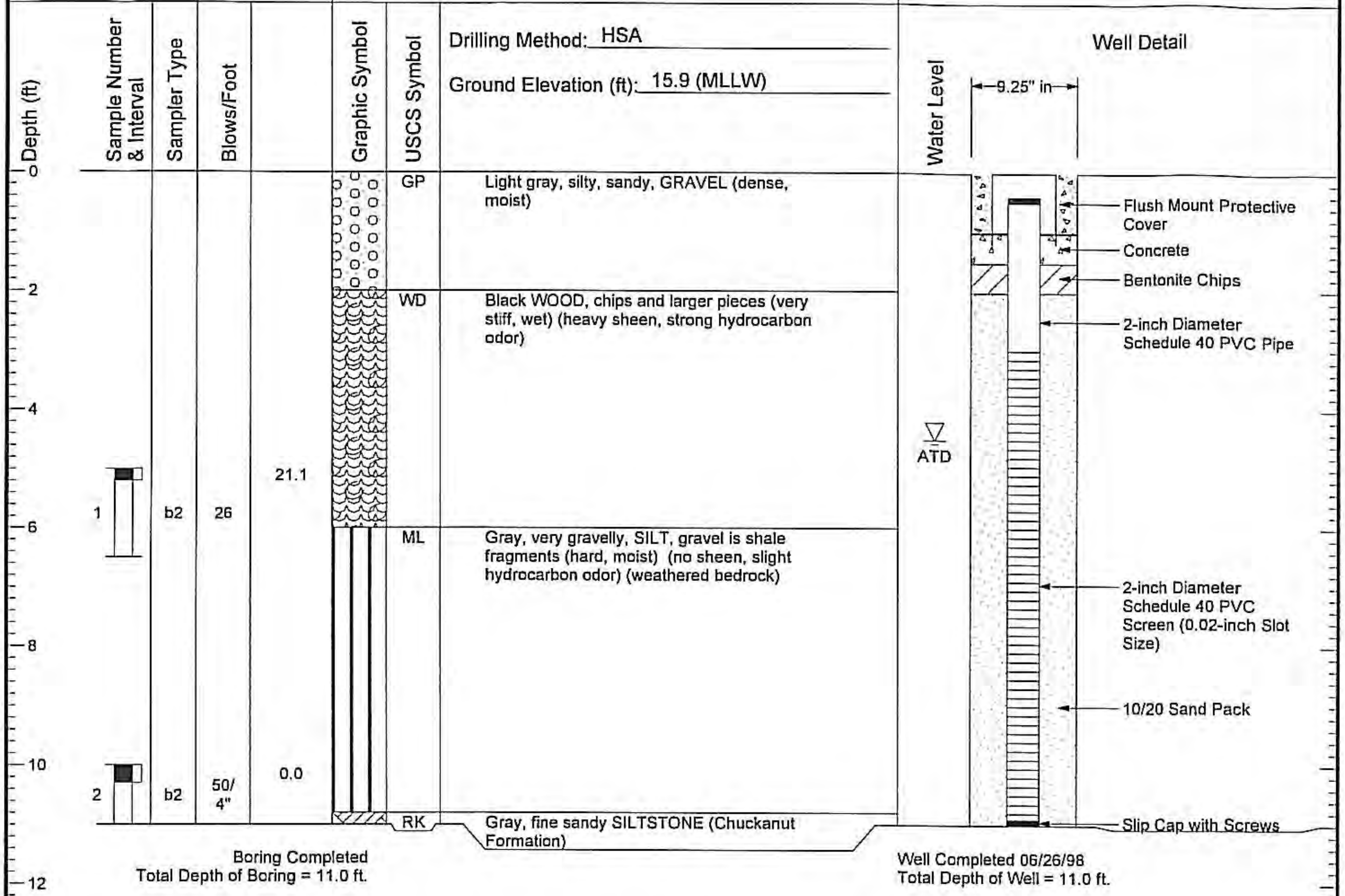
Drilling Method: HSA

Ground Elevation (ft): 15.9 (MLLW)

USCS Symbol	Description
GP	Light gray, silty, sandy, GRAVEL (dense, moist)
WD	Black WOOD, chips and larger pieces (very stiff, wet) (heavy sheen, strong hydrocarbon odor)
ML	Gray, very gravelly, SILT, gravel is shale fragments (hard, moist) (no sheen, slight hydrocarbon odor) (weathered bedrock)
RK	Gray, fine sandy SILTSTONE (Chuckanut Formation)

Boring Completed
Total Depth of Boring = 11.0 ft.

GROUNDWATER



Well Completed 06/26/98
Total Depth of Well = 11.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1020.60 10/9/03 \\EDMNAS\GINT\GINTWPROJECTS\CORNWALL.GPJ WELL LOG

Log of Well MW-1

Figure C-2

MW-2

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

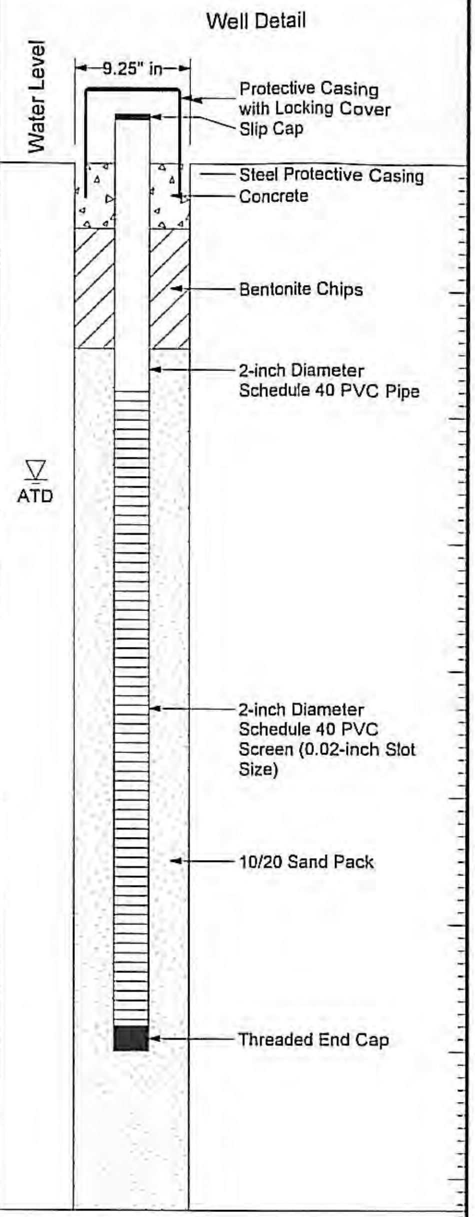
Drilling Method: HSA

Ground Elevation (ft): 13.4 (MLLW)

Sample Number & Interval	Sampler Type	Blows/Foot		USCS Symbol	Description
				SP	Gray-green, fine SAND with gravel (medium dense, moist to wet)
1	b2	21	0.0	ML	Mottled gray and orange-brown, sandy SILT with gravel (very stiff, moist)
2	b2	9	0.0	ML	Dark gray to black, gravelly, sandy, SILT with refuse; gravel is fine to coarse; sand is fine (stiff, wet)
				SM	Black, gravelly, fine to medium SAND with wood debris, refuse, and silt; gravel is fine to coarse (loose, wet)
3	b2	10	0.0		

Water Level: ▽ ATD

Boring Completed
Total Depth of Boring = 16.5 ft.



Well Completed 06/25/98
Total Depth of Well = 14.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

Log of Well MW-2

Figure C-3

MW-3

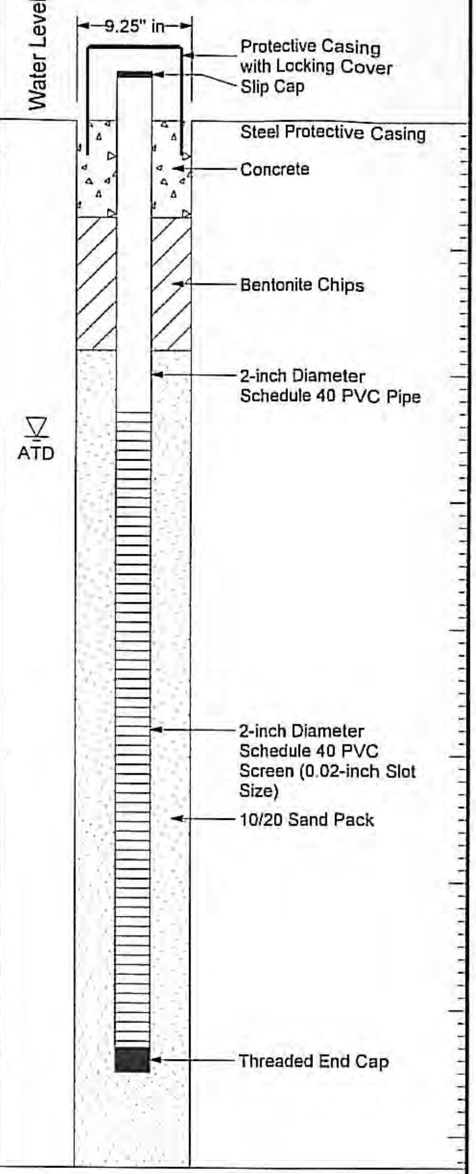
Drilling Method: HSA

Ground Elevation (ft): 14.2 (MLLW)

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Sample Number & Interval	Sampler Type	Blows/Foot		Graphic Symbol	USCS Symbol		Water Level
			0.0		WD	Brown, sandy, silty WOOD, chips and larger pieces (stiff, moist)	
1	b2	50/ 2"			GP	Light gray, sandy GRAVEL (very dense, damp)	
2	b2	13	0.0		ML	Gray-brown, sandy SILT with clay and gravel; gravel is fine to coarse (stiff, moist)	▽ ATD
3	b2	9	0.0		SM	Dark gray to black, gravelly, silty, fine to medium SAND with wood debris and refuse; gravel is fine (loose, wet) (slight sheen, no odor)	
4	b2	4	0.0		WD/ DB	Black, silty DEBRIS and WOOD; refuse, wood chips and large wood debris (soft, wet) (slight sheen, no odor)	

Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Well Detail



Boring Completed
Total Depth of Boring = 16.5 ft.

Well Completed 06/25/98
Total Depth of Well = 15.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1020.60 10/9/03 \EDMNAS\GINT\GINTW\PROJECTS\CORNWALL.GPJ WELL LOG

MW-4

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	
1	b2	4	0.0
2	b2	4	0.0
3	b2	12	0.0

SOIL PROFILE

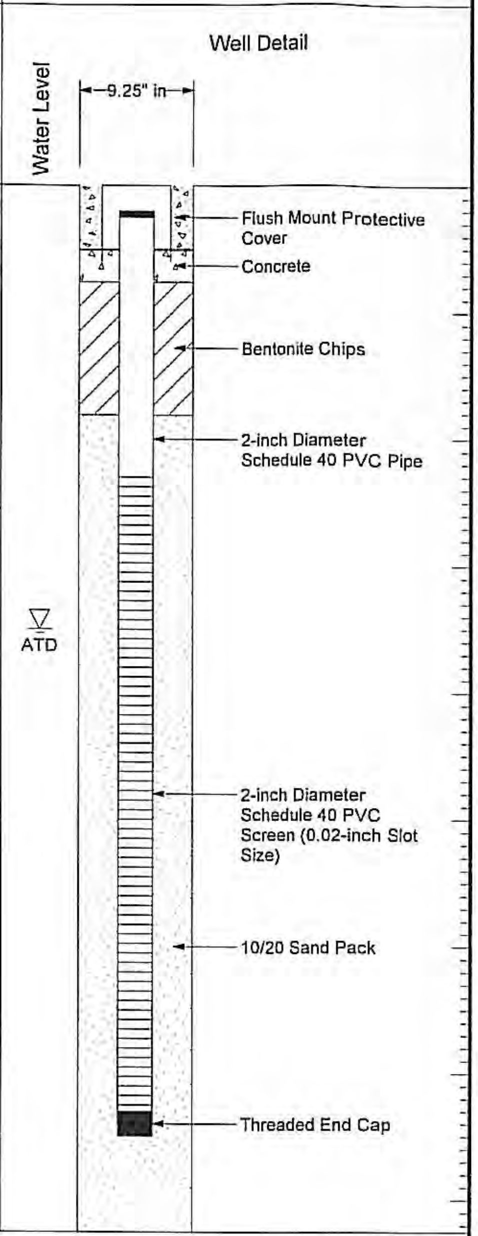
Drilling Method: HSA

Ground Elevation (ft): 15.1 (MLLW)

USCS Symbol	
SM	Brown, very gravelly, fine to medium SAND with silt (medium dense, moist)
ML	Gray-brown, gravelly, clayey, SILT with fine to medium sand and occasional wood debris; gravel is fine (soft, moist to wet)
WD	Gray to black WOOD, chips and large wood debris, with gravel (soft, wet)
WD	Light brown SAWDUST, trace silt (stiff, wet)

Boring Completed
Total Depth of Boring = 16.5 ft.

GROUNDWATER



Well Completed 06/25/98
Total Depth of Well = 15.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

Log of Well MW-4

Figure C-5

MW-5

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	
1	b2	38	0.0
2	b2	5	0.0
3	b2	50/ 2"	0.0

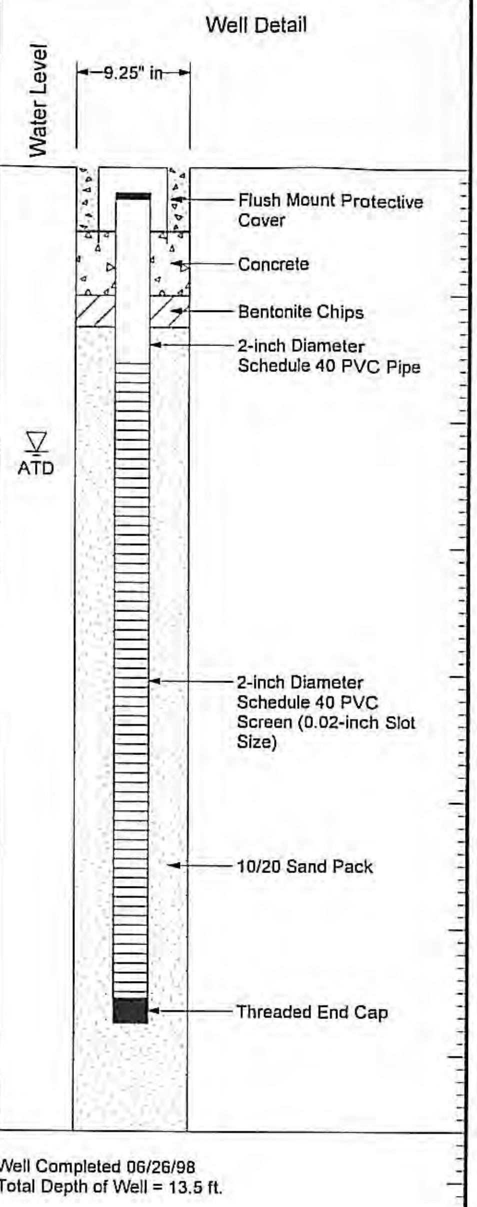
Boring Completed
Total Depth of Boring = 15.2 ft.

SOIL PROFILE

Drilling Method: HSA
Ground Elevation (ft): 17.3 (MLLW)

USCS Symbol	
WD	Dark brown, very gravelly, WOOD, chips and larger pieces (stiff, wet) Light brown, silty, sandy sawdust
RK	Gray, weathered, fine sandy SILTSTONE (hard, dry to damp) (Chuckanut Formation)

GROUNDWATER



Well Completed 06/26/98
Total Depth of Well = 13.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1020.60 10/9/03 \\EDMNAS\GINT\GINTW\PROJECTS\CORNWALL.GPJ WELL LOG

Log of Well MW-5

Figure C-6

TABLE 2

INTERTIDAL TEST PIT DESCRIPTIONS

	Approximate Elevation (ft, MLLW)[a]	Depth Interval (ft)	Description
TP-1	+2	0 - 6	Refuse with granular material (silt, sand, and gravel). Plastic bags, trash, wood, bottles, bricks. Test pit did not encounter native soil/sediment. Granular material is black (possibly indicating iron sulfide presence).
TP-2	+2	0 - 4	Refuse with granular material. Less refuse than TP-1. Bricks, metal debris, porcelain, wires. Did not appear to reach native soil/sediment. Sloughing of test pit wall limited depth attained. Sheen (and petroleum odor) observed on water that collected in pit. Bottles observed. The surface 0-6 inches of material is red gravel (iron staining?). The 6-24 inch interval was black and sulfidic with similar material composition as the remainder of the excavation.
TP-3	+1	0 - 4.5	Similar to TP-2 with slightly more refuse. Petroleum odor and sheen observed. Test pit did not encounter native soil/sediment.
TP-4	+5	0 - 5	Refuse with granular material. Similar to TP-1. Test pit did not encounter native soil/sediment.

(a) Elevations were estimated based on test pit elevation relative to the tide line at a certain time.

Drilled Start 6/29/2012 End 6/29/2012	Total Depth (ft) 9.5	Logged By RNM Checked By CEB	Driller Cascade Drilling, L.P.	Drilling Method Hollow-stem Auger

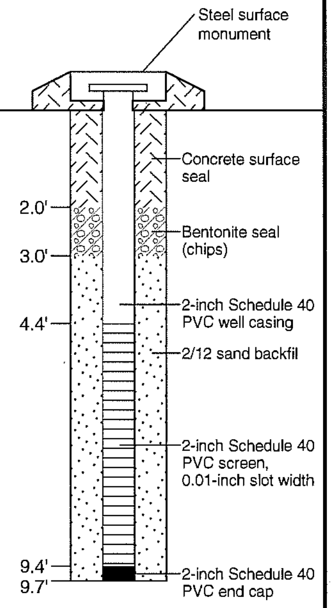
Hammer Data 300 (lbs) / 30 (in) Drop	Drilling Equipment Truck-mounted CME 75	DOE Well I.D.: BHE 982 A 2 (in) well was installed on 6/29/2012 to a depth of 9.7 (ft).
Surface Elevation (ft) 13.65 Vertical Datum NAVD88	Top of Casing Elevation (ft) 13.06	
Easting (X) 638936.68 Northing (Y) 1239888.2	Horizontal Datum NAD83/98	

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/29/2012	5.3	8.35

Notes: Auger Data: 4¼-inch I.D.

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
10	0		10	5				SM	Silty sand with gravel (55/25/20), fine to medium sand, fine gravel, brown, moist, loose	SS	<1
	5		12	3		CL-MW-101-6-7 CA	∇	ML	Gravelly silt with sand (60/25/15), fine gravel, fine sand, moist, medium stiff	NS	<1
5			12	3				Wood	Wood fragments and shavings, black to brown, 15% silt between 7 and 7.5 feet, wet at 7.5 feet	NS	<1

WELL LOG



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well CL-MW-101

GEOENGINEERS

Project: R.G. Haley Site
Project Location: Bellingham, Washington
Project Number: 0356-114-06

Figure A-
Sheet 1 of 1

Drilled Start 6/29/2012 End 6/29/2012	Total Depth (ft) 9	Logged By RNM Checked By CEB	Driller Cascade Drilling, L.P.	Drilling Method Hollow-stem Auger

Hammer Data	300 (lbs) / 30 (in) Drop	Drilling Equipment	Truck-mounted CME 75	DOE Well I.D.: BHE 983 A 2 (in) well was installed on 6/29/2012 to a depth of 8.2 (ft).
Surface Elevation (ft) Vertical Datum	14.58 NAVD88	Top of Casing Elevation (ft)	14.27	
Easting (X) Northing (Y)	638879.53 1230037.41	Horizontal Datum	NAD83/98	

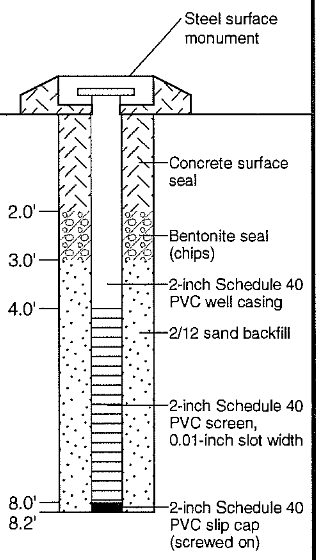
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
6/29/2012	7.0	7.58

Notes: Auger Data: 4¼-inch I.D.

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								AC	3 inches asphalt concrete		
									SM	Silty sand with gravel (60/25/15), fine to medium sand, fine gravel, dark gray, moist, loose		
10	5		14	6							SS	<1
									ML	Sandy silt with gravel (50/30/20), fine to medium sand, fine gravel, brown to green-gray, moist, medium stiff	MS MS	7 10
			16	10		CL-MW-102-6-7 CA			Wood	Wood fragments and shavings, black to dark brown, 25% silt, moist to wet, staining and petroleum-like odor	NS	<1
							▽		SM	Silty sand with gravel (50/30/20), fine to coarse sand, fine to coarse gravel, black, occasional orange-red brick fragments and white shell fragments, wet, medium dense		
			9	72/9"		CL-MW-102-7-8			Siltstone	Siltstone	NS	<1

WELL LOG



DRAFT

Note: Please see Figure A-1 for explanation of symbols

Seattle: Date:9/27/12 Path:C:\USERS\CVOSS\DESKTOP\035611406 HALEY.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_WELL

Log of Monitoring Well CL-MW-102

GEOENGINEERS

Project: R.G. Haley Site
Project Location: Bellingham, Washington
Project Number: 0356-114-06

Figure A-
Sheet 1 of 1

Drilled	Start 7/10/2012	End 7/10/2012	Total Depth (ft) 16.5	Logged By CTB Checked By CEB	Driller Boart Longyear	Drilling Method Hollow-stem Auger

Hammer Data	300 (lbs) / 30 (in) Drop	Drilling Equipment	Truck-mounted CME 75	DOE Well I.D.: BHK 961 A 2 (in) well was installed on 7/10/2012 to a depth of 15 (ft).
Surface Elevation (ft) Vertical Datum	14.8 NAVD88	Top of Casing Elevation (ft)	14.41	
Easting (X) Northing (Y)	639109.99 1240003.47	Horizontal Datum	NAD83/98	

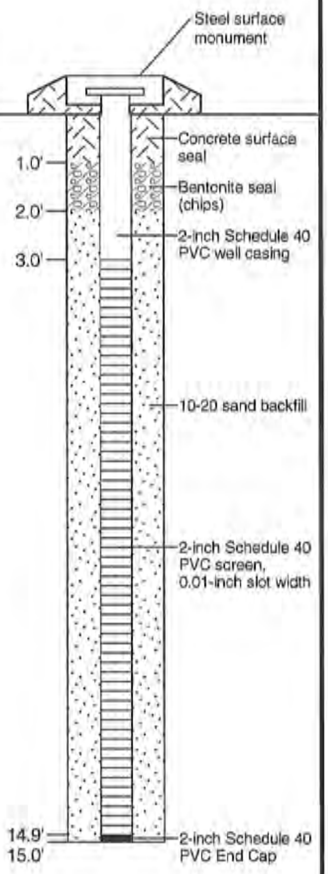
Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
7/10/2012	6.5	8.30

Notes: Auger Data: 4¼-inch I.D.; 8½-inch O.D.

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								Wood	Wood fragments with 10% sand with silt, black, moist to wet, petroleum-like odor		
10	5		2	3		CL-MW-103-5-6.5 CA	▼ ▽				MS	1
			5	4					Wood	Wood fragments with <5% silty sand, black, wet, petroleum-like odor, NAPL	HS	<1
5	10		4	2		CL-MW-103-10-11.5 (M)					HS	<1
									SM	Silty sand (60/40), fine to coarse sand, with 30% wood fragments, gray-black, very loose, wet, petroleum-like odor, NAPL		
			6	12		CL-MW-103-12.5-14					HS	<1
0	15		4	50/6"							SS	<1
									ML	Sandy silt (70/30), fine to medium sand, gray, hard, moist		

Refusal on bedrock at 16.5 feet

WELL LOG



DRAFT

Note: Please see Figure A-1 for explanation of symbols

Seattle: Date:9/27/12 Path:C:\USERS\CVOSS\DESKTOP\035611406 HALEY.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_WELL

Log of Monitoring Well CL-MW-103

GEOENGINEERS

Project: R.G. Haley Site
Project Location: Bellingham, Washington
Project Number: 0356-114-06

Figure A-
Sheet 1 of 1

Drilled	Start 6/25/2012	End 6/25/2012	Total Depth (ft) 7.5	Logged By RNM Checked By CEB	Driller Cascade Drilling, L.P.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum	15.23 NAVD88	Hammer Data 140 (lbs) / 30 (in) Drop	Drilling Equipment GeoProbe 6600
Easting (X) Northing (Y)	638967.38 1240106.26	System Datum NAD83/98	Groundwater
Notes: 5 foot by 1½-inch core with poly liner			

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/25/2012	4.5	10.73

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	**Collected Sample**	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
15	0		32						GP	Poorly graded gravel (100), fine to coarse gravel, gray, moist			
									GP	Poorly graded gravel with sand (60/35/5 silt), fine to coarse gravel, fine to medium sand, brown, moist	NS	<1	
									SM	Silty sand (70/30), fine to medium, gray, occasional wood shavings, moist			
						CL-SB-101-4-5 CA	∇		SP-SM	Poorly graded sand with gravel and silt (60/30/10) gray, occasional brown wood fragments, wet	SS	<1	
10	5		29								MS	2	
						CL-SB-101-6-7 CA					MS	<1	
									Siltstone	Siltstone	NS	<1	

DRAFT

Note: Please see Figure A-1 for explanation of symbols

Log of Boring CL-SB-101

GEOENGINEERS

Project:	R.G. Haley Site
Project Location:	Bellingham, Washington
Project Number:	0356-114-06

Figure A-
Sheet 1 of 1

Drilled Start 6/25/2012 End 6/25/2012	Total Depth (ft) 15	Logged By RNM Checked By CEB	Driller Cascade Drilling, L.P.	Drilling Method Direct Push

Surface Elevation (ft) 15.01 Vertical Datum NAVD88	Hammer Data 140 (lbs) / 30 (in) Drop	Drilling Equipment GeoProbe 6600
Easting (X) 639061.86 Northing (Y) 1240059.79	System Datum NAD83/98	Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
6/25/2012	10.0	5.01

Notes: 5 foot by 1½-inch core with poly liner

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	**Collected Sample**	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		54						GP	Poory graded gravel with sand (50/45/5 silt), fine to coarse gravel, fine to medium sand, brown, moist	SS	<1	
									GP	Poorly graded gravel (90/10 sand), fine to medium sand, gray, moist			
									SP-SM	Poorly graded sand with gravel and silt (50/40/10), medium to coarse sand, fine to coarse gravel, gray to brown, occasional red-orange brick fragments and black staining, moist	NS	<1	
10	5		48			CL-SB-102-4-5 CA			SM	Silty sand (50/45/5 gravel), fine to medium sand, fine to coarse gravel, brown, occasional brown fresh wood shavings and roots, moist	NS NS NS NS	<1 <1 <1 <1	
									SP-SM	Poorly graded sand with gravel and silt (50/40/10), medium to coarse sand, fine to coarse gravel, gray to brown, occasional red-orange brick fragments, moist	NS	<1	
									SM	Silty sand with gravel (50/30/20), fine to medium sand, fine to coarse gravel, gray, occasional brown fresh wood fragments and roots, moist	MS MS	 4	
5	10		50			CL-SB-102-9-10 CA	∇		Wood	Silt and wood (50% silt, 50% wood), fresh brown to decomposed black wood fragments and shavings, moist to wet, petroleum-like odor	HS	27	
									Wood	Fresh orange-brown wood fragments and shavings, wet	MS NS	3 <1	
						CL-SB-102-13-14 CA			ML	Silt with sand (80/20), fine sand, gray, occasional fine gravel, wet to moist	NS	<1	
	15								Siltstone	Siltstone	NS	<1	

DRAFT

Note: Please see Figure A-1 for explanation of symbols

Seattle: Date:9/27/12 Path:C:\USERS\CVOSS\DESKTOP\035611406 HALEY.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD

Log of Boring CL-SB-102

GEOENGINEERS

Project: R.G. Haley Site
Project Location: Bellingham, Washington
Project Number: 0356-114-06

Figure A-
Sheet 1 of 1

Drilled	Start 6/25/2012 End 6/25/2012	Total Depth (ft) 15	Logged By RNM Checked By CEB	Driller Cascade Drilling, L.P.	Drilling Method Direct Push
Surface Elevation (ft) 15.06 Vertical Datum NAVD88		Hammer Data 140 (lbs) / 30 (in) Drop		Drilling Equipment GeoProbe 6600	
Easting (X) 638969.79 Northing (Y) 124002.83		System Datum NAD83/98		Groundwater	

Notes: 5 foot by 1½-inch core with poly liner

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/25/2012	8.5	6.56

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	50					AC	Asphalt concrete			
							GP	Poorly graded gravel with sand (70/25/5 silt) fine to coarse gravel, fine to medium sand, gray to brown, moist	SS NS	<1 <1	
10	5	36			CL-SB-103-4-5 CA		SM	Silty sand (50/40/10 gravel), fine to medium sand, fine gravel, dark gray, occasional red-orange brick fragments and greenish-gray staining, moist	MS	7	
					CL-SB-103-8-9 CA	∇	SP-SM	Poorly graded sand with gravel and silt (70/20/10), fine to medium sand, fine gravel, dark gray to black, moist to wet, petroleum-like odor and staining	MS HS	12 30	
5	10	48					Wood	Fresh brown to decomposed black wood fragments and shavings, wet, NAPL, petroleum-like odor and staining	HS	28	
							SM	Silty sand (70/20/10 gravel), fine to medium sand, fine to coarse gravel, gray, wet			
					CL-SB-103-14-15 CA		SP-SM	Poorly graded sand with gravel and silt (70/20/10), medium to coarse sand, fine gravel, dark gray to black, occasional red-orange brick fragments, white shells and fresh brown wood fragments, wet	SS NS	<1 <1	
	15						Siltstone	Gray siltstone			

DRAFT

Note: Please see Figure A-1 for explanation of symbols

Seattle: Date:9/27/12 Path:C:\USERS\CVOSS\DESKTOP\035611406 HALEY.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD

Log of Boring CL-SB-103

GEOENGINEERS

Project: R.G. Haley Site
Project Location: Bellingham, Washington
Project Number: 0356-114-06

Figure A-
Sheet 1 of 1

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	▒	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			▒	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	GM	SILTY GRAVELS, GRAVEL-SAND SILT MIXTURES
			▒	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	░	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			▓	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	SM	SILTY SANDS, SAND SILT MIXTURES
			░	SC	CLAYEY SANDS, SAND CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			░	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▥	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▓	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			▓	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			▨	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			░	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

UNIFIED SOIL CLASSIFICATION SYSTEM

DRIVEN SAMPLES

BLOWS REQUIRED TO DRIVE SAMPLER ONE FOOT

MOISTURE CONTENT

11.2% 111

DRY DENSITY IN PCF

28

■ INDICATES LOCATION OF UNDISTURBED SAMPLE

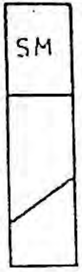
☒ INDICATES LOCATION OF DISTURBED SAMPLE

☐ INDICATES LOCATION OF SAMPLING ATTEMPT WITH NO RECOVERY

OTHER TYPES OF SAMPLES

I INDICATES LOCATION OF THIN WALL, PITCHER, OR OTHER TYPES OF SAMPLES (SEE TEXT)

GRAPHIC LOG



LETTER SYMBOL SOIL TYPE

DISTINCT CONTACT BETWEEN SOIL STRATA

GRADUAL CHANGE BETWEEN SOIL STRATA

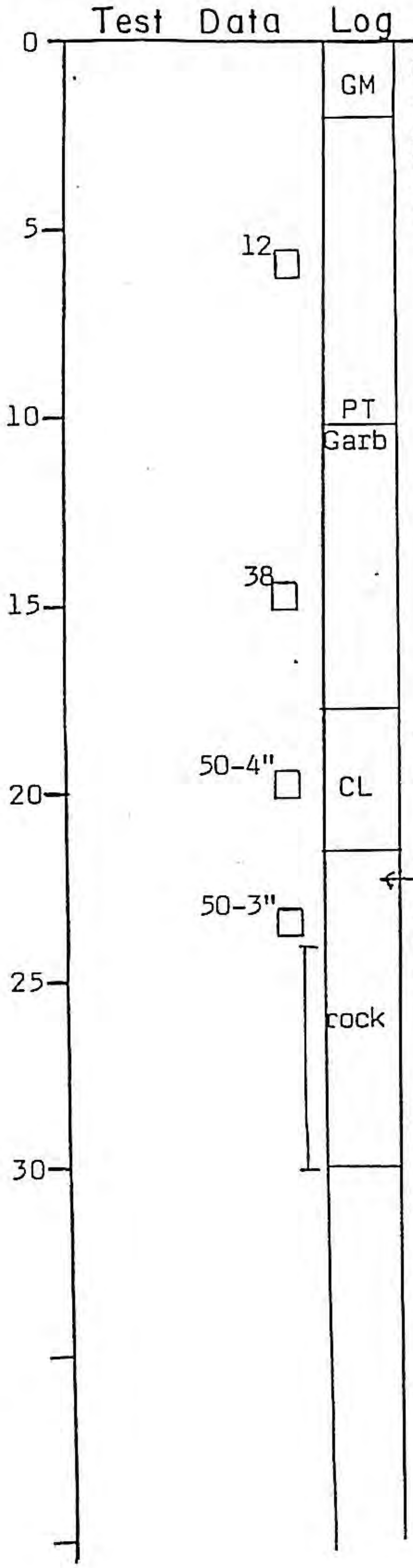
BOTTOM OF BORING

W. D. PURNELL & ASSOCIATES

SAMPLE DATA KEY

ELEVATION: 15.0 feet

BORING NO. 1



Description

Gray silty sand and gravel with angular cobbles (fill)(compact)(road ballast)

Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)

Gray silty sandy clay with occasional gravel (moderately stiff)

Estimated Pile Tip at Elev. - 7.0 feet

Gray fine grained sandstone, slightly weathered at surface grading to unweathered within 1.5 feet

Core sample rock 25 to 30 feet 92% core recovery

Boring completed at 30.0 feet on 2-5-85

W. D. PURNELL & ASSOCIATES

EXPLORATION LOG

11 X 17 PRINTED ON NO. 1000H CLEARPRINT

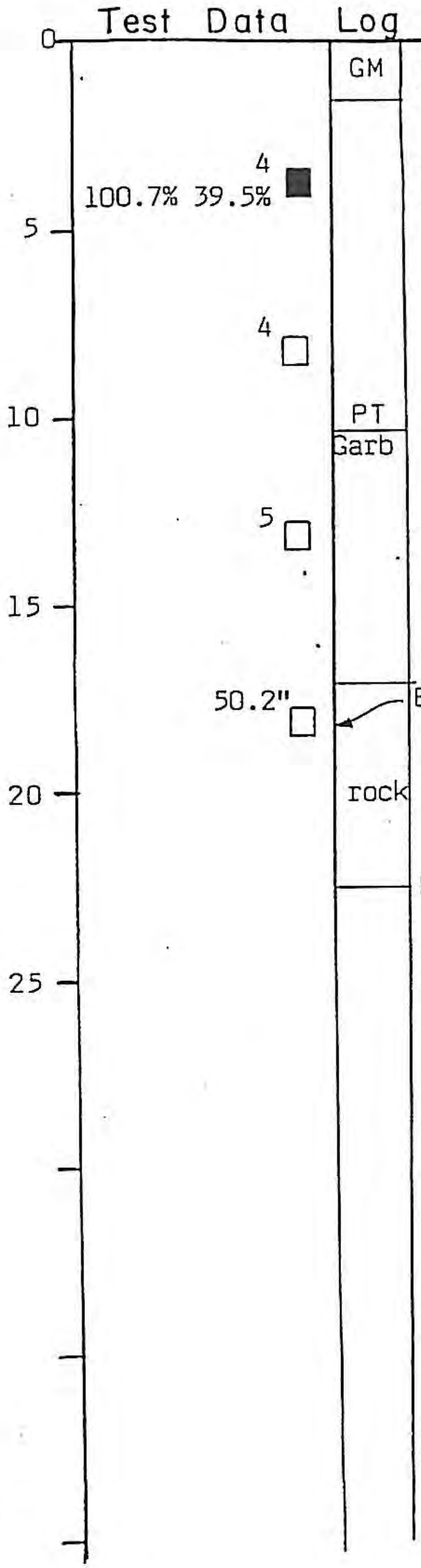
ELEVATION 16.8 feet BORING NO. 2

	Test Data	Log	Description
0		GM	Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)
5		PT Garb	Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)
10			
	1 ☒	CL	Gray silty sandy clay with occasional gravel (moderately stiff)
15			Gray fine grained sandstone, slightly weathered at surface grading to unweathered within 1.5 feet
	50-1" ☐		Estimated Pile Tip at Elevation - 1.5 feet
			Core sample rock 18.5 to 23.5 feet 94% core recovery
20		rock	
			Boring completed at 23.5 feet on 2/6/85
25			

W. D. PURNELL & ASSOCIATES EXPLORATION LOG

ELEVATION: 15.6 feet

BORING NO. 3



Description

Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)

Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)

Estimated Pile Tip at Elevation - 3.0 feet

Gray fine grained sandstone, slightly weathered at surface grading to unweathered within 1.5 feet

Boring completed at 22.5 feet 2/6/85

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

ELEVATION: 15.4 feet

BORING NO. 4

	Test Data	Log	Description
0		GM	Brown sand and gravel (fill)(compact) (road ballast)
	27.9% 90.9 4 ■		Mottled gray and brown silty sandy clay with occasional gravel & marine shells (moderately stiff)(fill)
5			
		CL	Note: Oil from unknow origin floating on water surface
	20 ■		
10			Siltstone boulder
			Estimated Pile Tip at Elevation +3.0 feet
	50-2" ☒		Brown siltstone slightly weathered at surface grading unweathered within 1.5 feet (very hard)
15		rock	
	50-6" ■		Boring completed at 12 feet on 2/6/85
20			

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

ELEVATION: 14.3 feet

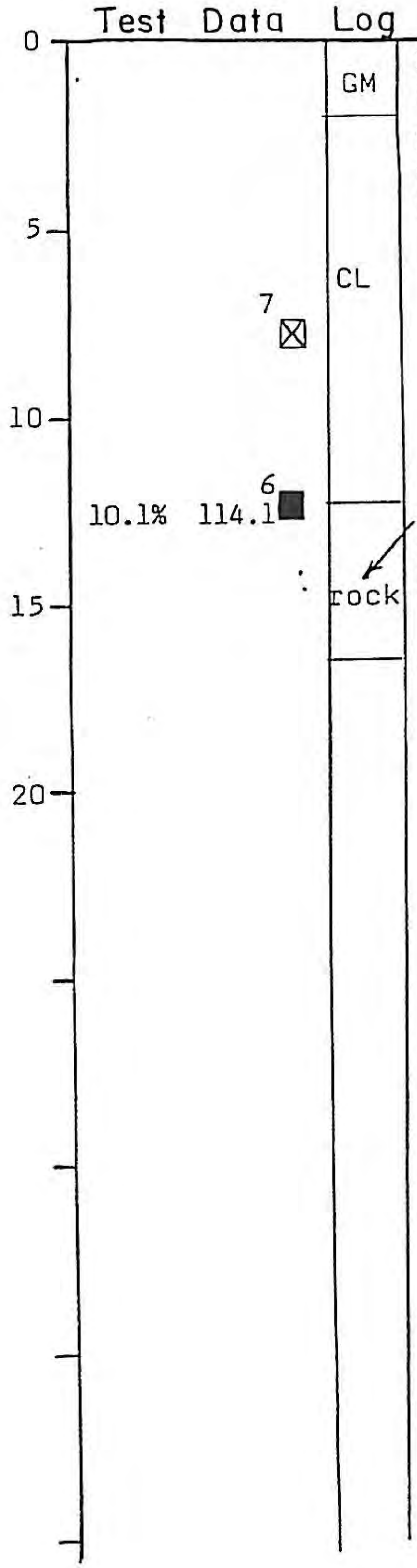
BORING NO. 5

	Test Data	Log	Description
0		GM	Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)
	7 ■	CL	Mottled gray and brown silty sandy clay with occasional gravel & marine shells (moderately stiff) (fill)
5			
	271.9% 17.3 3 ■	PT	Bark, silt, wood & sawdust (loose with voids) (fill)
10		wood	
	62.2% 49.3 5 ■		
			←Estimated Pile Tip at Elevation 0.0 feet
15	50-6" ■	rock	Brown siltstone, slightly weathered at surface grading unweathered within 1.5 feet (very hard)
			Boring completed at 18.0 feet on 2/6/95
20			

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

ELEVATION: 14.3 feet

BORING NO. 6



Description

Brown sand and gravel (fill)(compact) (road ballast)

Mottled gray and brown silty sandy clay with occasional gravel & marine shells (moderately stiff) (fill)

Estimated Pile Tip at elevation 0.0 feet

Brown siltstone, slightly weathered at surface grading unweathered within 1.5 feet (very hard)

Boring completed at 16.5 feet on 2/6/85

W. D. PURNELL & ASSOCIATES

EXPLORATION LOG

ELEVATION: 16.5 feet

BORING NO. 7

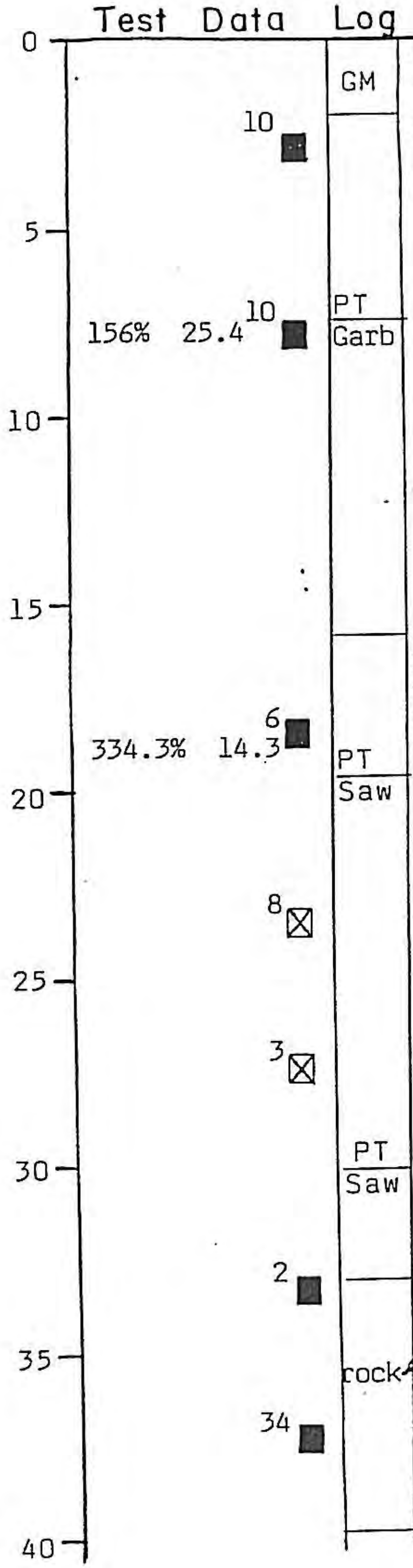
	Test Data	Log	Description
0			2" asphalt concrete
		GM	Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)
	3 ■	CL	Mottled gray and brown silty sandy clay with occasional gravel & marine shells(moderately stiff) (fill)
5			Bark silt sand wood & sawdust (loose with voids) (fill)
	3 ■		
10		PT wood	Mixed with sawdust
	3 ■		
	77.7% 39.3		
15			
			← Estimated Pile Tip at Elevation - 1.5 feet
	50-3" ■	rock	Brown siltstone slightly weathered at surface grading unweathered within 1.6 feet (very hard)
20			Boring completed at 20.0 feet on 2/9/85

W. D. PURNELL & ASSOCIATES

EXPLORATION LOG

ELEVATION: 11.5 feet

BORING NO. 8



Description

Brown sand and gravel (fill) (compact) (road ballast)

Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)

Brown sawdust with wood chips, occasional scrap lumber at top of stratum (compressible) (unweathered)(fill)

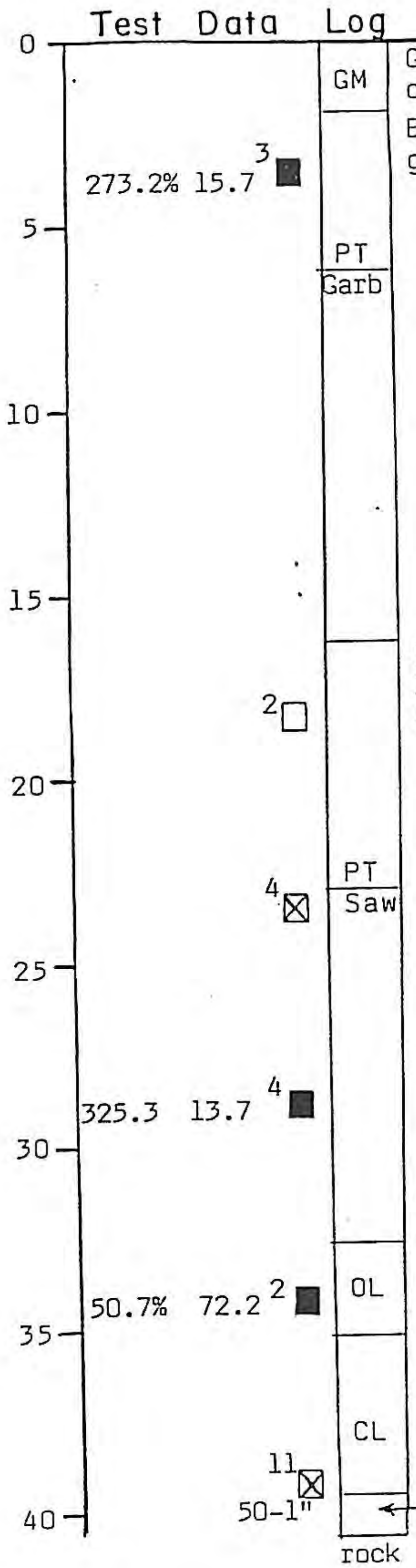
Brown siltstone slightly weathered at surface frading unweathered within 1.5 feet (very hard)
Estimated Pile Tip at Elevation - 24.0 feet

Boring completed at 39.5 feet on 2/9/85

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

ELEVATION: 12.4 feet

BORING NO. 9



Description

Gray silt sand and gravel with angular cobbles (fill)(compact(road ballast)

Black decomposing gargabe with occasional gravel (soft to loose)(highly compressible)(fill)

Brown sawdust with wood chips, occasional scrap lumber at top of stratum (compressible) (unweathered)(fill)

Green silt with occasional marine shells (soft)

Gray silty sandy clay with occasional gravel (moderately stiff)

← Estimated piling Tip at Elevation-27.5 feet

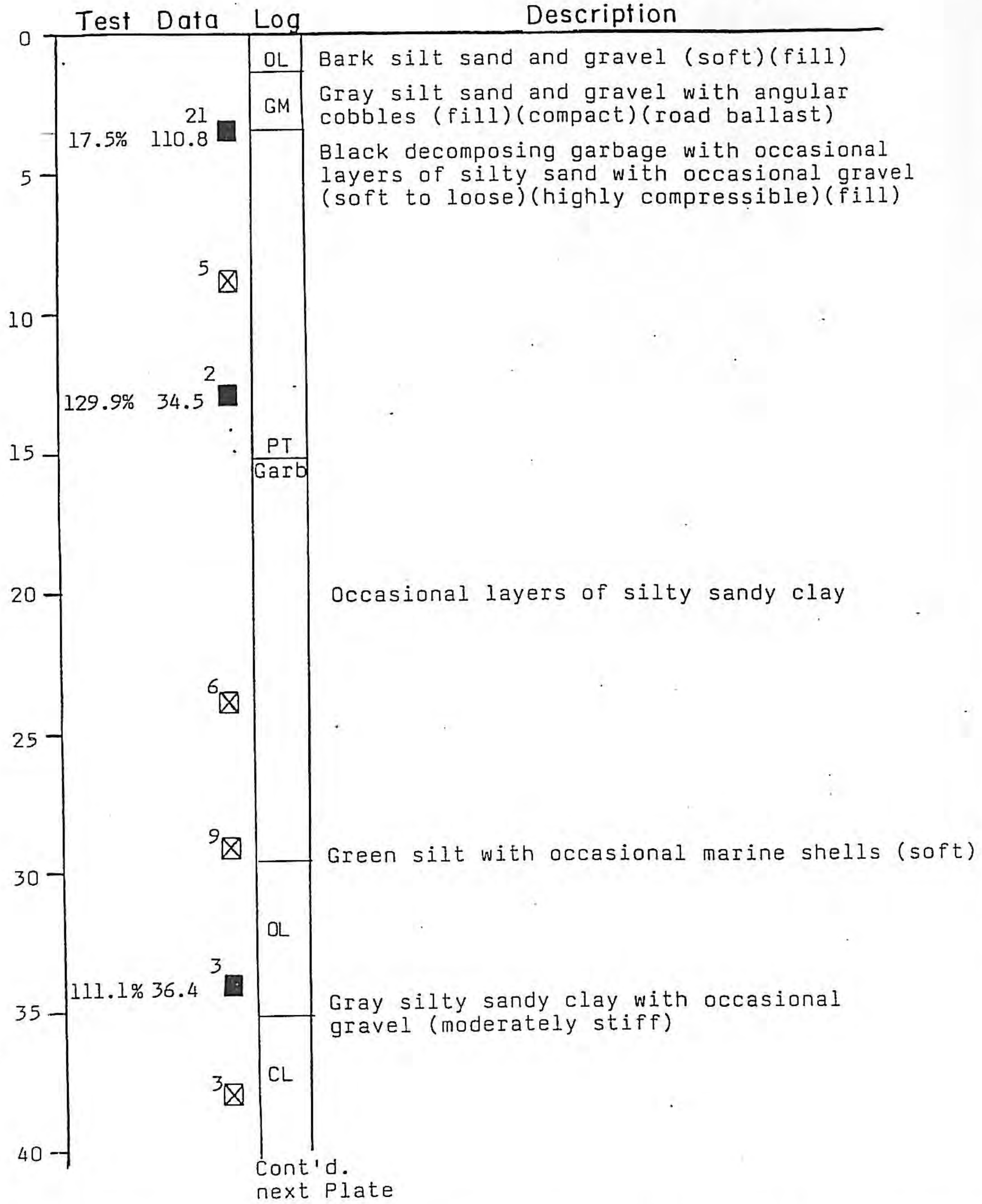
Brown siltstone, slightly weathered at surface grading unweathered within 1.5 feet (very hard)

Boring completed at 40.5 feet on 2/9/85

W. D. PURNELL & ASSOCIATES	EXPLORATION LOG

ELEVATION: 13.6 feet

BORING NO. 10
PLATE 1 of 2



Bark silt sand and gravel (soft)(fill)

Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)

Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)

Occasional layers of silty sandy clay

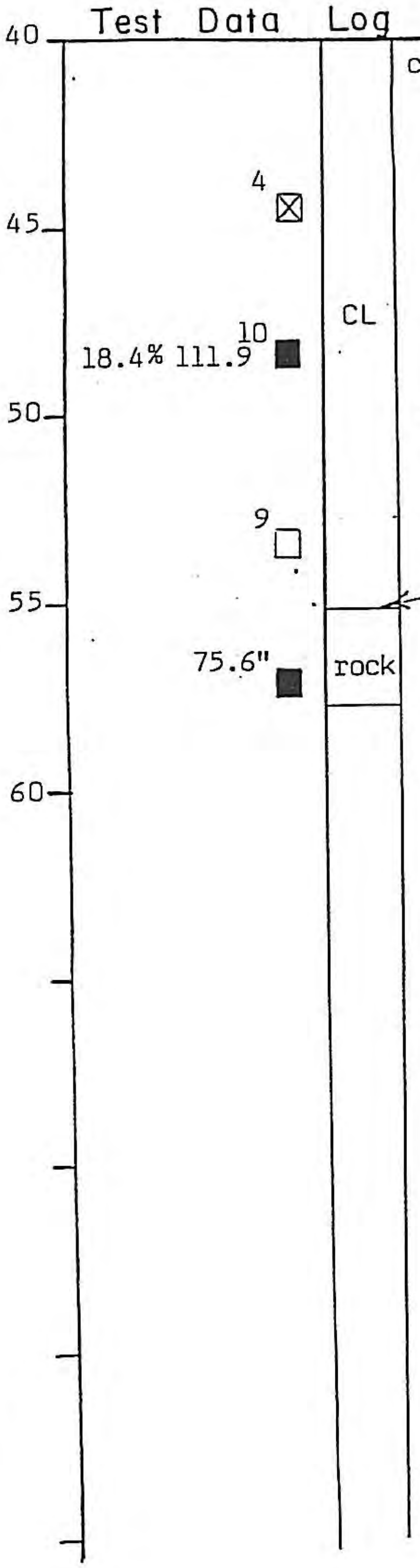
Green silt with occasional marine shells (soft)

Gray silty sandy clay with occasional gravel (moderately stiff)

Cont'd.
next Plate

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

BORING NO. 10
PLATE 2 of 2



Description

continued from page 1

Increasing gravel content

Estimated Pile Tip at Elevation - 41.3 feet

Gray medium to coarse sandstone (very hard)

Boring completed at 58.0 feet on 2/11/85

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

ELEVATION: 13.5 feet

BORING NO. 11

	Test Data	Log	Description
0		GM	Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)
	10 ■		Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)
5			
	1 ■ 37.0% 122.9	PT Garb	
10			
15			Green silt with occasional marine shells (soft)
	3 ■ 176.3% 28.6	OL	
20		CL	Gray silty sandy clay with occasional gravel (moderately stiff)
	56-6" ☒		Brown siltstone slightly weathered at surface grading unweathered within 1.5 feet (very hard)
25		rock	Layers become softer then hard drilling Estimated Pile Tip at Elevation - 10.0 feet
	50-2" ■		
30			Boring completed at 29.5 feet on 2/11/85
35			
40			

W. D. PURNELL & ASSOCIATES

EXPLORATION LOG

ELEVATION 14.0 feet

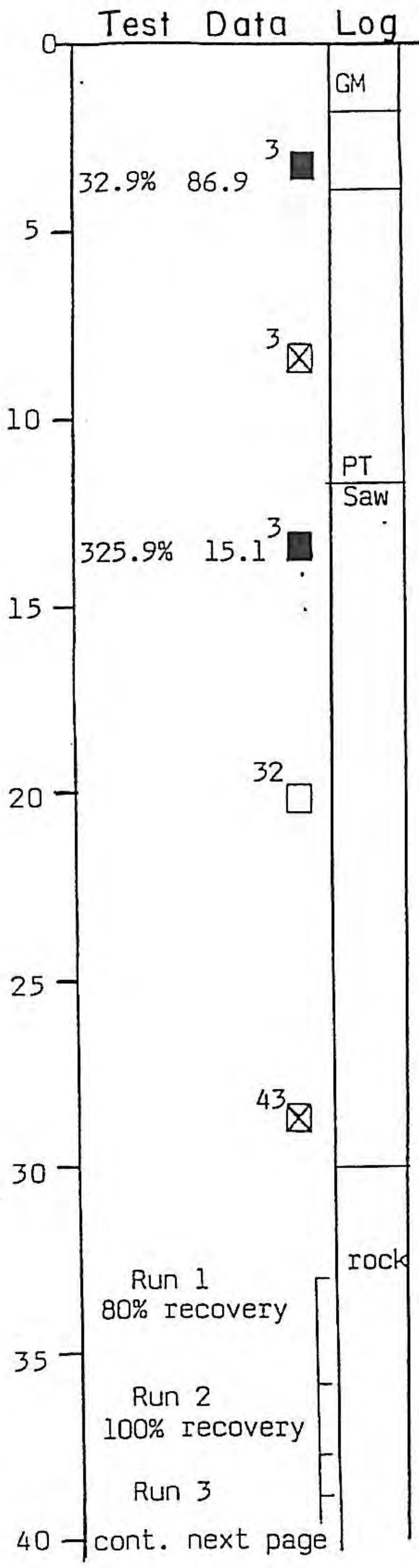
BORING NO. 12

	Test Data	Log	Description
0		GM	Brown sand and gravel (fill)(compact) (road ballast)
5	3 ■ 46.3% 51.2 3 ■	CL	Mottled gray and brown silty sandy clay with occasional gravel & marine shells (moderately stiff) (fill)
10 15 20	6 ☒ 270.9% 17.5 2 ■ 3 ☒	PT/Saw	Brown sawdust with wood chips, occasional scrap lumber at top of stratum (compressible)(unweathered) (fill)
25 30	28.4% 122.9 3 ■	SM/CL	Green silty sand grading to gray silty sandy clay with occasional gravel and marine shells
35	63 ■ 68-6" ■	rock	Brown siltstone slightly weathered at surface grading unweathered within 1.5 feet (very hard) Estimated Pile Tip at Elevation - 20.0 feet
40			Boring completed at 38.5 feet on 2/11/85

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

ELEVATION: 13.8

BORING NO. 13
PLATE 1 of 2



Description

Brown siltstone slightly weathered at surface grading unweathered within 1.5 feet (very hard)
Estimated Pile Tip at Elevation - 17.2 feet

Rock cored from 33.0 feet to 42.8 feet core

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

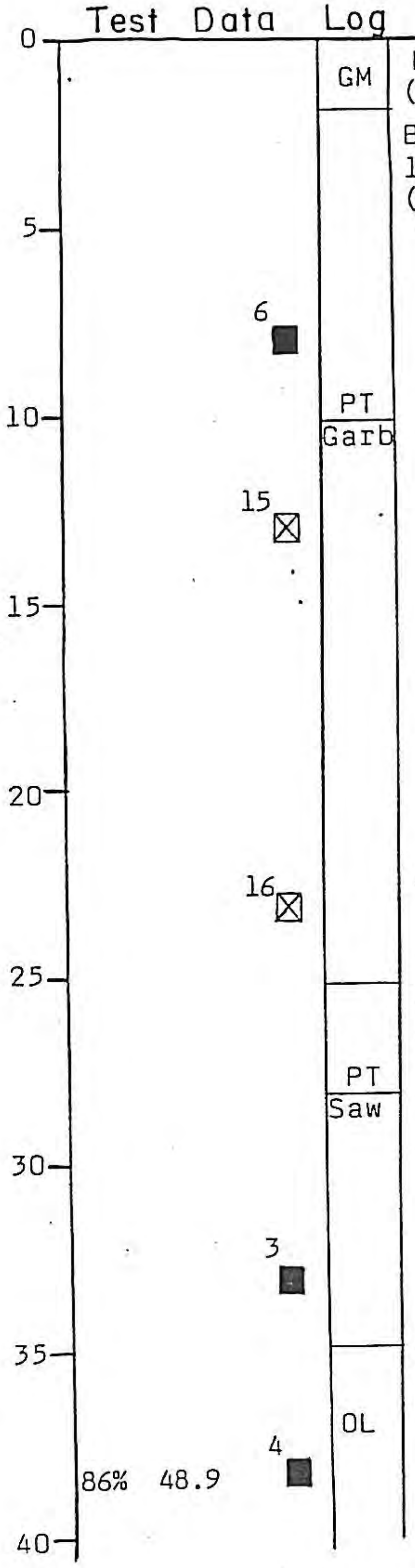
BORING NO. 13
PLATE 2 of 2

	Test Data	Log	Description
40	Run 3 100% recovery	rock	continued from page 1
			Auger refused to advance further Boring completed at 44.5 feet on 2/13/85
45			

W. D. PURNELL & ASSOCIATES EXPLORATION LOG

ELEVATION: 11.5 feet

BORING NO. 14
PLATE 1 of 2



Description

Brown sand and gravel (fill)(compact) (road ballast)

Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)

Brown sawdust with wood chips, occasional scrap lumber at top of stratum (compressible) (unweathered)(fill)

Green silt with occasional marine shells (soft)

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

BORING NO. 14
PLATE 2 of 2

	Test Data	Log	Description
40		OL	
	2 ☒	CL	Gray silty sandy clay with occasional gravel (moderately stiff)
45		rock	Estimated Pile Tip at Elevation - 33.0 feet Brown siltstone slightly weathred at surface grading unweathered within 1.5 feet (very hard)

Boring completed at 46.0 feet on 2/14/85

W. D. PURNELL & ASSOCIATES | EXPLORATION LOG

Test Pit No. 1

Elevation 16.0 feet

Soils Classified Visually
by the Unified Soils
Classification System
Pit Excavated by
Rubber Tired Backhoe

0 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.

GM	Brown sand and gravel (fill)(compact) (road ballast)
OL	Black silt with organic matter (soft)(fill)
CL	Mottled gray and brown silty sandy clay with occasional gravel & marine shells (moderately stiff)(fill)
SM	Red cinders mixed with sandy silt (loose)(fill)
PT wood	Bark, wood, sawdust and silty sand (loose with voids)
	Brown siltstone, slightly weathered at surface grading unweathered within 1.5 feet (very hard)

Note: Water level at 7 feet after 5 hours
Oil on surface of water

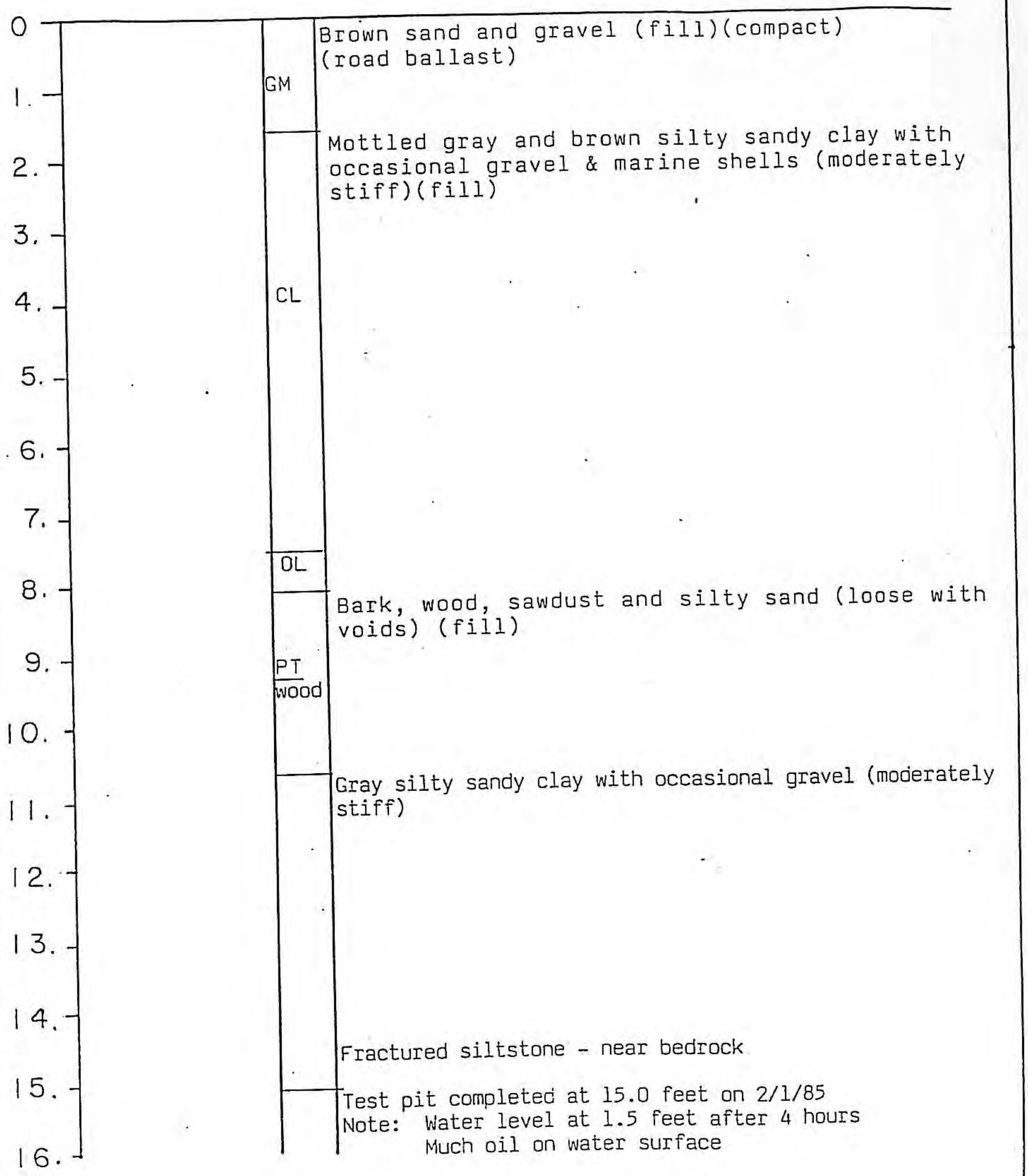
W. D. PURNELL & ASSOCIATES

4202 Guide Meridian, Suite 200
Bellingham, WA 98226

Test Pit No. 2

Elevation 15.3 feet

Soils Classified Visually
by the Unified Soils
Classification System
Pit Excavated by
Rubber Tired Backhoe



Brown sand and gravel (fill)(compact) (road ballast)

Mottled gray and brown silty sandy clay with occasional gravel & marine shells (moderately stiff)(fill)

Bark, wood, sawdust and silty sand (loose with voids) (fill)

Gray silty sandy clay with occasional gravel (moderately stiff)

Fractured siltstone - near bedrock

Test pit completed at 15.0 feet on 2/1/85
Note: Water level at 1.5 feet after 4 hours
Much oil on water surface

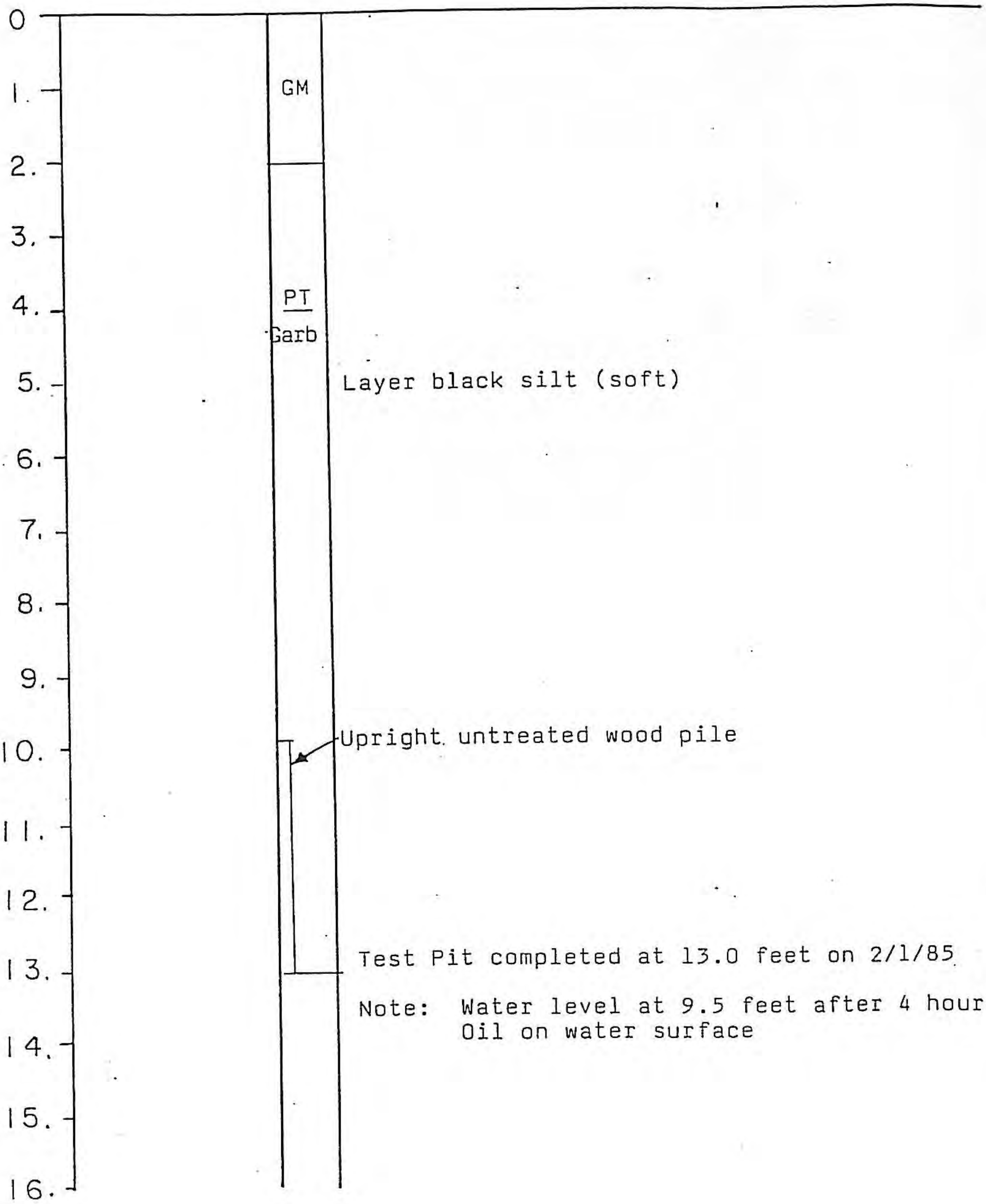
W. D. PURNELL & ASSOCIATES

4202 Guide Meridian, Suite 200
Bellingham, WA 98226

Test Pit No. 3

Elevation 16.5 feet

Soils Classified Visually
by the Unified Soils
Classification System
Pit Excavated by
Rubber Tired Backhoe



Layer black silt (soft)

Upright untreated wood pile

Test Pit completed at 13.0 feet on 2/1/85

Note: Water level at 9.5 feet after 4 hours
Oil on water surface

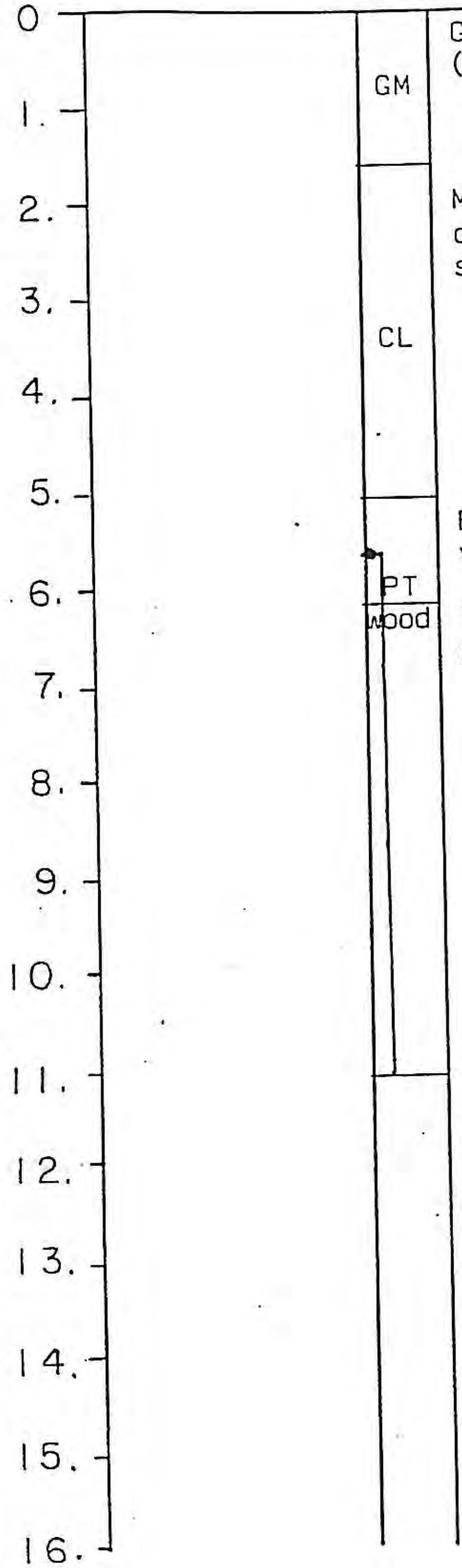
W. D. PURNELL & ASSOCIATES

4202 Guide Meridian, Suite 200
Bellingham, WA 98226

Test Pit No. 4

Elevation 14.1 feet

Soils Classified Visually
by the Unified Soils
Classification System
Pit Excavated by
Rubber Tired Backhoe



Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)

Mottled gray and brown silty sandy clay with occasional gravel and marine shells (moderately stiff)(fill)

Bark, wood, sawdust and silty sand (loose with voids)(fill)

Two untreated wood piles restricting backhoe progress

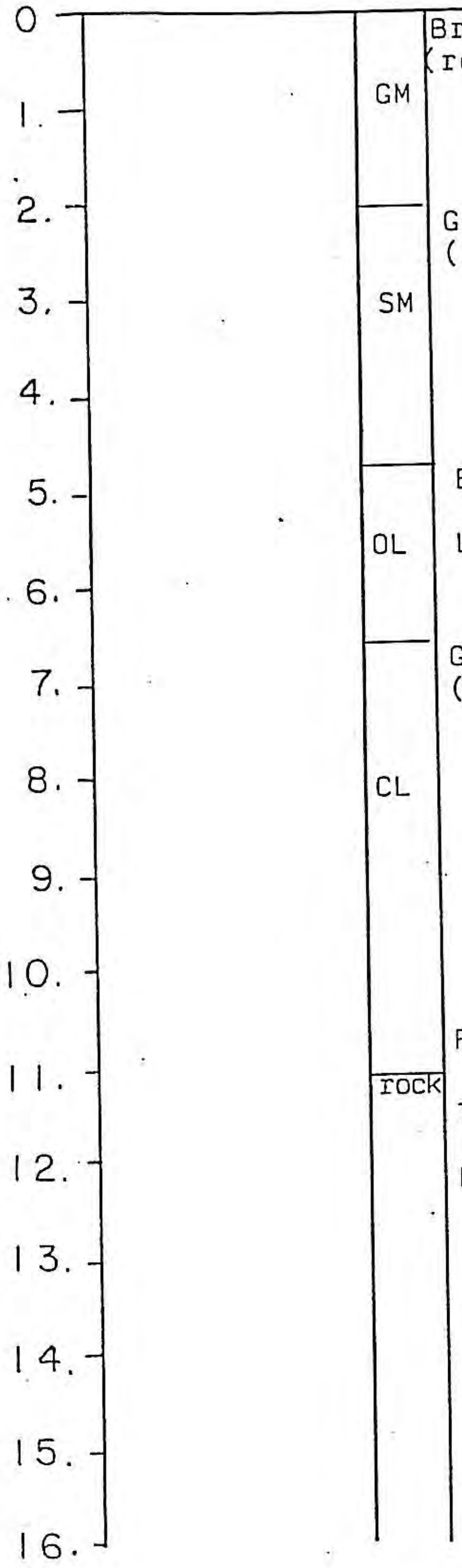
Test Pit completed at 11.0 feet on 2/1/85

Note: Water level at 5.0 feet after 2 hours.
Oil on water surface

Test Pit No. 5

Elevation 14.7 feet

Soils Classified Visually
by the Unified Soils
Classification System
Pit Excavated by
Rubber Tired Backhoe



Brown sand and gravel (fill)(compact)
(road ballast)

Gray fine to medium sand with shells (fill)
(loose)

Black silt with wood (soft)(fill)

Log 2 foot diameter laying horizontal

Gray silty sandy clay with occasional gravel
(moderately stiff)

Rock encountered at bottom of Pit

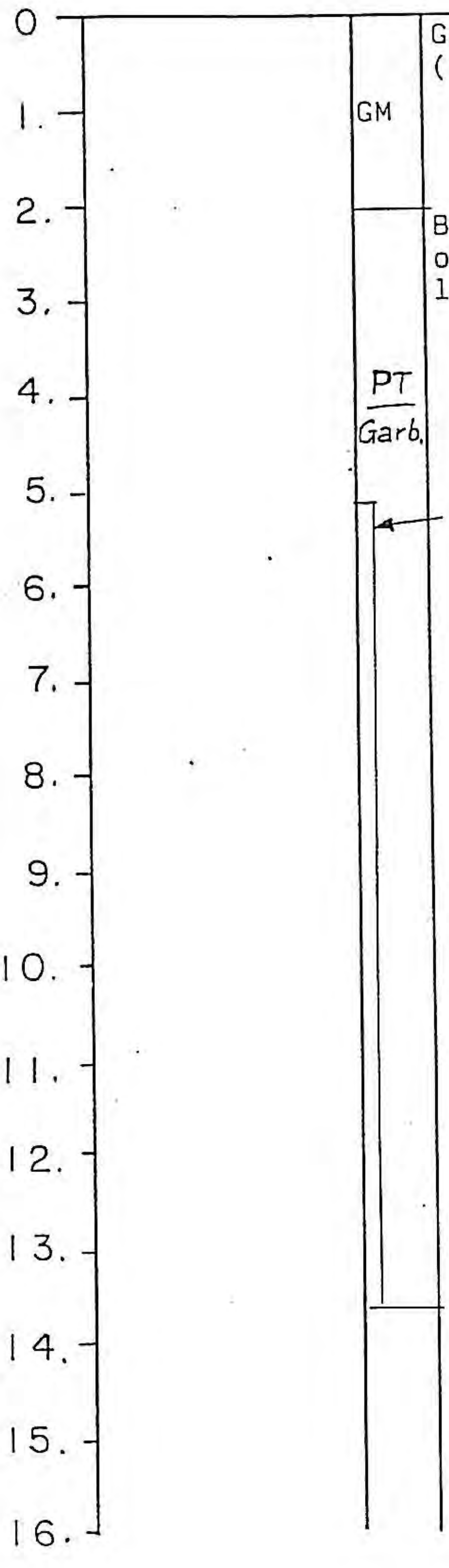
Test Pit completed at 11.0 feet on 2/1/85

Note: Water level at 6.0 feet after 2 hours

Test Pit No. 6

Elevation 14.5 feet

Soils Classified Visually
by the Unified Soils
Classification System
Pit Excavated by
Rubber Tired Backhoe



Gray silt sand and gravel with angular cobbles (fill)(compact)(road ballast)

Black decomposing garbage with occasional layers of silty sand with occasional gravel (soft to loose)(highly compressible)(fill)

Untreated wood pile

Test Pit completed at 13.5 feet on 2/1/85

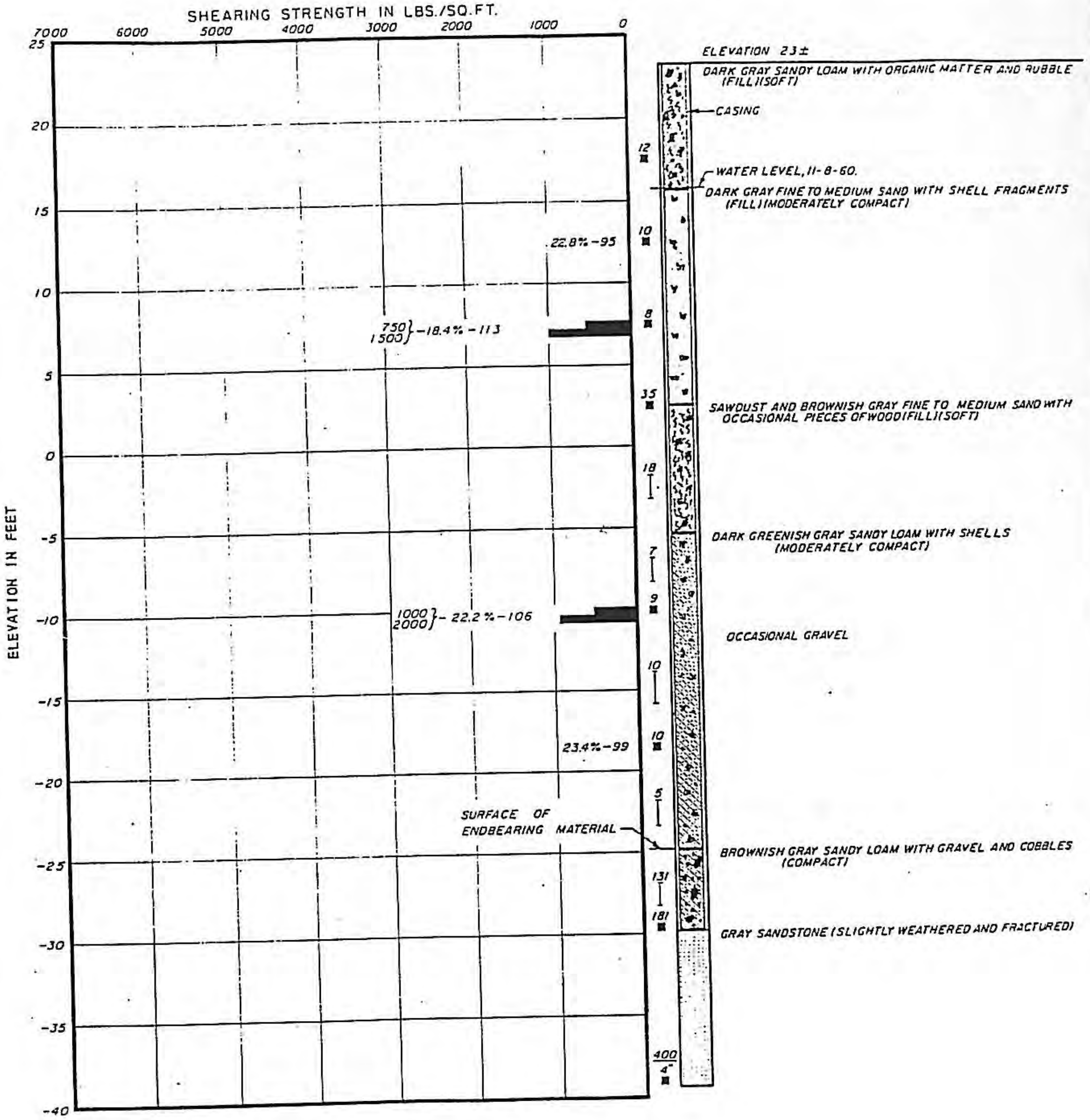
W. D. PURNELL & ASSOCIATES

4202 Guide Meridian, Suite 200
Bellingham, WA 98226

FILE [illegible]
Port of Bellingham
BY RHD DATE 11-21-60
CHECKED BY ___ DATE ___

BY ___ DATE ___
BY ___ DATE ___
PLATE ___ OF ___

BORING I

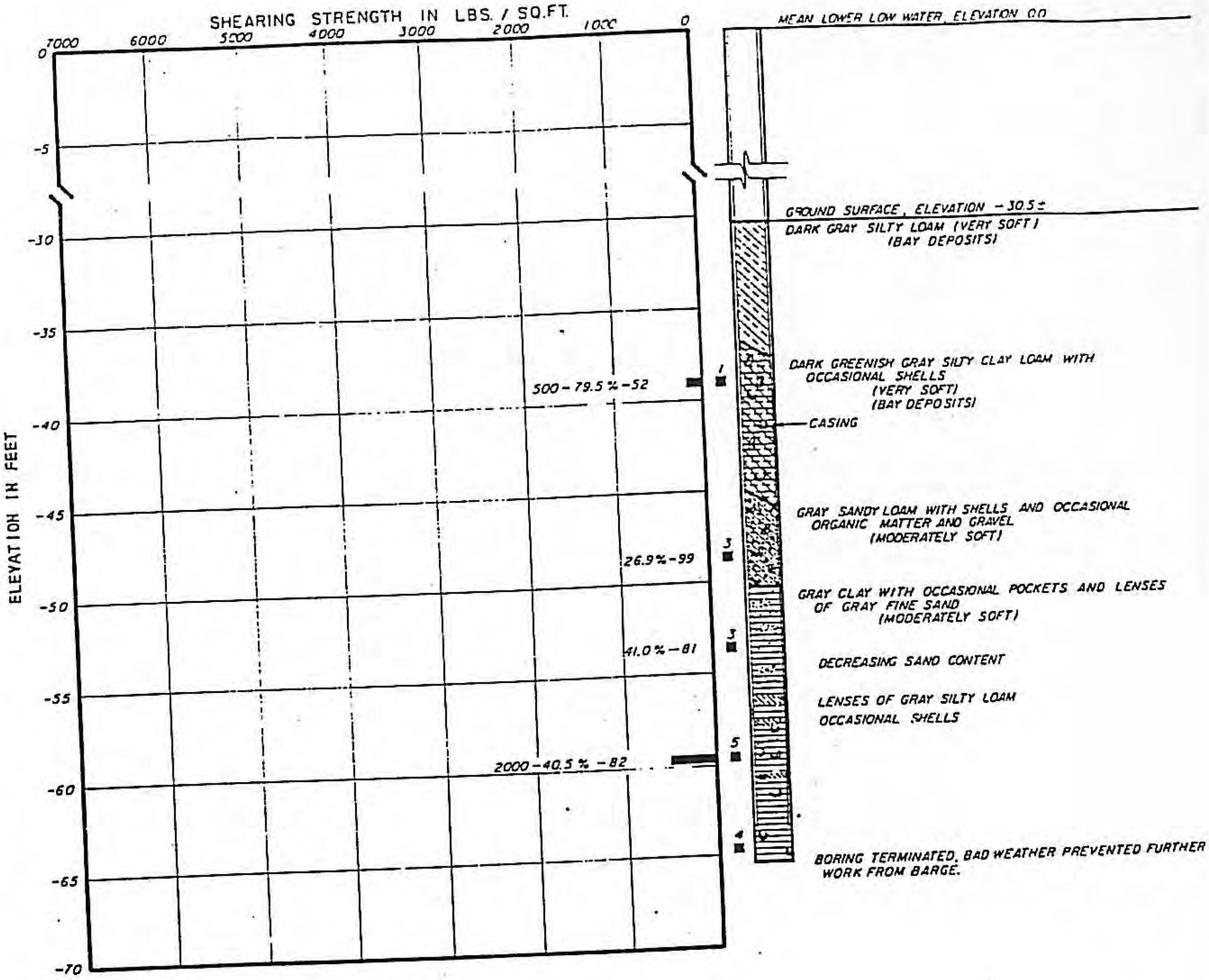


NOTE:
ELEVATIONS REFER TO U.S.C.&G.S
DATUM, (M.L.L.W. = ELEVATION 0.0).

LOG OF BORINGS

DAMES & MOORE
SOIL MECHANICS ENGINEERS

BORING 3



LOG OF BORINGS

FILE 3395-8
Port of Bellingham
BY 156 DATE 12-1-60
CHECKED BY ____ DATE ____

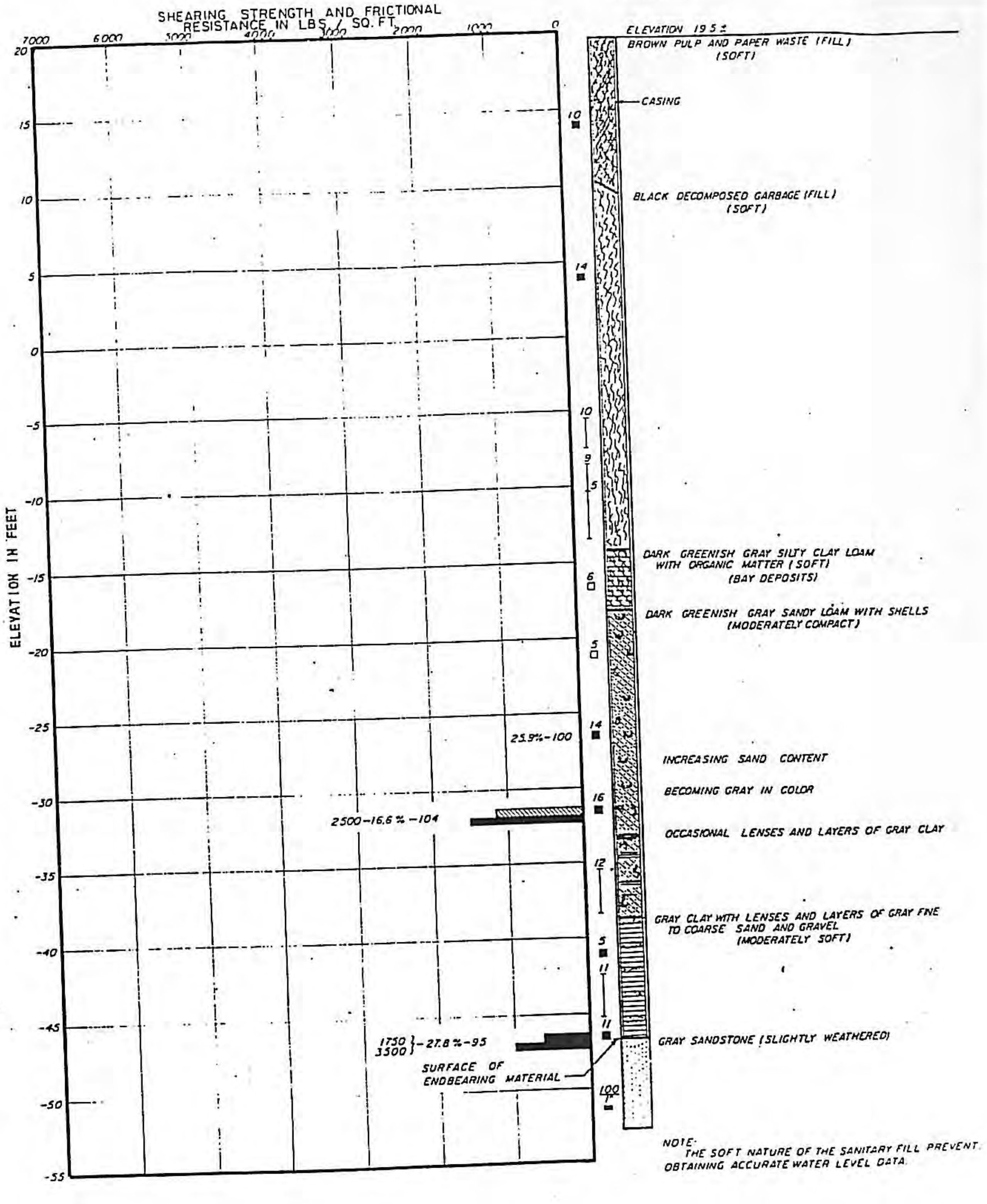
REVISIONS
BY ____ DATE ____
BY ____ DATE ____
PLATE ____ OF ____

DAMES & MO
SOIL MECHANICS ENGI

FILE 3325-8
Port of Bellingham
BY BL DATE 12-1-60
CHECKED BY DATE

REVISIONS
BY DATE
BY DATE
PLATE OF

BORING 4



NOTE:
THE SOFT NATURE OF THE SANITARY FILL PREVENT OBTAINING ACCURATE WATER LEVEL DATA.

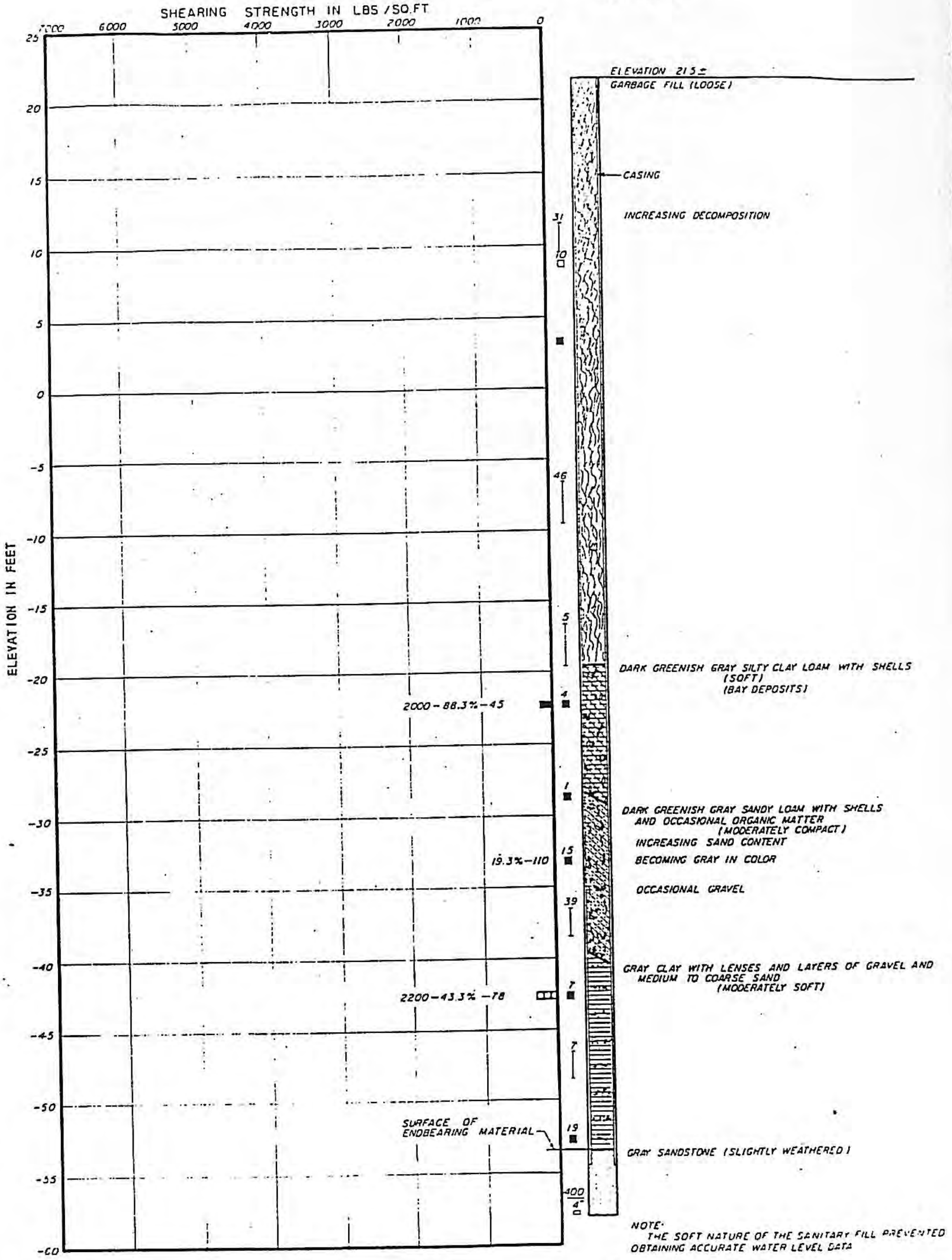
LOG OF BORINGS

DAMES & MO
SOIL MECHANICS ENGIN

FILE 3335-B
Port of Bellingham
BY KC DATE 12-2-60
CHECKED BY ... DATE ...

REVISIONS
BY____ DATE____
BY____ DATE____
PLATE____ OF____

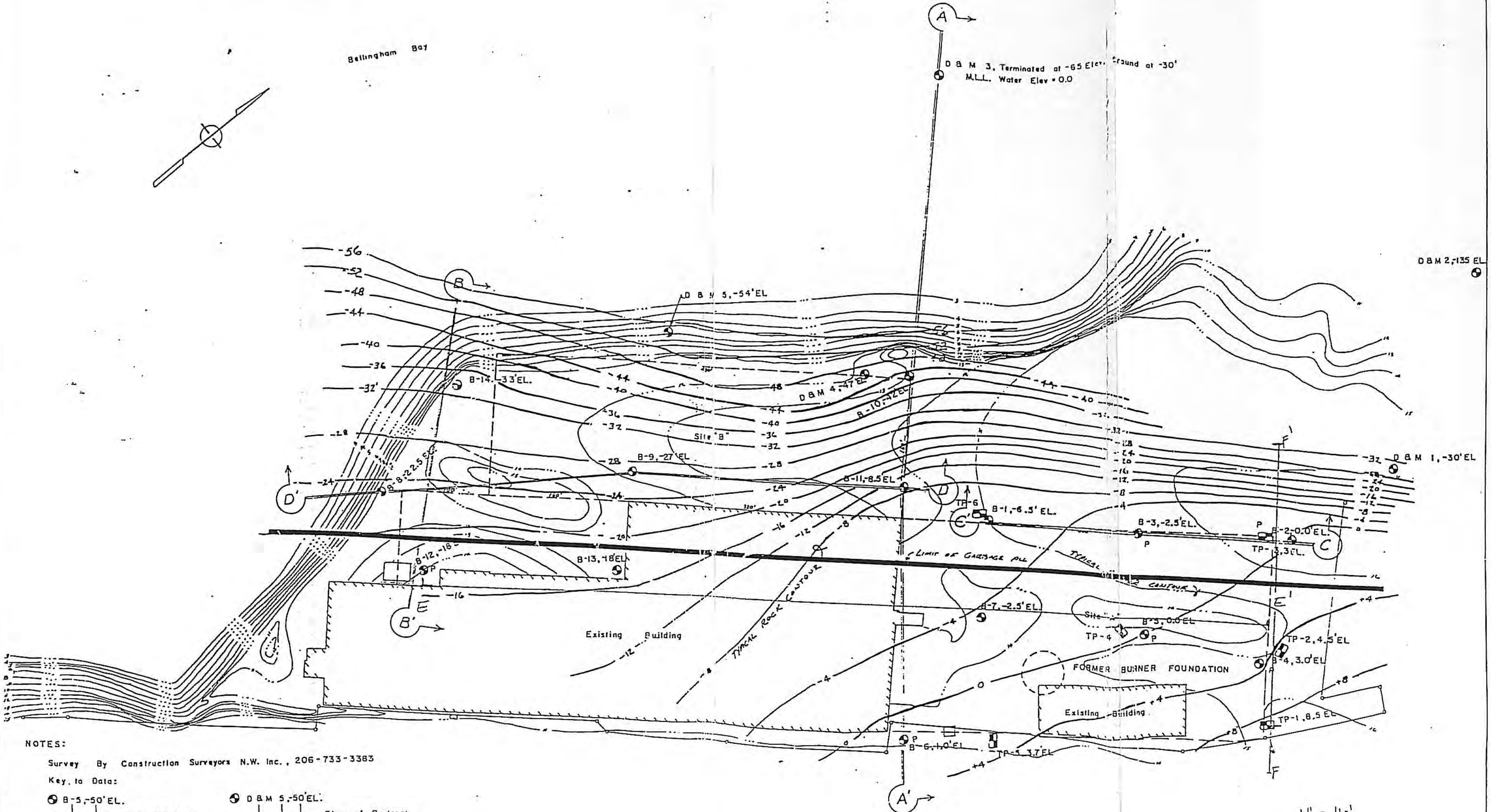
BORING 5



NOTE:
THE SOFT NATURE OF THE SANITARY FILL PREVENTED OBTAINING ACCURATE WATER LEVEL DATA

LOG OF BORINGS

DAMES & MOORE
SOIL MECHANICS ENGINEERS



1" = 110'

NOTES:

Survey By Construction Surveyors N.W. Inc., 206-733-3383

Key to Data:

● B-5, -50'EL.
- Elev. of Bedrock
- Boring Number

▮ TP-5, -10'EL.
- Elev. of Bedrock
- Test Pit Number

● D & M 5, -50'EL.
- Elev. of Bedrock
- Boring Number
- Ref: Report of Soils Investigation Port of Bellingham February 1962

Rock Contours estimated between borings

P - Piezometer Location

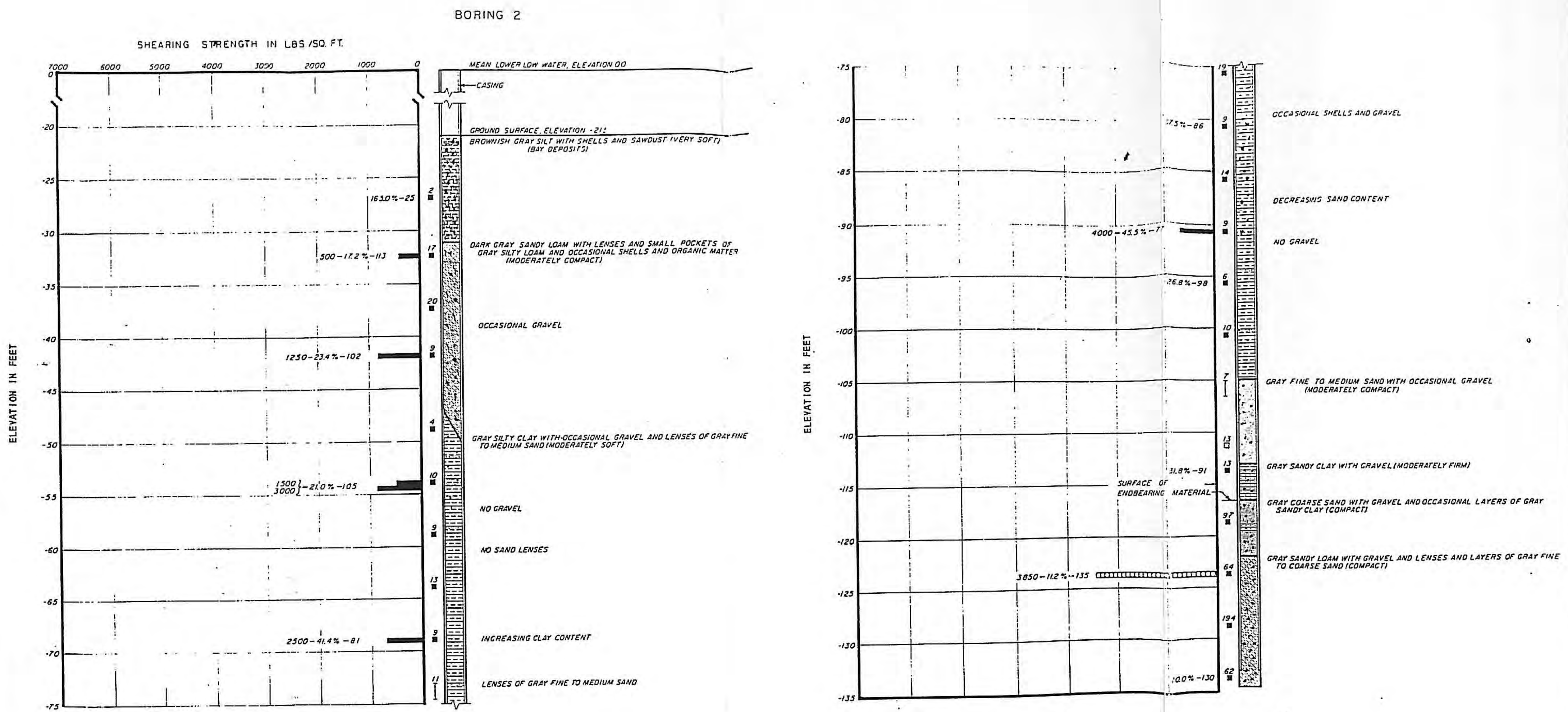
ROCK CONTOURS
PLAN OF TEST PITS & BORING LOCATIONS
AND GEOLOGIC SECTIONS

SCALE ~~1" = 30'~~	Sim Purnell	JP
DATE 3-7-85		

GEORGIA - PACIFIC CORP. WAREHOUSE

W. D. PURNELL & ASSOCIATES
206-676-9589

FIGURE 1



LOG OF BORINGS

DAMES & MOORE

REVISIONS
BY DATE
BY DATE
PLATE OF

FILE
BY DATE
CHECKED BY DATE

FILE 3995-B
Port Of Bellingham
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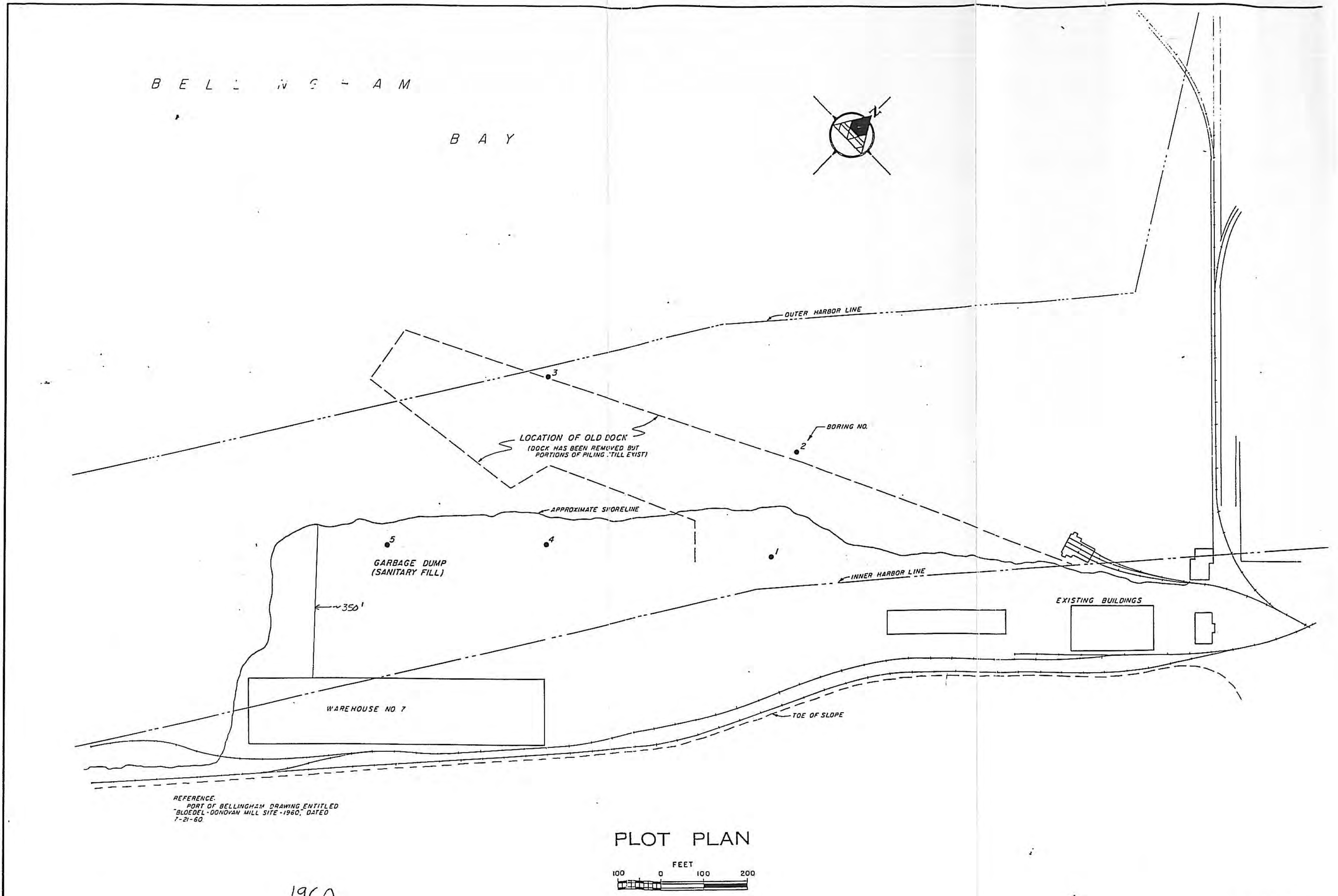

REFERENCE.
PORT OF BELLINGHAM DRAWING ENTITLED "BLOEDEL-DONOVAN MILL SITE-1960," DATED 7-21-60.

PLOT PLAN

1960

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APPENDIX C

American Fabricators Soil Analytical Results (Aspect Consulting 2004)

Table 20 - American Fabrications Soil Analysis Results

Chemical Name	Method A-Soil (Unrestricted)	Method A-Soil (Restricted)	Method B-Soil (Unrestricted)	Method C-Soil (Restricted)	AF-MW01-2 07/19/04 (2.5-4 ft.)	AF-MW01-5 07/19/04 (10-11.5 ft.)	AF-MW02-3 07/19/04 (5-6.5 ft.)	AF-MW02-5 07/19/04 (10-11.5 ft.)	AF-MW02-7 07/19/04 (15-16.5 ft.)	AF-SB01-2 07/19/04 (4-8 ft.)	AF-SB02-1 07/19/04 (0-4 ft.)
Conventionals											
pH in std units					6.99	6.32	6.85	6.78	7.51	7.22	6.59
Metals											
Total Arsenic in mg/kg	20	20	8.5	87.5	5 U	10 U	6 U	7 U	20 U	8 U	7 U
Total Cadmium in mg/kg	2	2	40	1750	0.2 U	0.4 U	0.2 U	0.3 U	0.7 U	0.3 U	0.6
Total Copper in mg/kg			2960	130000	60.8	29.5	31.7	47.3	70.5	31.4	75.2
Total Lead in mg/kg	250	1000			29 J	15 J	5 J	19 J	14 J	89 J	84 J
Total Mercury in mg/kg	2	2	24	1050	0.04	0.1 U	0.04 U	0.06 U	0.07 U	0.08 U	0.07
Total Nickel in mg/kg			1600	70000	35	36	55	48	19	31	50
Total Zinc in mg/kg			24000	1050000	62.9	58	43.3	75.5	46	87	237
Total Chromium in mg/kg					37.7	23	50.2	43.1	19	39.5	38
Chromium III in mg/kg	2000	2000	120000	5250000	37.7	23	50.2	43.1	19	39.5	38
Volatile Aromatics											
Benzene in mg/kg	0.03	0.03	18.2	2390	0.026 U	0.092 U	0.026 U	0.031 U	0.038 U	0.032 U	0.028 U
Ethylbenzene in mg/kg	6	6	8000	350000	0.026 U	0.092 U	0.41	0.031 U	0.038 U	0.032 U	0.028 U
Toluene in mg/kg	7	7	16000	700000	0.026 U	0.092 U	0.042	0.031 U	0.038 U	0.032 U	0.028 U
m,p-Xylene in mg/kg			160000	7000000	0.052 U	0.18 U	0.16	0.062 U	0.075 U	0.065 U	0.056 U
o-Xylene in mg/kg			160000	7000000	0.026 U	0.092 U	0.23	0.031 U	0.038 U	0.032 U	0.028 U
Total Xylenes in mg/kg	9	9			0.039 U	0.136 U	0.39	0.0465 U	0.0565 U	0.0485 U	0.042 U
PAHs											
Acenaphthene in mg/kg			4800	210000	0.049	0.015 U		0.42	0.011		0.0094 U
Acenaphthylene in mg/kg					0.0072 U	0.015 U		0.1	0.0098 U		0.016
Anthracene in mg/kg			24000	1050000	0.051	0.015 U		0.12	0.012		0.024
Benzo(g,h,i)perylene in mg/kg					0.011	0.015 U		0.021 U	0.0098 U		0.11
Fluoranthene in mg/kg			3200	140000	0.28	0.015 U		0.065	0.013		0.24
Fluorene in mg/kg			3200	140000	0.063	0.015 U		0.49	0.02		0.014
Phenanthrene in mg/kg					0.31	0.015 U		1.1	0.042		0.13
Pyrene in mg/kg			2400	105000	0.2	0.015 U		0.12	0.017		0.34
Benzo(a)anthracene in mg/kg					0.051	0.015 U		0.021 U	0.0098 U		0.18
Benzo(a)pyrene in mg/kg	0.1	2	0.137	18	0.022	0.015 U		0.021 U	0.0098 U		0.28
Benzo(b)fluoranthene in mg/kg					0.032	0.015 U		0.021 U	0.0098 U		0.19
Benzo(k)fluoranthene in mg/kg					0.025	0.015 U		0.021 U	0.0098 U		0.22
Chrysene in mg/kg					0.052	0.015 U		0.029	0.0098 U		0.25
Dibenz(a,h)anthracene in mg/kg					0.0072 U	0.015 U		0.021 U	0.0098 U		0.036
Indeno(1,2,3-cd)pyrene in mg/kg					0.0087	0.015 U		0.021 U	0.0098 U		0.1
Total cPAHs (TEF) in mg/kg	0.1	2	0.137	18	0.0356	0.0136 U		0.0192	0.00887 U		0.366
1-Methylnaphthalene in mg/kg					0.018	0.015 U		7.1	0.16		0.12
2-Methylnaphthalene in mg/kg					0.032	0.015 U		12	0.26		0.11
Naphthalene in mg/kg			1600	70000	0.0072 U	0.015 U		0.021 U	0.017		0.063
Total Naphthalenes in mg/kg	5	5			0.0536	0.0225 U		19.1	0.437		0.293

See Table 23 Notes & Definitions for information on result values and qualifiers.

Table 20 - American Fabrications Soil Analysis Results

Chemical Name	Method A-Soil (Unrestricted)	Method A-Soil (Restricted)	Method B-Soil (Unrestricted)	Method C-Soil (Restricted)	AF-MW01-2 07/19/04 (2.5-4 ft.)	AF-MW01-5 07/19/04 (10-11.5 ft.)	AF-MW02-3 07/19/04 (5-6.5 ft.)	AF-MW02-5 07/19/04 (10-11.5 ft.)	AF-MW02-7 07/19/04 (15-16.5 ft.)	AF-SB01-2 07/19/04 (4-8 ft.)	AF-SB02-1 07/19/04 (0-4 ft.)
Semivolatiles											
1,2,4-Trichlorobenzene in mg/kg			800	35000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
1,2-Dichlorobenzene in mg/kg			7200	315000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
1,3-Dichlorobenzene in mg/kg					0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
1,4-Dichlorobenzene in mg/kg			41.7	5470	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
1-Methylnaphthalene in mg/kg							81				
2,2'-Oxybis(1-Chloropropane) in mg/kg			14.3	1880	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
2,4,5-Trichlorophenol in mg/kg			8000	350000	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
2,4,6-Trichlorophenol in mg/kg			90.9	11900	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
2,4-Dichlorophenol in mg/kg			240	10500	0.22 U	0.44 U	0.84 U	0.27 U	0.29 U		0.28 U
2,4-Dimethylphenol in mg/kg			1600	70000	0.22 U	0.44 U	0.84 U	0.27 U	0.29 U		0.28 U
2,4-Dinitrophenol in mg/kg			160	7000	0.72 U	1.5 U	2.8 U	0.91 U	0.98 U		0.94 U
2,4-Dinitrotoluene in mg/kg			160	7000	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
2,6-Dinitrotoluene in mg/kg			80	3500	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
2-Chloronaphthalene in mg/kg			6400	280000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
2-Chlorophenol in mg/kg			400	17500	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
2-Methylnaphthalene in mg/kg							150				
2-Methylphenol in mg/kg			4000	175000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
2-Nitroaniline in mg/kg					0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
2-Nitrophenol in mg/kg					0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
3,3'-Dichlorobenzidine in mg/kg			2.22	292	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
3-Nitroaniline in mg/kg					0.43 U	0.88 U	1.7 U	0.54 U	0.59 U		0.56 U
4,6-Dinitro-2-Methylphenol in mg/kg					0.72 U	1.5 U	2.8 U	0.91 U	0.98 U		0.94 U
4-Bromophenyl-phenylether in mg/kg					0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
4-Chloro-3-methylphenol in mg/kg					0.14 U	0.29 U	0.56 U	0.18 U	0.2 U		0.19 U
4-Chloroaniline in mg/kg			320	14000	0.22 U	0.44 U	0.84 U	0.27 U	0.29 U		0.28 U
4-Chlorophenyl-phenylether in mg/kg					0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
4-Methylphenol in mg/kg			400	17500	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
4-Nitroaniline in mg/kg					0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
4-Nitrophenol in mg/kg					0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
Acenaphthene in mg/kg			4800	210000			4.4				
Acenaphthylene in mg/kg							0.74				
Anthracene in mg/kg			24000	1050000			0.87				
Benzo(g,h,i)perylene in mg/kg							0.19 U				
Benzoic Acid in mg/kg			320000	1.4E+07	0.72 U	1.5 U	2.8 U	0.91 U	0.98 U		0.94 U
Benzyl Alcohol in mg/kg			24000	1050000	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
bis(2-Chloroethoxy) Methane in mg/kg					0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Bis-(2-Chloroethyl) Ether in mg/kg			0.909	119	0.14 U	0.29 U	0.56 U	0.18 U	0.2 U		0.19 U
bis(2-Ethylhexyl)phthalate in mg/kg			71.4	9380	0.1	0.15 U	0.28 U	0.11	0.098 U		0.094 U
Butylbenzylphthalate in mg/kg			16000	700000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Carbazole in mg/kg			50	6560	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Dibenzofuran in mg/kg					0.072 U	0.15 U	2	0.091 U	0.098 U		0.094 U
Diethylphthalate in mg/kg			64000	2800000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U

See Table 23 Notes & Definitions for information on result values and qualifiers.

Table 20 - American Fabrications Soil Analysis Results

Chemical Name	Method A-Soil (Unrestricted)	Method A-Soil (Restricted)	Method B-Soil (Unrestricted)	Method C-Soil (Restricted)	AF-MW01-2 07/19/04 (2.5-4 ft.)	AF-MW01-5 07/19/04 (10-11.5 ft.)	AF-MW02-3 07/19/04 (5-6.5 ft.)	AF-MW02-5 07/19/04 (10-11.5 ft.)	AF-MW02-7 07/19/04 (15-16.5 ft.)	AF-SB01-2 07/19/04 (4-8 ft.)	AF-SB02-1 07/19/04 (0-4 ft.)
Dimethylphthalate in mg/kg			80000	3500000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Di-n-Butylphthalate in mg/kg			8000	350000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Di-n-Octyl phthalate in mg/kg			1600	70000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Fluoranthene in mg/kg			3200	140000			0.6				
Fluorene in mg/kg			3200	140000			4.6				
Hexachlorobenzene in mg/kg			0.625	82	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Hexachlorobutadiene in mg/kg			12.8	1680	0.14 U	0.29 U	0.56 U	0.18 U	0.2 U		0.19 U
Hexachlorocyclopentadiene in mg/kg			480	21000	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
Hexachloroethane in mg/kg			71.4	9380	0.14 U	0.29 U	0.56 U	0.18 U	0.2 U		0.19 U
Isophorone in mg/kg			1050	138000	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
Naphthalene in mg/kg			1600	70000			0.87				
Nitrobenzene in mg/kg			40	1750	0.072 U	0.15 U	0.28 U	0.091 U	0.098 U		0.094 U
N-Nitroso-Di-N-Propylamine in mg/kg			0.143	18.8	0.14 U	0.29 U	0.56 U	0.18 U	0.2 U		0.19 U
N-Nitrosodiphenylamine in mg/kg			204	26800	0.072 U	0.15 U	0.28 U	0.41	0.098 U		0.094 U
Pentachlorophenol in mg/kg			8.33	1090	0.36 U	0.74 U	1.4 U	0.45 U	0.49 U		0.47 U
Phenanthrene in mg/kg							12				
Phenol in mg/kg			48000	2100000	0.14 U	0.29 U	0.56 U	0.18 U	0.2 U		0.19 U
Pyrene in mg/kg			2400	105000			1.2				
Benzo(a)anthracene in mg/kg							0.19 U				
Benzo(a)pyrene in mg/kg	0.1	2	0.137	18			0.19 U				
Benzo(b)fluoranthene in mg/kg							0.19 U				
Benzo(k)fluoranthene in mg/kg							0.19 U				
Chrysene in mg/kg							0.21				
Dibenz(a,h)anthracene in mg/kg							0.19 U				
Indeno(1,2,3-cd)pyrene in mg/kg							0.19 U				
Total cPAHs (TEF) in mg/kg	0.1	2	0.137	18			0.173				
TPH											
Gasoline Range Hydrocarbons in mg/kg	100	100			5.2 U	18 U	500	80	7.5 U	6.5 U	5.6 U
Bunker C in mg/kg	2000	2000				230 J					
Diesel Range Hydrocarbons in mg/kg	2000	2000			10 J		7100	270	160	19 J	200
Motor Oil in mg/kg	2000	2000			43 J		310	22	76	120 J	150
PCBs											
Aroclor 1016 in mg/kg			5.6	245	0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Aroclor 1221 in mg/kg					0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Aroclor 1232 in mg/kg					0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Aroclor 1242 in mg/kg					0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Aroclor 1248 in mg/kg					0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Aroclor 1254 in mg/kg			1.6	70	0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Aroclor 1260 in mg/kg					0.036 U	0.073 U	0.038 U	0.045 U	0.049 U		0.047 U
Total PCBs in mg/kg	1	10			0.126 U	0.256 U	0.133 U	0.157 U	0.172 U		0.164 U

See Table 23 Notes & Definitions for information on result values and qualifiers.

Table 20 - American Fabrications Soil Analysis Results

Chemical Name	AF-SB02-2 07/19/04 (4-8 ft.)	AF-SB03-1 07/19/04 (0-4 ft.)	AF-SB03-3 07/19/04 (8-12 ft.)	AF-SB04-1 07/22/04 (0-4 ft.)	AF-SB04-2 07/22/04 (4-8 ft.)	AF-SB04-3 07/22/04 (8-12 ft.)	AF-SB04-8 07/22/04 (8-12 ft.)
Conventionals							
pH in std units	6.63	8.04	6.63	7.58		8.05	8.1
Metals							
Total Arsenic in mg/kg	7 U	5 U	6 U	10 U		6 U	6 U
Total Cadmium in mg/kg	0.3 U	0.2	0.2 U	0.5 U		0.3	0.2 U
Total Copper in mg/kg	62.9	27.1	38.6	56.7		48	44.1
Total Lead in mg/kg	13 J	20 J	14	27		42	44
Total Mercury in mg/kg	0.06 U	0.05 U	0.05	0.18		0.09	0.08
Total Nickel in mg/kg	22	31	29	31		29	45
Total Zinc in mg/kg	38.8	76.3	60.7	64		77.5	76.8
Total Chromium in mg/kg	23.3	30.5	40	51		34.4	41.9
Chromium III in mg/kg	23.3	30.5	40	51		34.4	41.9
Volatile Aromatics							
Benzene in mg/kg	0.034 U	0.025 U	0.027 U		0.028 U	0.029 U	
Ethylbenzene in mg/kg	0.034 U	0.025 U	0.027 U		0.82	0.093	
Toluene in mg/kg	0.034 U	0.025 U	0.027 U		0.028 U	0.029 U	
m,p-Xylene in mg/kg	0.067 U	0.05 U	0.055 U		0.072	0.067	
o-Xylene in mg/kg	0.034 U	0.025 U	0.027 U		0.15	0.029 U	
Total Xylenes in mg/kg	0.0505 U	0.0375 U	0.041 U		0.222	0.0815	
PAHs							
Acenaphthene in mg/kg	0.0098 U	0.0071 U	0.0083 U		2.6	4.3	2.5
Acenaphthylene in mg/kg	0.0098 U	0.0071 U	0.0083 U		0.66	1.1	0.62
Anthracene in mg/kg	0.0098 U	0.0085	0.0083 U		0.65 J	1.2 J	0.75 J
Benzo(g,h,i)perylene in mg/kg	0.0098 U	0.0071 U	0.0083 U		0.21	0.07	0.061
Fluoranthene in mg/kg	0.012	0.041	0.011		0.87	1.5	0.85
Fluorene in mg/kg	0.0098 U	0.0071 U	0.0083 U		3.7	7.5	3.5
Phenanthrene in mg/kg	0.019	0.033	0.021		10	20	12
Pyrene in mg/kg	0.019	0.034	0.013		1.5	2.5	1.5
Benzo(a)anthracene in mg/kg	0.0098 U	0.013	0.0083 U		0.36	0.38	0.22
Benzo(a)pyrene in mg/kg	0.013	0.014	0.0083 U		0.32	0.18	0.12
Benzo(b)fluoranthene in mg/kg	0.0098 U	0.027	0.0083 U		0.36	0.16	0.1
Benzo(k)fluoranthene in mg/kg	0.0098 U	0.012	0.0083 U		0.29	0.15	0.12
Chrysene in mg/kg	0.0098 U	0.023	0.0083 U		0.49	0.58	0.35
Dibenz(a,h)anthracene in mg/kg	0.0098 U	0.0071 U	0.0083 U		0.057	0.06 U	0.038 U
Indeno(1,2,3-cd)pyrene in mg/kg	0.0098 U	0.0071 U	0.0083 U		0.18	0.06 U	0.041
Total cPAHs (TEF) in mg/kg	0.017	0.0212	0.00751 U		0.467	0.27	0.179
1-Methylnaphthalene in mg/kg	0.063	0.077	0.04		52	120	73
2-Methylnaphthalene in mg/kg	0.057	0.094	0.018		96	240	140
Naphthalene in mg/kg	0.032	0.015	0.0091		2	15	9.2
Total Naphthalenes in mg/kg	0.152	0.186	0.0671		150	375	222

See Table 23 Notes & Definitions for information on result values and qualifiers.

Table 20 - American Fabrications Soil Analysis Results

Chemical Name	AF-SB02-2 07/19/04 (4-8 ft.)	AF-SB03-1 07/19/04 (0-4 ft.)	AF-SB03-3 07/19/04 (8-12 ft.)	AF-SB04-1 07/22/04 (0-4 ft.)	AF-SB04-2 07/22/04 (4-8 ft.)	AF-SB04-3 07/22/04 (8-12 ft.)	AF-SB04-8 07/22/04 (8-12 ft.)
Semivolatiles							
1,2,4-Trichlorobenzene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
1,2-Dichlorobenzene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
1,3-Dichlorobenzene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
1,4-Dichlorobenzene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
1-Methylnaphthalene in mg/kg							
2,2'-Oxybis(1-Chloropropane) in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
2,4,5-Trichlorophenol in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
2,4,6-Trichlorophenol in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
2,4-Dichlorophenol in mg/kg	0.29 U	0.21 U	0.25 U		0.24 U	0.31 U	0.24 U
2,4-Dimethylphenol in mg/kg	0.29 U	0.21 U	0.25 U		0.24 U	0.31 U	0.24 U
2,4-Dinitrophenol in mg/kg	0.98 U	0.71 U	0.83 U		0.8 U	1 U	0.79 U
2,4-Dinitrotoluene in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
2,6-Dinitrotoluene in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
2-Chloronaphthalene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
2-Chlorophenol in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
2-Methylnaphthalene in mg/kg							
2-Methylphenol in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
2-Nitroaniline in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
2-Nitrophenol in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
3,3'-Dichlorobenzidine in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
3-Nitroaniline in mg/kg	0.59 U	0.42 U	0.5 U		0.48 U	0.61 U	0.48 U
4,6-Dinitro-2-Methylphenol in mg/kg	0.98 U	0.71 U	0.83 U		0.8 U	1 U	0.79 U
4-Bromophenyl-phenylether in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
4-Chloro-3-methylphenol in mg/kg	0.2 U	0.14 U	0.17 U		0.16 U	0.2 U	0.16 U
4-Chloroaniline in mg/kg	0.29 U	0.21 U	0.25 U		0.24 U	0.31 U	0.24 U
4-Chlorophenyl-phenylether in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
4-Methylphenol in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
4-Nitroaniline in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
4-Nitrophenol in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
Acenaphthene in mg/kg							
Acenaphthylene in mg/kg							
Anthracene in mg/kg							
Benzo(g,h,i)perylene in mg/kg							
Benzoic Acid in mg/kg	0.98 U	0.71 U	0.83 U		0.8 U	1 U	0.79 U
Benzyl Alcohol in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
bis(2-Chloroethoxy) Methane in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
Bis-(2-Chloroethyl) Ether in mg/kg	0.2 U	0.14 U	0.17 U		0.16 U	0.2 U	0.16 U
bis(2-Ethylhexyl)phthalate in mg/kg	0.098 U	0.071 U	0.083 U		0.22	0.1 U	0.079 U
Butylbenzylphthalate in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
Carbazole in mg/kg	0.098 U	0.071 U	0.083 U		0.16	0.1 U	0.079 U
Dibenzofuran in mg/kg	0.098 U	0.071 U	0.083 U		0.084 J	0.1 U	0.85
Diethylphthalate in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U

See Table 23 Notes & Definitions for information on result values and qualifiers.

Table 20 - American Fabrications Soil Analysis Results

Chemical Name	AF-SB02-2 07/19/04 (4-8 ft.)	AF-SB03-1 07/19/04 (0-4 ft.)	AF-SB03-3 07/19/04 (8-12 ft.)	AF-SB04-1 07/22/04 (0-4 ft.)	AF-SB04-2 07/22/04 (4-8 ft.)	AF-SB04-3 07/22/04 (8-12 ft.)	AF-SB04-8 07/22/04 (8-12 ft.)
Dimethylphthalate in mg/kg	0.098 U	0.071 U	0.083 U		0.68	0.1 U	0.079 U
Di-n-Butylphthalate in mg/kg	0.098 U	0.071 U	0.083 U		0.48	0.1 U	0.079 U
Di-n-Octyl phthalate in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
Fluoranthene in mg/kg							
Fluorene in mg/kg							
Hexachlorobenzene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
Hexachlorobutadiene in mg/kg	0.2 U	0.14 U	0.17 U		0.16 U	0.2 U	0.16 U
Hexachlorocyclopentadiene in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.51 U	0.4 U
Hexachloroethane in mg/kg	0.2 U	0.14 U	0.17 U		0.16 U	0.2 U	0.16 U
Isophorone in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
Naphthalene in mg/kg							
Nitrobenzene in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
N-Nitroso-Di-N-Propylamine in mg/kg	0.2 U	0.14 U	0.17 U		0.16 U	0.2 U	0.16 U
N-Nitrosodiphenylamine in mg/kg	0.098 U	0.071 U	0.083 U		0.08 U	0.1 U	0.079 U
Pentachlorophenol in mg/kg	0.49 U	0.35 U	0.41 U		0.4 U	0.61 J	0.65 J
Phenanthrene in mg/kg							
Phenol in mg/kg	0.2 U	0.14 U	0.17 U		0.16 U	0.2 U	0.16 U
Pyrene in mg/kg							
Benzo(a)anthracene in mg/kg							
Benzo(a)pyrene in mg/kg							
Benzo(b)fluoranthene in mg/kg							
Benzo(k)fluoranthene in mg/kg							
Chrysene in mg/kg							
Dibenz(a,h)anthracene in mg/kg							
Indeno(1,2,3-cd)pyrene in mg/kg							
Total cPAHs (TEF) in mg/kg							
TPH							
Gasoline Range Hydrocarbons in mg/kg	6.7 U	5.0 U	7.3		**490**	**170**	
Bunker C in mg/kg							
Diesel Range Hydrocarbons in mg/kg	160	30	33	55	1700	**4200**	**2500**
Motor Oil in mg/kg	130	90	77	300	940	1700	1100
PCBs							
Aroclor 1016 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Aroclor 1221 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Aroclor 1232 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Aroclor 1242 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Aroclor 1248 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Aroclor 1254 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Aroclor 1260 in mg/kg	0.049 U	0.036 U	0.041 U	0.036 U		0.041 U	
Total PCBs in mg/kg	0.172 U	0.126 U	0.144 U	0.126 U		0.144 U	

See Table 23 Notes & Definitions for information on result values and qualifiers.

APPENDIX D

Site Laboratory Analytical Reports, Summary of Results, and Data Validation

Analytical Resources, Incorporated
Analytical Chemists and Consultants

October 12, 2012

Mr. Larry Beard
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall, 0001020.400.510
ARI Job Nos: VK65, VK75, VL48

Dear Larry,

Please find enclosed the Chain-of-Custody records (COCs), sample receipt documentation, and the final analytical results for samples received under the project referenced above. Analytical Resources, Inc. (ARI) accepted fifteen water samples and a trip blank on September 25, 2012. The samples were received in good condition and there were no discrepancies between the COCs and container labels.

Select samples were centrifuged prior to analysis. Details regarding centrifuging can be found in the Geotechnical Case Narrative.

The samples were analyzed for SVOCs, SIM PAHs, Pesticides, Herbicides, NWTPH-HCID, VOCs, Dissolved Metals, Anions, Sulfide, Ammonia, Total and Amenable Cyanide, TOC, COD, BOD, Turbidity, and Tannins/Lignins, as requested on the COCs. NWTPH-Gx and NWTPH-Dx were additionally listed as requested on the COCs but were only analyzed if NWTPH-HCID results were above detection limits. The Tannins/Lignins analysis was subcontracted to Aquatic Research, Inc. and all results have been included in this report.

The VOC LCSD percent recovery of 2,2-Dichloropropane fell outside the control limits low for **LCS-092612A**. All other percent recoveries were within control limits. No corrective action was taken.

Both SVOC continuing calibrations fell outside the 20% control limit low for 2,4-Dinitrophenol. All detected results for this compound have been flagged with a "Q" qualifier. No further corrective action was taken.

The Pesticide LCS and LCSD percent recoveries of delta-BHC fell outside the control limits low for **LCS-092912**. All other percent recoveries were within control limits. No corrective action was taken.

Several LCS and LCSD percent recoveries were outside control limits with wide RPDs for **LCS-092812**. The LCS, LCSD, Method Blank, and all associated samples were re-extracted and re-analyzed outside the method recommended holding time. The re-extracted LCS/LCSD percent recoveries of 2,4-D, and the LCS percent recoveries of 2,4,5-T and Dicamba fell outside the control limits low with a wide RPD for Dalapon. All samples were undetected for requested compounds. No further corrective action was taken.

Samples **MW-15D-092412**, **MW-16D-092412**, **MW-14D-092412**, **MW-15S-092412**, **MW-16S-092412**, and **MW-14S-092412** were extracted outside the seven-day recommended holding time for NWTPH-Dx. Samples **MW-13D-092412** and **MW-DUP-092412** were extracted within the recommended holding time.

The samples were analyzed outside the recommended holding time for Turbidity.

The cyanide aliquot for sample **MW-12S-092412** was not preserved upon laboratory receipt. This sample was analyzed for cyanide outside the recommended holding time for unpreserved samples.

The replicate RPD of COD was outside the 20% control limit for sample **MW-15D-092412**. All other quality control parameters were met for this analysis. No corrective action was taken.

The sulfate samples MW-15D-092412 and MW-Dup-092412 were originally analyzed within method recommended holding time and at the request of the client the samples were re-analyzed and reported outside of the method recommended holding time as the data was not consistent with a sample duplicate.

An electronic copy of this report and all associated raw data will remain on file at ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,
ANALYTICAL RESOURCES, INC.

Cheronne Oreiro
Project Manager
-For-
Kelly Bottem
Client Services Manager
206-695-6211

LANDAU ASSOCIATES

☒ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐

0.4-5.9

Date 09/24/12
Page 1 of 2

Chain-of-Custody Record

Project Name CORNWALL
Project No. 000020.400.510
Project Location/Event BELLINGHAM, WA / ADDITIONAL GROUNDWATER INVESTIGATION
Sampler's Name CHRISTOPHE VENOT / ROSEMARY TRIMMER
Project Contact " / JEREMY DAVIS / LARRY BEARD
Send Results To ANNE HALVORSEN / " / "

Turnaround Time
☒ Standard
☐ Accelerated
☐

Testing Parameters

	Sample I.D.	Date	Time	Matrix	No. of Containers	SVOC	SIM PAH	PESTICIDES	HERBICIDES	HCID	VOCS	DISSOLVED METALS (c)	ANIONS (NO2, NO3, SO4)(d)	SULFIDE	NH3	TOT + FREE CYANIDE	TANNINS + LIGNINS
(a)	MW-15D-092412	092412	0826	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-16D-092412	092412	0830	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-14D-092412	092412	1000	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-15S-092412	092412	1050	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-16S-092412	092412	1130	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-14S-092412	092412	1250	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-13S-092412	092412	1300	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-12S-092412	092412	1400	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-11S-092412	092412	1425	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-12D-092412	092412	1510	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-11D-092412	092412	1535	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-13D-092412	092412	1700	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
	MW-DUP-092412	092412	—	AQ	19	X	X	X	X	X	X	X	X	X	X	X	X
(b)	MW-15S-092412	092412	1050	AQ	8	X	X	X	X								
	MW-13D-092412	092412	1700	AQ	8	X	X	X	X								
	TBS			AQ	3						X						

Observations/Comments
X Allow water samples to settle, collect aliquot from clear portion
X NWTPH-Dx - run acid wash/silica gel cleanup
___ run samples standardized to ___ product
___ Analyze for EPH if no specific product identified
VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt
X Dissolved metal water samples field filtered
Other (a) Centrifuge prior to analysis FOR SVOC PAH PEST + HERB
(b) DO NOT Centrifuge prior to analysis
(c) As, Cu, Pb, Mn, Zn, Hg
(d) NOTE SHORT 48-HR HOLD TIME

Special Shipment/Handling or Storage Requirements ON ICE
Method of Shipment DROP-OFF

Relinquished by	Received by	Relinquished by	Received by
Signature Rosemary Trimmer	Signature	Signature	Signature
Printed Name Rosemary Trimmer	Printed Name Jennifer Millsap	Printed Name	Printed Name
Company Landau Associates	Company ARI	Company	Company
Date 9/25/12 Time 12:01	Date 9/25/12 Time 1201	Date Time	Date Time

VK65 : 00003

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

LANDAU ASSOCIATES

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☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ______

Date 09/24/12
Page 2 of 2

Chain-of-Custody Record

Project Name CORNWALL
Project No. 0001020.400.510
Project Location/Event BELLINGHAM, WA / ADDITIONAL GW INVESTIGATION
Sampler's Name CHRISTOPHE VENOT / ROSEMARY TRIMMER
Project Contact " / JEREMY DAVIS / LARRY BEARD
Send Results To ~~ANNE~~ HALVORSEN / " / "

Turnaround Time
☒ Standard
☐ Accelerated
☐ ______

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	TOC AND COD	BOD (c)	NWTPH-DX (a)	NWTPH-GX (a)	TURBIDITY (b)
MW-15D-092412	092412	0826	AQ	6	X	X			
MW-16D-092412	092412	0836	AQ	6	X	X			
MW-14D-092412	092412	1000	AQ	6	X	X			
MW-15S-092412	092412	1050	AQ	6	X	X			X (b)
MW-16S-092412	092412	1130	AQ	6	X	X			
MW-14S-092412	092412	1250	AQ	6	X	X			
MW-13S-092412	092412	1300	AQ	6	X	X			
MW-12S-092412	092412	1400	AQ	6	X	X			
MW-11S-092412	092412	1425	AQ	6	X	X			
MW-12D-092412	092412	1510	AQ	6	X	X			
MW-11D-092412	092412	1535	AQ	6	X	X			
MW-13D-092412	092412	1700	AQ	6	X	X			X (b)
MW-DUP-092412	092412	—	AQ	6	X	X			
~~MW-15S-092412~~	~~092412~~	~~1050~~	~~AQ~~						~~X~~
~~MW-13D-092412~~	~~092412~~	~~1700~~	~~AQ~~						~~X~~
TBS				2				X	

OK CW 9/24/12

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash/silica gel cleanup

___ run samples standardized to ______ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt

___ Dissolved metal water samples field filtered

Other (a) LAI TO FOLLOW-UP BASED ON HCID RESULTS
(b) MEASURE FROM CENTRIFUGED SAMPLES
(c) NOTE 48-HR HOLD TIME

Special Shipment/Handling or Storage Requirements ON ICE

Method of Shipment DROP-OFF

Relinquished by	Received by	Relinquished by	Received by
Signature Rosemary Trimmer	Signature	Signature	Signature
Printed Name Rosemary Trimmer	Printed Name Jennifer Millsap	Printed Name	Printed Name
Company Landau Associates	Company ARI	Company	Company
Date 9/25/12 Time 12:01	Date 9/25/12 Time 1201	Date ______ Time ______	Date ______ Time ______

VK65 : 00004

WHITE COPY - Project File   YELLOW COPY - Laboratory   PINK COPY - Client Representative

Rev 8/09

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client Landau
Project Name Cornwall
COC No(s) ______ NA
Delivered by: Fed-Ex UPS Courier [✓ Hand Delivered] Other: ______
Assigned ARI Job No ~~VE65~~ VK65
Tracking No ______ [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES [✓ NO]
Were custody papers included with the cooler? [✓ YES] NO
Were custody papers properly filled out (ink, signed, etc.) [✓ YES] NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.3 5.9 1.4 5.1 3.6 3.7
If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90877952
Cooler Accepted by JM Date ______ Time: ______

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES [✓ NO]
What kind of packing material was used? Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: ______
Was sufficient ice used (if appropriate)? NA [✓ YES] NO
Were all bottles sealed in individual plastic bags? YES [✓ NO]
Did all bottles arrive in good condition (unbroken)? [✓ YES] NO
Were all bottle labels complete and legible? [✓ YES] NO
Did the number of containers listed on COC match with the number of containers received? [✓ YES] NO
Did all bottle labels and tags agree with custody papers? [✓ YES] NO
Were all bottles used correct for the requested analyses? [✓ YES] NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) NA [✓ YES] NO
Were all VOC vials free of air bubbles? NA YES [✓ NO]
Was sufficient amount of sample sent in each bottle? [✓ YES] NO
Date VOC Trip Blank was made at ARI NA 9/13/12
Was Sample Split by ARI: [✓ NA] YES Date/Time: ______ Equipment ______ Split by ______

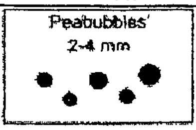
Samples Logged by JM Date: 9/25/12 Time: 1358

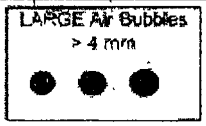
*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions: 0.4, 5.7, 2.9, 1.3, 1.8, 4.9, 1.9, 0.9

By JM Date: 9/25/12





Small → "sm"	
Peabubbles → "pb"	
Large → "lg"	
Headspace → "hs"	

VOA Bubbles

MW-15D-092412 = LG in 1, PB in 4 of 5
MW-16D-092412 = PB in 3 of 5
MW-14D-092412 = LG in 4, SM in 1 of 5
MW-15S-092412 = SM in 4 of 5
MW-16S-092412 = PB in 2, SM in 3 of 5
MW-14S-092412 = SM in 5 of 5
MW-13S-092412 = PB in 2, SM in 3 of 5
MW-12S-092412 = PB in 2, SM in 3 of 5
MW-11S-092412 = SM in 5 of 5
MW-12D-092412 = SM in 3, PB in 2 of 5
MW-11D-092412 = PB in 4, SM in 1 of 5
MW-13D-092412 = PB in 5 of 5
MW-DUP-092412 = PB in 3, SM in 2 of 5
TBS = SM in 4 of 9

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client Landau

Project Name Cornwall

COC No(s) JM [✓ NA]

Delivered by Fed-Ex UPS Courier [✓ Hand Delivered] Other

Assigned ARI Job No ~~VE65~~ ~~VK65~~ VK75

Tracking No [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	[✓ NO]
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.3 5.9 1.4 5.1 3.6 3.7

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID# 90877952

Cooler Accepted by: JM Date: Time:

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	[✓ NO]
What kind of packing material was used? Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other:			
Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		YES	[✓ NO]
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		[✓ YES]	NO
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	NA	[✓ YES]	NO
Were all VOC vials free of air bubbles?	[✓ NA]	YES	NO
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	[✓ NA]		

Was Sample Split by ARI: [✓ NA] YES Date/Time: Equipment: Split by:

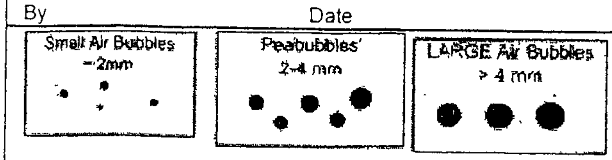
Samples Logged by: JM Date: 9/25/12 Time: 1541

*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions: 0.4, 5.7, 2.9, 1.3, 1.8, 4.9, 1.9, 0.9

By Date



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

PRESERVATION VERIFICATION 09/25/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VK65**

PC: Kelly
VTSR: 09/25/12

Inquiry Number: NONE
Analysis Requested: 09/25/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0001020.400-510
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-18405 **VK65A**	MW-15D-092412	F		P	P		DIS P					P	F			Y						
12-18406 **VK65B**	MW-16D-092412	F		P	P		DIS P					P	F			Y						
12-18407 **VK65C**	MW-14D-092412	F		P	P		DIS P					P	F			Y						
12-18408 **VK65D**	MW-15S-092412	F		P	P		DIS P					P	F			Y						
12-18409 **VK65E**	MW-16S-092412	F		P	P		DIS P					P	F			Y						
12-18410 **VK65F**	MW-14S-092412	F		P	P		DIS P					P	F			Y						
12-18411 **VK65G**	MW-13S-092412	F		P	P		DIS P					P	F			Y						
12-18412 **VK65H**	MW-12S-092412	F		P	P		DIS P					P	F			Y						
12-18413 **VK65I**	MW-11S-092412	F		P	P		DIS P					P	F			Y						
12-18414 **VK65J**	MW-12D-092412	F		P	P		DIS P					P	F			Y						
12-18415 **VK65K**	MW-11D-092412	F		P	P		DIS P					P	F			Y						
12-18416 **VK65L**	MW-13D-092412	F		P	P		DIS P					P	F			Y						
12-18417 **VK65M**	MW-DUP-092412	F		P	P		DIS P					P	F			Y						

P= Pass
F= Fail

S2 only preserved with ZnOAc.

Checked By JM Date 9/25/12

PRESERVATION VERIFICATION 09/25/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VK65**

Inquiry Number: NONE
Analysis Requested: 09/25/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

PC: Kelly
VTSR: 09/25/12

Project #: 0001020.400-510
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-18405 **VK65A**	MW-15D-092412	F		P	P		DIS P					P	F			Y		S⁼ CN	>12 >12		2ml NaOH 6N	9-25-12
12-18406 **VK65B**	MW-16D-092412	F		P	P		DIS P					P	F			Y						
12-18407 **VK65C**	MW-14D-092412	F		P	P		DIS P					P	F			Y						
12-18408 **VK65D**	MW-15S-092412	F		P	P		DIS P					P	F			Y						
12-18409 **VK65E**	MW-16S-092412	F		P	P		DIS P					P	F			Y						
12-18410 **VK65F**	MW-14S-092412	F		P	P		DIS P					P	F			Y						
12-18411 **VK65G**	MW-13S-092412	F		P	P		DIS P					P	F			Y						
12-18412 **VK65H**	MW-12S-092412	F		P	P		DIS P					P	F			Y						
12-18413 **VK65I**	MW-11S-092412	F		P	P		DIS P					P	F			Y						
12-18414 **VK65J**	MW-12D-092412	F		P	P		DIS P					P	F			Y						
12-18415 **VK65K**	MW-11D-092412	F		P	P		DIS P					P	F			Y						
12-18416 **VK65L**	MW-13D-092412	F		P	P		DIS P					P	F			Y						
12-18417 **VK65M**	MW-DUP-092412	F		P	P		DIS P					P	F			Y						

P= Pass
F= Fail

S2 only preserved with ZnOAc.

Checked By JM Date 9/25/12

PRESERVATION VERIFICATION 09/25/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VK75**

PC: Kelly
VTSR: 09/25/12

Inquiry Number: NONE
Analysis Requested: 09/25/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0001020.400-510
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-18431 **VK75A**	MW-15D-092412						DIS P									Y						
12-18432 **VK75B**	MW-16D-092412						DIS P									Y						
12-18433 **VK75C**	MW-14D-092412						DIS P									Y						
12-18434 **VK75D**	MW-15S-092412						DIS P									Y						
12-18435 **VK75E**	MW-16S-092412						DIS P									Y						
12-18436 **VK75F**	MW-14S-092412						DIS P									Y						
12-18437 **VK75G**	MW-13S-092412						DIS P									Y						
12-18438 **VK75H**	MW-12S-092412						DIS P									Y						
12-18439 **VK75I**	MW-11S-092412						DIS P									Y						
12-18440 **VK75J**	MW-12D-092412						DIS P									Y						
12-18441 **VK75K**	MW-11D-092412						DIS P									Y						
12-18442 **VK75L**	MW-13D-092412						DIS P									Y						
12-18443 **VK75M**	MW-DUP-092412						DIS P									Y						

P= Pass

Checked By JM Date 9/25/12

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VK65
Client: Landau Associates
Project Event: 0001020.400-510
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-15D-092412	VK65A	12-18405	Water	09/24/12 08:26	09/25/12 12:01
2.	MW-16D-092412	VK65B	12-18406	Water	09/24/12 08:30	09/25/12 12:01
3.	MW-14D-092412	VK65C	12-18407	Water	09/24/12 10:00	09/25/12 12:01
4.	MW-15S-092412	VK65D	12-18408	Water	09/24/12 10:50	09/25/12 12:01
5.	MW-16S-092412	VK65E	12-18409	Water	09/24/12 11:30	09/25/12 12:01
6.	MW-14S-092412	VK65F	12-18410	Water	09/24/12 12:50	09/25/12 12:01
7.	MW-13S-092412	VK65G	12-18411	Water	09/24/12 13:00	09/25/12 12:01
8.	MW-12S-092412	VK65H	12-18412	Water	09/24/12 14:00	09/25/12 12:01
9.	MW-11S-092412	VK65I	12-18413	Water	09/24/12 14:25	09/25/12 12:01
10.	MW-12D-092412	VK65J	12-18414	Water	09/24/12 15:10	09/25/12 12:01
11.	MW-11D-092412	VK65K	12-18415	Water	09/24/12 15:35	09/25/12 12:01
12.	MW-13D-092412	VK65L	12-18416	Water	09/24/12 17:00	09/25/12 12:01
13.	MW-DUP-092412	VK65M	12-18417	Water	09/24/12	09/25/12 12:01
14.	MW-15S-092412	VK65N	12-18418	Water	09/24/12 10:50	09/25/12 12:01
15.	MW-13D-092412	VK65O	12-18419	Water	09/24/12 17:00	09/25/12 12:01
16.	TBS	VK65P	12-18420	Water	09/24/12	09/25/12 12:01

Printed 09/25/12 Page 1 of 1

Sample ID Cross Reference Report

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ARI Job No: VK75
Client: Landau Associates
Project Event: 0001020.400-510
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-15D-092412	VK75A	12-18431	Water	09/24/12 08:26	09/25/12 12:01
2.	MW-16D-092412	VK75B	12-18432	Water	09/24/12 08:30	09/25/12 12:01
3.	MW-14D-092412	VK75C	12-18433	Water	09/24/12 10:00	09/25/12 12:01
4.	MW-15S-092412	VK75D	12-18434	Water	09/24/12 10:50	09/25/12 12:01
5.	MW-16S-092412	VK75E	12-18435	Water	09/24/12 11:30	09/25/12 12:01
6.	MW-14S-092412	VK75F	12-18436	Water	09/24/12 12:50	09/25/12 12:01
7.	MW-13S-092412	VK75G	12-18437	Water	09/24/12 13:00	09/25/12 12:01
8.	MW-12S-092412	VK75H	12-18438	Water	09/24/12 14:00	09/25/12 12:01
9.	MW-11S-092412	VK75I	12-18439	Water	09/24/12 14:25	09/25/12 12:01
10.	MW-12D-092412	VK75J	12-18440	Water	09/24/12 15:10	09/25/12 12:01
11.	MW-11D-092412	VK75K	12-18441	Water	09/24/12 15:35	09/25/12 12:01
12.	MW-13D-092412	VK75L	12-18442	Water	09/24/12 17:00	09/25/12 12:01
13.	MW-DUP-092412	VK75M	12-18443	Water	09/24/12	09/25/12 12:01

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VL48
Client: Landau Associates
Project Event: 0001020.400-510
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-15D-092412	VL48A	12-18901	Water	09/24/12 08:26	09/25/12 12:01
2.	MW-16D-092412	VL48B	12-18902	Water	09/24/12 08:30	09/25/12 12:01
3.	MW-14D-092412	VL48C	12-18903	Water	09/24/12 10:00	09/25/12 12:01
4.	MW-15S-092412	VL48D	12-18904	Water	09/24/12 10:50	09/25/12 12:01
5.	MW-16S-092412	VL48E	12-18905	Water	09/24/12 11:30	09/25/12 12:01
6.	MW-14S-092412	VL48F	12-18906	Water	09/24/12 12:50	09/25/12 12:01
7.	MW-13D-092412	VL48G	12-18907	Water	09/24/12 17:00	09/25/12 12:01
8.	MW-DUP-092412	VL48H	12-18908	Water	09/24/12	09/25/12 12:01

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Landau Associates	**ARI Job No.:** VK65
Client Project: Cornwall	**Client Project No.:** 0001020.400-510

Case Narrative

1. Thirteen samples were submitted for preparation on September 25, 2012, and were in good condition. Each sample was received in eight 500 milliliters amber glass bottles, with a total of 52 liters for the entire job.
2. The samples were submitted for removal of solid particulate by means of centrifuging according to modified Corp of Engineers draft interim guide lines.
3. The samples were centrifuged in decontaminated 500mL glass bottles, in a pre-cooled centrifuge (4°C) at 1,000 x g for 30 minutes.
4. The supernatant water was decanted back into the original sample bottles and delivered to the laboratory for analysis.
5. There were no other anomalies in the sample or methods on this project.

Released by: ______________________ Date: 9/28/12
Geotechnical Laboratory Manager

Reviewed by: ______________________ Date: September 29, 2012
Lead Technician

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Data Reporting Qualifiers

Effective 2/14/2011

Inorganic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Duplicate RPD is not within established control limits
B	Reported value is less than the CRDL but ≥ the Reporting Limit
N	Matrix Spike recovery not within established control limits
NA	Not Applicable, analyte not spiked
H	The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
L	Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Flagged value is not within established control limits
B	Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J	Estimated concentration when the value is less than ARI's established reporting limits
D	The spiked compound was not detected due to sample extract dilution
E	Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

S	Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte
NA	The flagged analyte was not analyzed for
NR	Spiked compound recovery is not reported due to chromatographic interference
NS	The flagged analyte was not spiked into the sample
M	Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
M2	The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
Y	The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
EMPC	Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria" **(Dioxin/Furan analysis only)**
C	The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
P	The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference
X	Analyte signal includes interference from polychlorinated diphenyl ethers. **(Dioxin/Furan analysis only)**
Z	Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**

Geotechnical Data

A	The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
F	Samples were frozen prior to particle size determination
SM	Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
SS	Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
W	Weight of sample in some pipette aliquots was below the level required for accurate weighting

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ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-15D-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 21:41

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**0.67**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.20**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.32**	

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ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Date Analyzed: 09/26/12 21:41

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.42**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.74**	
99-87-6	**4-Isopropyltoluene**	**0.20**	**1.7**	
104-51-8	**n-Butylbenzene**	**0.20**	**0.26**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	108%
d8-Toluene	95.9%
Bromofluorobenzene	93.5%
d4-1,2-Dichlorobenzene	103%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16D-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 22:06

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**0.69**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16D-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Date Analyzed: 09/26/12 22:06

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	102%
d8-Toluene	95.2%
Bromofluorobenzene	98.7%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-14D-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 22:33

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**4.2**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	**m,p-Xylene**	**0.40**	**0.96**	
95-47-6	**o-Xylene**	**0.20**	**0.60**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.41**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-14D-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Date Analyzed: 09/26/12 22:33

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.39**	
99-87-6	**4-Isopropyltoluene**	**0.20**	**0.36**	
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**0.93**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	100%
d8-Toluene	94.4%
Bromofluorobenzene	97.1%
d4-1,2-Dichlorobenzene	104%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 1 of 2

Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 22:58

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	**Benzene**	**0.20**	**0.44**	
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	**Toluene**	**0.20**	**0.38**	
108-90-7	**Chlorobenzene**	**0.20**	**6.7**	
100-41-4	**Ethylbenzene**	**0.20**	**0.49**	
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.32**	
95-50-1	**1,2-Dichlorobenzene**	**0.20**	**0.36**	
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**2.1**	

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Date Analyzed: 09/26/12 22:58

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	**1,2,4-Trimethylbenzene**	**0.20**	**0.39**	
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.70**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	**tert-Butylbenzene**	**0.20**	**0.23**	
135-98-8	**sec-Butylbenzene**	**0.20**	**0.99**	
99-87-6	**4-Isopropyltoluene**	**0.20**	**0.38**	
104-51-8	**n-Butylbenzene**	**0.20**	**0.44**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**12**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	110%
d8-Toluene	96.1%
Bromofluorobenzene	96.3%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16S-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 23:24

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**0.60**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.23**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16S-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Date Analyzed: 09/26/12 23:24

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	105%
d8-Toluene	95.9%
Bromofluorobenzene	93.9%
d4-1,2-Dichlorobenzene	99.0%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-14S-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 23:50

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	**Benzene**	**0.20**	**0.22**	
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**4.6**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.29**	
95-50-1	**1,2-Dichlorobenzene**	**0.20**	**0.28**	
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**2.2**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-14S-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Date Analyzed: 09/26/12 23:50

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.28**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	**tert-Butylbenzene**	**0.20**	**0.25**	
135-98-8	**sec-Butylbenzene**	**0.20**	**1.1**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.49**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	110%
d8-Toluene	93.3%
Bromofluorobenzene	92.6%
d4-1,2-Dichlorobenzene	99.0%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 1 of 2

Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 00:16

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**1.3**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.26**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.90**	

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13S-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Date Analyzed: 09/27/12 00:16

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.40**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.21**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**19**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	102%
d8-Toluene	95.3%
Bromofluorobenzene	94.7%
d4-1,2-Dichlorobenzene	101%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12S-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 00:42

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**3.4**	
100-41-4	**Ethylbenzene**	**0.20**	**3.1**	
100-42-5	**Styrene**	**0.20**	**0.26**	
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	**m,p-Xylene**	**0.40**	**0.68**	
95-47-6	**o-Xylene**	**0.20**	**0.43**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**1.1**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12S-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Date Analyzed: 09/27/12 00:42

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.29**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.35**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	103%
d8-Toluene	101%
Bromofluorobenzene	98.3%
d4-1,2-Dichlorobenzene	96.7%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11S-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 01:08

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11S-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Date Analyzed: 09/27/12 01:08

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	**4-Isopropyltoluene**	**0.20**	**0.35**	
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	106%
d8-Toluene	97.7%
Bromofluorobenzene	97.8%
d4-1,2-Dichlorobenzene	97.6%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12D-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 01:34

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**1.2**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12D-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Date Analyzed: 09/27/12 01:34

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	104%
d8-Toluene	100%
Bromofluorobenzene	96.7%
d4-1,2-Dichlorobenzene	94.9%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET

Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11D-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 02:00

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	**Carbon Disulfide**	**0.20**	**0.76**	
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11D-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Date Analyzed: 09/27/12 02:00

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	104%
d8-Toluene	95.0%
Bromofluorobenzene	101%
d4-1,2-Dichlorobenzene	100%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13D-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65L	QC Report No: VK65-Landau Associates
LIMS ID: 12-18416	Project: Cornwall
Matrix: Water	0001020.400-510
Data Release Authorized:	Date Sampled: 09/24/12
Reported: 10/02/12	Date Received: 09/25/12
Instrument/Analyst: NT3/PAB	Sample Amount: 10.0 mL
Date Analyzed: 09/27/12 02:26	Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	**Benzene**	**0.20**	**0.20**	
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**0.73**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.37**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.39**	

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13D-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Date Analyzed: 09/27/12 02:26

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.58**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	**tert-Butylbenzene**	**0.20**	**0.22**	
135-98-8	**sec-Butylbenzene**	**0.20**	**0.86**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.41**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**0.71**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	106%
d8-Toluene	95.8%
Bromofluorobenzene	94.5%
d4-1,2-Dichlorobenzene	97.7%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-DUP-092412**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 02:52

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**1.0**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.24**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.49**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-DUP-092412**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Date Analyzed: 09/27/12 02:52

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.59**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**1.2**	
99-87-6	**4-Isopropyltoluene**	**0.20**	**2.8**	
104-51-8	**n-Butylbenzene**	**0.20**	**0.41**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	106%
d8-Toluene	97.6%
Bromofluorobenzene	95.5%
d4-1,2-Dichlorobenzene	103%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: TBS SAMPLE**
Page 1 of 2

Lab Sample ID: VK65P
LIMS ID: 12-18420
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/27/12 03:18

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: TBS SAMPLE**

Page 2 of 2

Lab Sample ID: VK65P
LIMS ID: 12-18420
Matrix: Water
Date Analyzed: 09/27/12 03:18

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	104%
d8-Toluene	95.4%
Bromofluorobenzene	96.7%
d4-1,2-Dichlorobenzene	95.6%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

VOA SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
MB-092612A	Method Blank	10	104%	98.3%	97.3%	98.6%	0
LCS-092612A	Lab Control	10	103%	95.3%	94.8%	100%	0
LCSD-092612A	Lab Control Dup	10	101%	96.4%	93.3%	98.5%	0
VK65A	MW-15D-092412	10	108%	95.9%	93.5%	103%	0
VK65B	MW-16D-092412	10	102%	95.2%	98.7%	102%	0
VK65C	MW-14D-092412	10	100%	94.4%	97.1%	104%	0
VK65D	MW-15S-092412	10	110%	96.1%	96.3%	102%	0
VK65E	MW-16S-092412	10	105%	95.9%	93.9%	99.0%	0
VK65F	MW-14S-092412	10	110%	93.3%	92.6%	99.0%	0
VK65G	MW-13S-092412	10	102%	95.3%	94.7%	101%	0
VK65H	MW-12S-092412	10	103%	101%	98.3%	96.7%	0
VK65I	MW-11S-092412	10	106%	97.7%	97.8%	97.6%	0
VK65J	MW-12D-092412	10	104%	100%	96.7%	94.9%	0
VK65K	MW-11D-092412	10	104%	95.0%	101%	100%	0
VK65L	MW-13D-092412	10	106%	95.8%	94.5%	97.7%	0
VK65M	MW-DUP-092412	10	106%	97.6%	95.5%	103%	0
VK65P	TBS	10	104%	95.4%	96.7%	95.6%	0

SW8260C	LCS/MB LIMITS	QC LIMITS
(DCE) = d4-1,2-Dichloroethane	(80-120)	(80-130)
(TOL) = d8-Toluene	(80-120)	(80-120)
(BFB) = Bromofluorobenzene	(80-120)	(80-120)
(DCB) = d4-1,2-Dichlorobenzene	(80-120)	(80-120)

Prep Method: SW5030B
Log Number Range: 12-18405 to 12-18420

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: LCS-092612A**
Page 1 of 2
LAB CONTROL SAMPLE

Lab Sample ID: LCS-092612A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT3/PAB
LCSD: NT3/PAB
Date Analyzed LCS: 09/26/12 19:57
LCSD: 09/26/12 20:23

Sample Amount LCS: 10.0 mL
LCSD: 10.0 mL
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Chloromethane	8.77	10.0	87.7%	8.46	10.0	84.6%	3.6%
Bromomethane	9.01	10.0	90.1%	8.23	10.0	82.3%	9.0%
Vinyl Chloride	9.46	10.0	94.6%	8.99	10.0	89.9%	5.1%
Chloroethane	8.58	10.0	85.8%	8.36	10.0	83.6%	2.6%
Methylene Chloride	8.67	10.0	86.7%	8.02	10.0	80.2%	7.8%
Acetone	48.6	50.0	97.2%	47.9	50.0	95.8%	1.5%
Carbon Disulfide	9.00	10.0	90.0%	8.76	10.0	87.6%	2.7%
1,1-Dichloroethene	9.22	10.0	92.2%	8.49	10.0	84.9%	8.2%
1,1-Dichloroethane	9.48	10.0	94.8%	9.49	10.0	94.9%	0.1%
trans-1,2-Dichloroethene	8.76	10.0	87.6%	8.43	10.0	84.3%	3.8%
cis-1,2-Dichloroethene	8.11	10.0	81.1%	8.27	10.0	82.7%	2.0%
Chloroform	9.55	10.0	95.5%	9.27	10.0	92.7%	3.0%
1,2-Dichloroethane	9.73	10.0	97.3%	9.70	10.0	97.0%	0.3%
2-Butanone	55.2	50.0	110%	55.1	50.0	110%	0.2%
1,1,1-Trichloroethane	9.19	10.0	91.9%	8.61	10.0	86.1%	6.5%
Carbon Tetrachloride	8.27	10.0	82.7%	8.54	10.0	85.4%	3.2%
Vinyl Acetate	9.52	10.0	95.2%	9.18	10.0	91.8%	3.6%
Bromodichloromethane	9.38	10.0	93.8%	9.36	10.0	93.6%	0.2%
1,2-Dichloropropane	9.16	10.0	91.6%	9.44	10.0	94.4%	3.0%
cis-1,3-Dichloropropene	8.99	10.0	89.9%	8.72	10.0	87.2%	3.0%
Trichloroethene	9.05	10.0	90.5%	9.33	10.0	93.3%	3.0%
Dibromochloromethane	9.85	10.0	98.5%	9.77	10.0	97.7%	0.8%
1,1,2-Trichloroethane	8.88	10.0	88.8%	8.87	10.0	88.7%	0.1%
Benzene	9.66	10.0	96.6%	9.66	10.0	96.6%	0.0%
trans-1,3-Dichloropropene	8.71	10.0	87.1%	8.59	10.0	85.9%	1.4%
2-Chloroethylvinylether	8.84	10.0	88.4%	8.94	10.0	89.4%	1.1%
Bromoform	9.95	10.0	99.5%	10.3	10.0	103%	3.5%
4-Methyl-2-Pentanone (MIBK)	52.3	50.0	105%	52.7	50.0	105%	0.8%
2-Hexanone	55.3	50.0	111%	53.7	50.0	107%	2.9%
Tetrachloroethene	9.61	10.0	96.1%	9.67	10.0	96.7%	0.6%
1,1,2,2-Tetrachloroethane	11.2	10.0	112%	11.1	10.0	111%	0.9%
Toluene	9.21	10.0	92.1%	9.16	10.0	91.6%	0.5%
Chlorobenzene	10.3	10.0	103%	10.0	10.0	100%	3.0%
Ethylbenzene	10.4	10.0	104%	10.0	10.0	100%	3.9%
Styrene	10.2	10.0	102%	9.92	10.0	99.2%	2.8%
Trichlorofluoromethane	8.81	10.0	88.1%	8.43	10.0	84.3%	4.4%
1,1,2-Trichloro-1,2,2-trifluoroetha	8.81	10.0	88.1%	8.59	10.0	85.9%	2.5%
m,p-Xylene	19.8	20.0	99.0%	19.7	20.0	98.5%	0.5%
o-Xylene	10.3	10.0	103%	9.74	10.0	97.4%	5.6%
1,2-Dichlorobenzene	10.4	10.0	104%	10.0	10.0	100%	3.9%
1,3-Dichlorobenzene	10.2	10.0	102%	10.2	10.0	102%	0.0%
1,4-Dichlorobenzene	10.2	10.0	102%	10.1	10.0	101%	1.0%
Acrolein	47.2	50.0	94.4%	48.4	50.0	96.8%	2.5%
Methyl Iodide	9.05	10.0	90.5%	8.93	10.0	89.3%	1.3%
Bromoethane	8.55	10.0	85.5%	8.70	10.0	87.0%	1.7%
Acrylonitrile	8.83	10.0	88.3%	9.03	10.0	90.3%	2.2%
1,1-Dichloropropene	9.06	10.0	90.6%	9.07	10.0	90.7%	0.1%
Dibromomethane	8.82	10.0	88.2%	8.67	10.0	86.7%	1.7%

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: LCS-092612A**
Page 2 of 2 **LAB CONTROL SAMPLE**

Lab Sample ID: LCS-092612A
LIMS ID: 12-18405
Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
1,1,1,2-Tetrachloroethane	9.20	10.0	92.0%	9.34	10.0	93.4%	1.5%
1,2-Dibromo-3-chloropropane	10.0	10.0	100%	9.74	10.0	97.4%	2.6%
1,2,3-Trichloropropane	11.0	10.0	110%	10.9	10.0	109%	0.9%
trans-1,4-Dichloro-2-butene	10.4	10.0	104%	9.97	10.0	99.7%	4.2%
1,3,5-Trimethylbenzene	11.2	10.0	112%	11.2	10.0	112%	0.0%
1,2,4-Trimethylbenzene	11.0	10.0	110%	10.9	10.0	109%	0.9%
Hexachlorobutadiene	8.94	10.0	89.4%	8.52	10.0	85.2%	4.8%
Ethylene Dibromide	8.67	10.0	86.7%	8.69	10.0	86.9%	0.2%
Bromochloromethane	9.57	10.0	95.7%	10.1	10.0	101%	5.4%
2,2-Dichloropropane	7.38	10.0	73.8%	7.00	10.0	70.0%	5.3%
1,3-Dichloropropane	10.4	10.0	104%	10.4	10.0	104%	0.0%
Isopropylbenzene	11.1	10.0	111%	11.4	10.0	114%	2.7%
n-Propylbenzene	10.7	10.0	107%	11.0	10.0	110%	2.8%
Bromobenzene	10.1	10.0	101%	10.4	10.0	104%	2.9%
2-Chlorotoluene	10.6	10.0	106%	10.8	10.0	108%	1.9%
4-Chlorotoluene	10.8	10.0	108%	10.8	10.0	108%	0.0%
tert-Butylbenzene	10.6	10.0	106%	10.6	10.0	106%	0.0%
sec-Butylbenzene	10.8	10.0	108%	10.8	10.0	108%	0.0%
4-Isopropyltoluene	10.3	10.0	103%	10.1	10.0	101%	2.0%
n-Butylbenzene	10.5	10.0	105%	10.1	10.0	101%	3.9%
1,2,4-Trichlorobenzene	9.99	10.0	99.9%	9.33	10.0	93.3%	6.8%
Naphthalene	11.7	10.0	117%	10.9	10.0	109%	7.1%
1,2,3-Trichlorobenzene	10.2	10.0	102%	9.43	10.0	94.3%	7.8%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	LCSD
d4-1,2-Dichloroethane	103%	101%
d8-Toluene	95.3%	96.4%
Bromofluorobenzene	94.8%	93.3%
d4-1,2-Dichlorobenzene	100%	98.5%

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-092612A**
Page 1 of 2 **METHOD BLANK**

Lab Sample ID: MB-092612A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Instrument/Analyst: NT3/PAB
Date Analyzed: 09/26/12 20:49

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-092612A**
METHOD BLANK
Page 2 of 2

Lab Sample ID: MB-092612A
LIMS ID: 12-18405
Matrix: Water
Date Analyzed: 09/26/12 20:49

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	104%
d8-Toluene	98.3%
Bromofluorobenzene	97.3%
d4-1,2-Dichlorobenzene	98.6%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 19:06
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Date Analyzed: 09/28/12 19:06

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	65.2%	2-Fluorobiphenyl	65.6%
d14-p-Terphenyl	78.8%	d4-1,2-Dichlorobenzene	57.6%
d5-Phenol	68.5%	2-Fluorophenol	68.5%
2,4,6-Tribromophenol	93.1%	d4-2-Chlorophenol	67.2%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-16D-092412
SAMPLE

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 19:40
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-16D-092412
SAMPLE

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Date Analyzed: 09/28/12 19:40

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	70.8%	2-Fluorobiphenyl	69.2%
d14-p-Terphenyl	76.4%	d4-1,2-Dichlorobenzene	60.4%
d5-Phenol	70.7%	2-Fluorophenol	74.9%
2,4,6-Tribromophenol	86.4%	d4-2-Chlorophenol	70.4%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-14D-092412
SAMPLE

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 20:14
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-14D-092412
SAMPLE

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Date Analyzed: 09/28/12 20:14

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	**Analyte**	**RL**	**Result**
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	**N-Nitrosodiphenylamine**	**1.0**	**1.0**
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	65.2%	2-Fluorobiphenyl	62.8%
d14-p-Terphenyl	73.6%	d4-1,2-Dichlorobenzene	56.4%
d5-Phenol	60.8%	2-Fluorophenol	67.5%
2,4,6-Tribromophenol	86.7%	d4-2-Chlorophenol	64.8%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 20:48
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	**Naphthalene**	**1.0**	**4.0**
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	**2-Methylnaphthalene**	**1.0**	**1.4**
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Date Analyzed: 09/28/12 20:48

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	**1-Methylnaphthalene**	**1.0**	**1.8**
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	63.2%	2-Fluorobiphenyl	62.4%
d14-p-Terphenyl	73.2%	d4-1,2-Dichlorobenzene	55.6%
d5-Phenol	64.0%	2-Fluorophenol	64.5%
2,4,6-Tribromophenol	84.0%	d4-2-Chlorophenol	63.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-16S-092412
SAMPLE

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 21:22
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

FORM I

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-16S-092412
SAMPLE

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Date Analyzed: 09/28/12 21:22

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	68.4%	2-Fluorobiphenyl	67.2%
d14-p-Terphenyl	71.6%	d4-1,2-Dichlorobenzene	60.8%
d5-Phenol	67.2%	2-Fluorophenol	73.1%
2,4,6-Tribromophenol	84.5%	d4-2-Chlorophenol	68.0%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-14S-092412
SAMPLE

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 21:56
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	**1,4-Dichlorobenzene**	**1.0**	**1.0**
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-14S-092412
SAMPLE

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Date Analyzed: 09/28/12 21:56

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	65.2%	2-Fluorobiphenyl	63.2%
d14-p-Terphenyl	64.0%	d4-1,2-Dichlorobenzene	58.0%
d5-Phenol	63.5%	2-Fluorophenol	69.3%
2,4,6-Tribromophenol	78.7%	d4-2-Chlorophenol	65.1%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 22:30
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	**Naphthalene**	**1.0**	**3.0**
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Date Analyzed: 09/28/12 22:30

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	59.6%	2-Fluorobiphenyl	59.2%
d14-p-Terphenyl	66.0%	d4-1,2-Dichlorobenzene	54.0%
d5-Phenol	59.2%	2-Fluorophenol	64.5%
2,4,6-Tribromophenol	76.3%	d4-2-Chlorophenol	60.3%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12S-092412
SAMPLE

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 23:03
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12S-092412
SAMPLE

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Date Analyzed: 09/28/12 23:03

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	62.0%	2-Fluorobiphenyl	64.4%
d14-p-Terphenyl	71.2%	d4-1,2-Dichlorobenzene	54.8%
d5-Phenol	63.5%	2-Fluorophenol	66.4%
2,4,6-Tribromophenol	85.9%	d4-2-Chlorophenol	63.2%

FORM I

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-11S-092412
SAMPLE

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 23:38
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11S-092412
SAMPLE

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Date Analyzed: 09/28/12 23:38

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	70.8%	2-Fluorobiphenyl	68.4%
d14-p-Terphenyl	68.0%	d4-1,2-Dichlorobenzene	61.2%
d5-Phenol	69.1%	2-Fluorophenol	74.1%
2,4,6-Tribromophenol	85.9%	d4-2-Chlorophenol	70.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12D-092412
SAMPLE

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 09/29/12 00:11
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12D-092412
SAMPLE

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Date Analyzed: 09/29/12 00:11

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	64.4%	2-Fluorobiphenyl	64.0%
d14-p-Terphenyl	58.8%	d4-1,2-Dichlorobenzene	58.0%
d5-Phenol	64.0%	2-Fluorophenol	66.7%
2,4,6-Tribromophenol	80.5%	d4-2-Chlorophenol	63.7%

ANALYTICAL RESOURCES INCORPORATED

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Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11D-092412
SAMPLE

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 10/01/12 13:51
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11D-092412
SAMPLE

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Date Analyzed: 10/01/12 13:51

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	66.0%	2-Fluorobiphenyl	64.4%
d14-p-Terphenyl	60.0%	d4-1,2-Dichlorobenzene	56.8%
d5-Phenol	67.5%	2-Fluorophenol	67.2%
2,4,6-Tribromophenol	84.5%	d4-2-Chlorophenol	65.6%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 10/01/12 18:59
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Date Analyzed: 10/01/12 18:59

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	66.8%	2-Fluorobiphenyl	66.8%
d14-p-Terphenyl	79.6%	d4-1,2-Dichlorobenzene	59.2%
d5-Phenol	66.9%	2-Fluorophenol	69.1%
2,4,6-Tribromophenol	81.6%	d4-2-Chlorophenol	66.4%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-DUP-092412
SAMPLE

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 10/01/12 19:33
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-DUP-092412
SAMPLE

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Date Analyzed: 10/01/12 19:33

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	59.2%	2-Fluorobiphenyl	60.8%
d14-p-Terphenyl	72.8%	d4-1,2-Dichlorobenzene	51.2%
d5-Phenol	59.7%	2-Fluorophenol	61.6%
2,4,6-Tribromophenol	74.1%	d4-2-Chlorophenol	59.2%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65N
LIMS ID: 12-18418
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 10/01/12 20:06
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	**1,4-Dichlorobenzene**	**1.0**	**1.2**
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	**Naphthalene**	**1.0**	**5.2**
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	**2-Methylnaphthalene**	**1.0**	**1.8**
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65N
LIMS ID: 12-18418
Matrix: Water
Date Analyzed: 10/01/12 20:06

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	**1-Methylnaphthalene**	**1.0**	**2.4**
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	66.4%	2-Fluorobiphenyl	65.6%
d14-p-Terphenyl	60.8%	d4-1,2-Dichlorobenzene	54.4%
d5-Phenol	65.3%	2-Fluorophenol	66.4%
2,4,6-Tribromophenol	81.9%	d4-2-Chlorophenol	64.3%

FORM I

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65O
LIMS ID: 12-18419
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/27/12
Date Analyzed: 10/01/12 20:41
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

FORM I

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65O
LIMS ID: 12-18419
Matrix: Water
Date Analyzed: 10/01/12 20:41

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	68.0%	2-Fluorobiphenyl	62.8%
d14-p-Terphenyl	63.6%	d4-1,2-Dichlorobenzene	55.6%
d5-Phenol	68.5%	2-Fluorophenol	69.1%
2,4,6-Tribromophenol	82.1%	d4-2-Chlorophenol	66.9%

SW8270 SEMIVOLATILES WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT OUT
MB-092712	66.8%	64.4%	78.0%	59.2%	66.9%	63.7%	75.5%	66.4%	0
LCS-092712	68.4%	67.2%	76.4%	59.2%	69.3%	64.8%	87.5%	68.5%	0
LCSD-092712	66.4%	63.6%	73.2%	52.8%	67.5%	66.4%	82.9%	65.9%	0
MW-15D-092412	65.2%	65.6%	78.8%	57.6%	68.5%	68.5%	93.1%	67.2%	0
MW-16D-092412	70.8%	69.2%	76.4%	60.4%	70.7%	74.9%	86.4%	70.4%	0
MW-14D-092412	65.2%	62.8%	73.6%	56.4%	60.8%	67.5%	86.7%	64.8%	0
MW-15S-092412	63.2%	62.4%	73.2%	55.6%	64.0%	64.5%	84.0%	63.2%	0
MW-16S-092412	68.4%	67.2%	71.6%	60.8%	67.2%	73.1%	84.5%	68.0%	0
MW-14S-092412	65.2%	63.2%	64.0%	58.0%	63.5%	69.3%	78.7%	65.1%	0
MW-13S-092412	59.6%	59.2%	66.0%	54.0%	59.2%	64.5%	76.3%	60.3%	0
MW-12S-092412	62.0%	64.4%	71.2%	54.8%	63.5%	66.4%	85.9%	63.2%	0
MW-11S-092412	70.8%	68.4%	68.0%	61.2%	69.1%	74.1%	85.9%	70.7%	0
MW-12D-092412	64.4%	64.0%	58.8%	58.0%	64.0%	66.7%	80.5%	63.7%	0
MW-11D-092412	66.0%	64.4%	60.0%	56.8%	67.5%	67.2%	84.5%	65.6%	0
MW-13D-092412	66.8%	66.8%	79.6%	59.2%	66.9%	69.1%	81.6%	66.4%	0
MW-DUP-092412	59.2%	60.8%	72.8%	51.2%	59.7%	61.6%	74.1%	59.2%	0
MW-15S-092412	66.4%	65.6%	60.8%	54.4%	65.3%	66.4%	81.9%	64.3%	0
MW-13D-092412	68.0%	62.8%	63.6%	55.6%	68.5%	69.1%	82.1%	66.9%	0

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(50-100)	(34-101)
(FBP) = 2-Fluorobiphenyl	(51-100)	(38-100)
(TPH) = d14-p-Terphenyl	(54-117)	(27-122)
(DCB) = d4-1,2-Dichlorobenzene	(40-100)	(27-100)
(PHL) = d5-Phenol	(15-121)	(16-106)
(2FP) = 2-Fluorophenol	(33-100)	(23-100)
(TBP) = 2,4,6-Tribromophenol	(46-125)	(31-128)
(2CP) = d4-2-Chlorophenol	(46-102)	(33-100)

Prep Method: SW3520C
Log Number Range: 12-18405 to 12-18419

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Page 1 of 2

Sample ID: LCS-092712
LCS/LCSD

Lab Sample ID: LCS-092712
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted LCS/LCSD: 09/27/12

Date Analyzed LCS: 09/28/12 17:24
LCSD: 09/28/12 17:58
Instrument/Analyst LCS: NT6/JZ
LCSD: NT6/JZ
GPC Cleanup: NO

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Phenol	19.3	25.0	77.2%	19.4	25.0	77.6%	0.5%
Bis-(2-Chloroethyl) Ether	18.8	25.0	75.2%	17.6	25.0	70.4%	6.6%
2-Chlorophenol	18.2	25.0	72.8%	17.8	25.0	71.2%	2.2%
1,3-Dichlorobenzene	12.4	25.0	49.6%	11.9	25.0	47.6%	4.1%
1,4-Dichlorobenzene	12.8	25.0	51.2%	12.5	25.0	50.0%	2.4%
Benzyl Alcohol	6.1	25.0	24.4%	6.5	25.0	26.0%	6.3%
1,2-Dichlorobenzene	13.6	25.0	54.4%	13.4	25.0	53.6%	1.5%
2-Methylphenol	17.4	25.0	69.6%	17.4	25.0	69.6%	0.0%
2,2'-Oxybis(1-Chloropropane)	17.2	25.0	68.8%	17.1	25.0	68.4%	0.6%
4-Methylphenol	36.4	50.0	72.8%	36.1	50.0	72.2%	0.8%
N-Nitroso-Di-N-Propylamine	18.2	25.0	72.8%	18.0	25.0	72.0%	1.1%
Hexachloroethane	11.1	25.0	44.4%	10.6	25.0	42.4%	4.6%
Nitrobenzene	16.9	25.0	67.6%	16.8	25.0	67.2%	0.6%
Isophorone	19.1	25.0	76.4%	18.7	25.0	74.8%	2.1%
2-Nitrophenol	18.6	25.0	74.4%	18.6	25.0	74.4%	0.0%
2,4-Dimethylphenol	54.4	75.0	72.5%	54.4	75.0	72.5%	0.0%
Benzoic Acid	125	138	90.6%	127	138	92.0%	1.6%
bis(2-Chloroethoxy) Methane	17.2	25.0	68.8%	17.2	25.0	68.8%	0.0%
2,4-Dichlorophenol	56.9	75.0	75.9%	57.2	75.0	76.3%	0.5%
1,2,4-Trichlorobenzene	13.6	25.0	54.4%	13.4	25.0	53.6%	1.5%
Naphthalene	15.4	25.0	61.6%	15.5	25.0	62.0%	0.6%
4-Chloroaniline	43.9	75.0	58.5%	43.8	75.0	58.4%	0.2%
Hexachlorobutadiene	10.1	25.0	40.4%	9.8	25.0	39.2%	3.0%
4-Chloro-3-methylphenol	61.9	75.0	82.5%	61.6	75.0	82.1%	0.5%
2-Methylnaphthalene	13.1	25.0	52.4%	13.2	25.0	52.8%	0.8%
Hexachlorocyclopentadiene	28.7	75.0	38.3%	27.4	75.0	36.5%	4.6%
2,4,6-Trichlorophenol	58.2	75.0	77.6%	57.4	75.0	76.5%	1.4%
2,4,5-Trichlorophenol	64.0	75.0	85.3%	63.0	75.0	84.0%	1.6%
2-Chloronaphthalene	16.6	25.0	66.4%	16.6	25.0	66.4%	0.0%
2-Nitroaniline	50.0	75.0	66.7%	48.7	75.0	64.9%	2.6%
Dimethylphthalate	19.0	25.0	76.0%	18.3	25.0	73.2%	3.8%
Acenaphthylene	16.6	25.0	66.4%	16.3	25.0	65.2%	1.8%
3-Nitroaniline	51.7	75.0	68.9%	50.9	75.0	67.9%	1.6%
Acenaphthene	15.9	25.0	63.6%	15.6	25.0	62.4%	1.9%
2,4-Dinitrophenol	108 Q	138	78.3%	109 Q	138	79.0%	0.9%
4-Nitrophenol	58.3	75.0	77.7%	59.0	75.0	78.7%	1.2%
Dibenzofuran	14.5	25.0	58.0%	14.3	25.0	57.2%	1.4%
2,6-Dinitrotoluene	58.0	75.0	77.3%	56.4	75.0	75.2%	2.8%
2,4-Dinitrotoluene	58.1	75.0	77.5%	56.5	75.0	75.3%	2.8%
Diethylphthalate	19.0	25.0	76.0%	18.4	25.0	73.6%	3.2%
4-Chlorophenyl-phenylether	17.1	25.0	68.4%	16.8	25.0	67.2%	1.8%
Fluorene	16.4	25.0	65.6%	16.1	25.0	64.4%	1.8%
4-Nitroaniline	51.3	75.0	68.4%	50.0	75.0	66.7%	2.6%
4,6-Dinitro-2-Methylphenol	112	138	81.2%	111	138	80.4%	0.9%
N-Nitrosodiphenylamine	17.8	25.0	71.2%	17.0	25.0	68.0%	4.6%

FORM III

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Page 2 of 2

Sample ID: LCS-092712
LCS/LCSD

Lab Sample ID: LCS-092712
LIMS ID: 12-18405
Matrix: Water
Date Analyzed LCS: 09/28/12 17:24
LCSD: 09/28/12 17:58

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
4-Bromophenyl-phenylether	18.5	25.0	74.0%	18.0	25.0	72.0%	2.7%
Hexachlorobenzene	17.8	25.0	71.2%	17.2	25.0	68.8%	3.4%
Pentachlorophenol	69.5	75.0	92.7%	69.1	75.0	92.1%	0.6%
Phenanthrene	17.2	25.0	68.8%	16.8	25.0	67.2%	2.4%
Carbazole	20.2	25.0	80.8%	19.8	25.0	79.2%	2.0%
Anthracene	17.3	25.0	69.2%	16.7	25.0	66.8%	3.5%
Di-n-Butylphthalate	19.9	25.0	79.6%	19.1	25.0	76.4%	4.1%
Fluoranthene	17.6	25.0	70.4%	17.2	25.0	68.8%	2.3%
Pyrene	18.0	25.0	72.0%	17.8	25.0	71.2%	1.1%
Butylbenzylphthalate	18.6	25.0	74.4%	18.4	25.0	73.6%	1.1%
3,3'-Dichlorobenzidine	51.0	75.0	68.0%	51.0	75.0	68.0%	0.0%
Benzo(a)anthracene	17.1	25.0	68.4%	16.5	25.0	66.0%	3.6%
bis(2-Ethylhexyl)phthalate	20.4	25.0	81.6%	20.0	25.0	80.0%	2.0%
Chrysene	15.8	25.0	63.2%	15.5	25.0	62.0%	1.9%
Di-n-Octyl phthalate	19.4	25.0	77.6%	19.0	25.0	76.0%	2.1%
Benzo(a)pyrene	16.6	25.0	66.4%	16.3	25.0	65.2%	1.8%
Indeno(1,2,3-cd)pyrene	16.8	25.0	67.2%	16.2	25.0	64.8%	3.6%
Dibenz(a,h)anthracene	15.8	25.0	63.2%	15.0	25.0	60.0%	5.2%
Benzo(g,h,i)perylene	15.6	25.0	62.4%	15.0	25.0	60.0%	3.9%
1-Methylnaphthalene	19.4	25.0	77.6%	19.4	25.0	77.6%	0.0%
Total Benzofluoranthenes	33.9	50.0	67.8%	33.2	50.0	66.4%	2.1%

Semivolatile Surrogate Recovery

	LCS	**LCSD**
d5-Nitrobenzene	68.4%	66.4%
2-Fluorobiphenyl	67.2%	63.6%
d14-p-Terphenyl	76.4%	73.2%
d4-1,2-Dichlorobenzene	59.2%	52.8%
d5-Phenol	69.3%	67.5%
2-Fluorophenol	64.8%	66.4%
2,4,6-Tribromophenol	87.5%	82.9%
d4-2-Chlorophenol	68.5%	65.9%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MB-092712
METHOD BLANK

Lab Sample ID: MB-092712
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Date Extracted: 09/27/12
Date Analyzed: 09/28/12 16:49
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	2.0	< 2.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	2.0	< 2.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	2.0	< 2.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	3.0	< 3.0 U
105-67-9	2,4-Dimethylphenol	3.0	< 3.0 U
65-85-0	Benzoic Acid	20	< 20 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	3.0	< 3.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	3.0	< 3.0 U
59-50-7	4-Chloro-3-methylphenol	3.0	< 3.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	3.0	< 3.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	3.0	< 3.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	3.0	< 3.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	20	< 20 U
100-02-7	4-Nitrophenol	10	< 10 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	3.0	< 3.0 U
121-14-2	2,4-Dinitrotoluene	3.0	< 3.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MB-092712
METHOD BLANK

Lab Sample ID: MB-092712
LIMS ID: 12-18405
Matrix: Water
Date Analyzed: 09/28/12 16:49

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	3.0	< 3.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	10	< 10 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	3.0	< 3.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	5.0	< 5.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	66.8%	2-Fluorobiphenyl	64.4%
d14-p-Terphenyl	78.0%	d4-1,2-Dichlorobenzene	59.2%
d5-Phenol	66.9%	2-Fluorophenol	63.7%
2,4,6-Tribromophenol	75.5%	d4-2-Chlorophenol	66.4%

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ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 18:50
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**0.11**
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.17**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.32**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.11**
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	**Phenanthrene**	**0.10**	**0.10**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	47.7%
d14-Dibenzo(a,h)anthracene	14.0%

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-16D-092412
SAMPLE

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 19:18
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.16**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.52**
86-73-7	**Fluorene**	**0.10**	**0.13**
85-01-8	**Phenanthrene**	**0.10**	**0.11**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	54.3%
d14-Dibenzo(a,h)anthracene	36.0%

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ORGANICS ANALYSIS DATA SHEET
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Extraction Method: SW3520C
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Sample ID: MW-14D-092412
SAMPLE

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 19:47
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**0.28**
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.12**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.23**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.17**
86-73-7	**Fluorene**	**0.10**	**0.12**
85-01-8	**Phenanthrene**	**0.10**	**0.13**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	60.7%
d14-Dibenzo(a,h)anthracene	20.3%

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ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 20:15
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**3.7**
91-57-6	**2-Methylnaphthalene**	**0.10**	**1.5**
90-12-0	**1-Methylnaphthalene**	**0.10**	**1.6**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.76**
86-73-7	**Fluorene**	**0.10**	**0.58**
85-01-8	**Phenanthrene**	**0.10**	**0.63**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	**Dibenzofuran**	**0.10**	**0.23**
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	55.3%
d14-Dibenzo(a,h)anthracene	19.0%

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ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-16S-092412
SAMPLE

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 20:43
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	1-Methylnaphthalene	0.10	< 0.10 U
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.29**
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	55.7%
d14-Dibenzo(a,h)anthracene	40.3%

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ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-14S-092412
SAMPLE

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 21:12
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.25**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.64**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.30**
86-73-7	**Fluorene**	**0.10**	**0.15**
85-01-8	**Phenanthrene**	**0.10**	**0.17**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	53.0%
d14-Dibenzo(a,h)anthracene	19.0%

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 21:40
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**3.0**
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.25**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.32**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.17**
86-73-7	**Fluorene**	**0.10**	**0.11**
85-01-8	**Phenanthrene**	**0.10**	**0.12**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	55.3%
d14-Dibenzo(a,h)anthracene	22.0%

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
Page 1 of 1

Sample ID: MW-12S-092412
SAMPLE

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 22:08
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.14**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	Acenaphthene	0.10	< 0.10 U
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	55.7%
d14-Dibenzo(a,h)anthracene	24.7%

FORM I

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11S-092412
SAMPLE

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 22:37
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	1-Methylnaphthalene	0.10	< 0.10 U
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	Acenaphthene	0.10	< 0.10 U
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	53.3%
d14-Dibenzo(a,h)anthracene	43.0%

FORM I

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12D-092412
SAMPLE

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/03/12 15:30
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.16**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	Acenaphthene	0.10	< 0.10 U
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	53.0%
d14-Dibenzo(a,h)anthracene	30.3%

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11D-092412
SAMPLE

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/03/12 15:58
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	1-Methylnaphthalene	0.10	< 0.10 U
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	Acenaphthene	0.10	< 0.10 U
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	54.3%
d14-Dibenzo(a,h)anthracene	41.7%

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/03/12 16:27
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
91-20-3	**Naphthalene**	**0.10**	**0.24**
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.32**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.54**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.14**
86-73-7	**Fluorene**	**0.10**	**0.12**
85-01-8	**Phenanthrene**	**0.10**	**0.16**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	48.0%
d14-Dibenzo(a,h)anthracene	29.3%

FORM I

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-DUP-092412
SAMPLE

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/03/12 16:55
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**0.12**
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.14**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.32**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.13**
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	53.0%
d14-Dibenzo(a,h)anthracene	37.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65N
LIMS ID: 12-18418
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/03/12 17:23
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**3.4**
91-57-6	**2-Methylnaphthalene**	**0.10**	**1.4**
90-12-0	**1-Methylnaphthalene**	**0.10**	**1.4**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.64**
86-73-7	**Fluorene**	**0.10**	**0.53**
85-01-8	**Phenanthrene**	**0.10**	**0.58**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	**Dibenzofuran**	**0.10**	**0.20**
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	45.7%
d14-Dibenzo(a,h)anthracene	26.0%

FORM I

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65O
LIMS ID: 12-18419
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/03/12 17:52
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.10**	**0.27**
91-57-6	**2-Methylnaphthalene**	**0.10**	**0.33**
90-12-0	**1-Methylnaphthalene**	**0.10**	**0.56**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**0.11**
86-73-7	**Fluorene**	**0.10**	**0.13**
85-01-8	**Phenanthrene**	**0.10**	**0.18**
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	48.3%
d14-Dibenzo(a,h)anthracene	20.0%

FORM I

SIM SW8270 SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Client ID	MNP	DBA	TOT OUT
MB-092812	57.7%	49.0%	0
LCS-092812	44.0%	49.0%	0
LCSD-092812	47.3%	65.3%	0
MW-15D-092412	47.7%	14.0%	0
MW-16D-092412	54.3%	36.0%	0
MW-14D-092412	60.7%	20.3%	0
MW-15S-092412	55.3%	19.0%	0
MW-16S-092412	55.7%	40.3%	0
MW-14S-092412	53.0%	19.0%	0
MW-13S-092412	55.3%	22.0%	0
MW-12S-092412	55.7%	24.7%	0
MW-11S-092412	53.3%	43.0%	0
MW-12D-092412	53.0%	30.3%	0
MW-11D-092412	54.3%	41.7%	0
MW-13D-092412	48.0%	29.3%	0
MW-DUP-092412	53.0%	37.7%	0
MW-15S-092412	45.7%	26.0%	0
MW-13D-092412	48.3%	20.0%	0

	LCS/MB LIMITS	QC LIMITS
(MNP) = d10-2-Methylnaphthalene	(40-110)	(33-107)
(DBA) = d14-Dibenzo(a,h)anthracene	(33-140)	(10-142)

Prep Method: SW3520C
Log Number Range: 12-18405 to 12-18419

FORM-II SIM SW8270

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ORGANICS ANALYSIS DATA SHEET
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Sample ID: LCS-092812
LAB CONTROL SAMPLE

Lab Sample ID: LCS-092812
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: NA
Date Received: NA

Date Extracted LCS/LCSD: 09/28/12

Date Analyzed LCS: 10/02/12 17:53
LCSD: 10/02/12 18:22
Instrument/Analyst LCS: NT4/JZ
LCSD: NT4/JZ

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Naphthalene	1.29	3.00	43.0%	1.36	3.00	45.3%	5.3%
2-Methylnaphthalene	1.24	3.00	41.3%	1.29	3.00	43.0%	4.0%
1-Methylnaphthalene	1.47	3.00	49.0%	1.54	3.00	51.3%	4.7%
Acenaphthylene	1.22	3.00	40.7%	1.34	3.00	44.7%	9.4%
Acenaphthene	1.50	3.00	50.0%	1.62	3.00	54.0%	7.7%
Fluorene	1.54	3.00	51.3%	1.64	3.00	54.7%	6.3%
Phenanthrene	2.13	3.00	71.0%	2.18	3.00	72.7%	2.3%
Anthracene	1.70	3.00	56.7%	1.54	3.00	51.3%	9.9%
Fluoranthene	2.27	3.00	75.7%	2.36	3.00	78.7%	3.9%
Pyrene	2.23	3.00	74.3%	2.19	3.00	73.0%	1.8%
Benzo(a)anthracene	1.88	3.00	62.7%	1.82	3.00	60.7%	3.2%
Chrysene	2.34	3.00	78.0%	2.38	3.00	79.3%	1.7%
Benzo(a)pyrene	1.82	3.00	60.7%	1.70	3.00	56.7%	6.8%
Indeno(1,2,3-cd)pyrene	1.87	3.00	62.3%	2.02	3.00	67.3%	7.7%
Dibenz(a,h)anthracene	1.66	3.00	55.3%	1.89	3.00	63.0%	13.0%
Benzo(g,h,i)perylene	1.99	3.00	66.3%	1.98	3.00	66.0%	0.5%
Dibenzofuran	1.52	3.00	50.7%	1.58	3.00	52.7%	3.9%
Total Benzofluoranthenes	7.88	9.00	87.6%	7.56	9.00	84.0%	4.1%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

SIM Semivolatile Surrogate Recovery

	LCS	**LCSD**
d10-2-Methylnaphthalene	44.0%	47.3%
d14-Dibenzo(a,h)anthracene	49.0%	65.3%

FORM III

ORGANICS ANALYSIS DATA SHEET
PNAs by SW8270D-SIM GC/MS
Extraction Method: SW3520C
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Sample ID: MB-092812
METHOD BLANK

Lab Sample ID: MB-092812
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/04/12

QC Report No: VK65-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: NA
Date Received: NA

Date Extracted: 09/28/12
Date Analyzed: 10/02/12 17:25
Instrument/Analyst: NT4/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.10	< 0.10 U
91-57-6	2-Methylnaphthalene	0.10	< 0.10 U
90-12-0	1-Methylnaphthalene	0.10	< 0.10 U
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	Acenaphthene	0.10	< 0.10 U
86-73-7	Fluorene	0.10	< 0.10 U
85-01-8	Phenanthrene	0.10	< 0.10 U
120-12-7	Anthracene	0.10	< 0.10 U
206-44-0	Fluoranthene	0.10	< 0.10 U
129-00-0	Pyrene	0.10	< 0.10 U
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	Dibenzofuran	0.10	< 0.10 U
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	57.7%
d14-Dibenzo(a,h)anthracene	49.0%

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 19:21
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 445 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.056	< 0.056 U
319-85-7	beta-BHC	0.056	< 0.056 U
319-86-8	delta-BHC	0.056	< 0.056 U
58-89-9	gamma-BHC (Lindane)	0.056	< 0.056 U
76-44-8	Heptachlor	0.056	< 0.056 U
309-00-2	Aldrin	0.056	< 0.056 U
1024-57-3	Heptachlor Epoxide	0.056	< 0.056 U
959-98-8	Endosulfan I	0.056	< 0.056 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.56	< 0.56 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.056	< 0.056 U
5103-71-9	cis-Chlordane $	0.056	< 0.056 U
8001-35-2	Toxaphene	5.6	< 5.6 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	63.2%
Tetrachlorometaxylene	46.0%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

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ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-16D-092412
SAMPLE

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 19:39
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 440 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.057	< 0.057 U
319-85-7	beta-BHC	0.057	< 0.057 U
319-86-8	delta-BHC	0.057	< 0.057 U
58-89-9	gamma-BHC (Lindane)	0.057	< 0.057 U
76-44-8	Heptachlor	0.057	< 0.057 U
309-00-2	Aldrin	0.057	< 0.057 U
1024-57-3	Heptachlor Epoxide	0.057	< 0.057 U
959-98-8	Endosulfan I	0.057	< 0.057 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.57	< 0.57 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.057	< 0.057 U
5103-71-9	cis-Chlordane $	0.057	< 0.057 U
8001-35-2	Toxaphene	5.7	< 5.7 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	75.5%
Tetrachlorometaxylene	52.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

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ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-14D-092412
SAMPLE

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 19:57
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 470 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.053	< 0.053 U
319-85-7	beta-BHC	0.053	< 0.053 U
319-86-8	delta-BHC	0.053	< 0.053 U
58-89-9	gamma-BHC (Lindane)	0.053	< 0.053 U
76-44-8	Heptachlor	0.053	< 0.053 U
309-00-2	Aldrin	0.053	< 0.053 U
1024-57-3	Heptachlor Epoxide	0.053	< 0.053 U
959-98-8	Endosulfan I	0.053	< 0.053 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.53	< 0.53 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.053	< 0.053 U
5103-71-9	cis-Chlordane $	0.053	< 0.053 U
8001-35-2	Toxaphene	5.3	< 5.3 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	58.8%
Tetrachlorometaxylene	39.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

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ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 20:14
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 470 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.053	< 0.053 U
319-85-7	beta-BHC	0.053	< 0.053 U
319-86-8	delta-BHC	0.053	< 0.053 U
58-89-9	gamma-BHC (Lindane)	0.053	< 0.053 U
76-44-8	Heptachlor	0.053	< 0.053 U
309-00-2	Aldrin	0.053	< 0.053 U
1024-57-3	Heptachlor Epoxide	0.053	< 0.053 U
959-98-8	Endosulfan I	0.053	< 0.053 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.53	< 0.53 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.053	< 0.053 U
5103-71-9	cis-Chlordane $	0.053	< 0.053 U
8001-35-2	Toxaphene	5.3	< 5.3 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	57.5%
Tetrachlorometaxylene	49.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-16S-092412
SAMPLE

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 20:32
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 470 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.053	< 0.053 U
319-85-7	beta-BHC	0.053	< 0.053 U
319-86-8	delta-BHC	0.053	< 0.053 U
58-89-9	gamma-BHC (Lindane)	0.053	< 0.053 U
76-44-8	Heptachlor	0.053	< 0.053 U
309-00-2	Aldrin	0.053	< 0.053 U
1024-57-3	Heptachlor Epoxide	0.053	< 0.053 U
959-98-8	Endosulfan I	0.053	< 0.053 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.53	< 0.53 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.053	< 0.053 U
5103-71-9	cis-Chlordane $	0.053	< 0.053 U
8001-35-2	Toxaphene	5.3	< 5.3 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	65.2%
Tetrachlorometaxylene	42.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

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ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-14S-092412
SAMPLE

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 20:50
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 445 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	**Analyte**	**RL**	**Result**
319-84-6	alpha-BHC	0.056	< 0.056 U
319-85-7	beta-BHC	0.056	< 0.056 U
319-86-8	delta-BHC	0.056	< 0.056 U
58-89-9	gamma-BHC (Lindane)	0.056	< 0.056 U
76-44-8	Heptachlor	0.056	< 0.056 U
309-00-2	Aldrin	0.056	< 0.056 U
1024-57-3	Heptachlor Epoxide	0.056	< 0.056 U
959-98-8	Endosulfan I	0.056	< 0.056 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.56	< 0.56 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.056	< 0.056 U
5103-71-9	cis-Chlordane $	0.056	< 0.056 U
8001-35-2	Toxaphene	5.6	< 5.6 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	61.8%
Tetrachlorometaxylene	47.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

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ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 21:08
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 455 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.055	< 0.055 U
319-85-7	beta-BHC	0.055	< 0.055 U
319-86-8	delta-BHC	0.055	< 0.055 U
58-89-9	gamma-BHC (Lindane)	0.055	< 0.055 U
76-44-8	Heptachlor	0.055	< 0.055 U
309-00-2	Aldrin	0.055	< 0.055 U
1024-57-3	Heptachlor Epoxide	0.055	< 0.055 U
959-98-8	Endosulfan I	0.055	< 0.055 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.55	< 0.55 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.055	< 0.055 U
5103-71-9	cis-Chlordane $	0.055	< 0.055 U
8001-35-2	Toxaphene	5.5	< 5.5 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	58.0%
Tetrachlorometaxylene	45.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

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ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-12S-092412
SAMPLE

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 22:55
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 445 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	**Analyte**	**RL**	**Result**
319-84-6	alpha-BHC	0.056	< 0.056 U
319-85-7	beta-BHC	0.056	< 0.056 U
319-86-8	delta-BHC	0.056	< 0.056 U
58-89-9	gamma-BHC (Lindane)	0.056	< 0.056 U
76-44-8	Heptachlor	0.056	< 0.056 U
309-00-2	Aldrin	0.056	< 0.056 U
1024-57-3	Heptachlor Epoxide	0.056	< 0.056 U
959-98-8	Endosulfan I	0.056	< 0.056 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.56	< 0.56 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.056	< 0.056 U
5103-71-9	cis-Chlordane $	0.056	< 0.056 U
8001-35-2	Toxaphene	5.6	< 5.6 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	55.0%
Tetrachlorometaxylene	46.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-11S-092412
SAMPLE

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 23:12
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 470 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.053	< 0.053 U
319-85-7	beta-BHC	0.053	< 0.053 U
319-86-8	delta-BHC	0.053	< 0.053 U
58-89-9	gamma-BHC (Lindane)	0.053	< 0.053 U
76-44-8	Heptachlor	0.053	< 0.053 U
309-00-2	Aldrin	0.053	< 0.053 U
1024-57-3	Heptachlor Epoxide	0.053	< 0.053 U
959-98-8	Endosulfan I	0.053	< 0.053 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.53	< 0.53 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.053	< 0.053 U
5103-71-9	cis-Chlordane $	0.053	< 0.053 U
8001-35-2	Toxaphene	5.3	< 5.3 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	68.8%
Tetrachlorometaxylene	48.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

FORM I

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12D-092412
SAMPLE

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 23:30
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 470 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.053	< 0.053 U
319-85-7	beta-BHC	0.053	< 0.053 U
319-86-8	delta-BHC	0.053	< 0.053 U
58-89-9	gamma-BHC (Lindane)	0.053	< 0.053 U
76-44-8	Heptachlor	0.053	< 0.053 U
309-00-2	Aldrin	0.053	< 0.053 U
1024-57-3	Heptachlor Epoxide	0.053	< 0.053 U
959-98-8	Endosulfan I	0.053	< 0.053 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.53	< 0.53 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.053	< 0.053 U
5103-71-9	cis-Chlordane $	0.053	< 0.053 U
8001-35-2	Toxaphene	5.3	< 5.3 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	43.0%
Tetrachlorometaxylene	37.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-092412
SAMPLE

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 23:48
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 450 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.056	< 0.056 U
319-85-7	beta-BHC	0.056	< 0.056 U
319-86-8	delta-BHC	0.056	< 0.056 U
58-89-9	gamma-BHC (Lindane)	0.056	< 0.056 U
76-44-8	Heptachlor	0.056	< 0.056 U
309-00-2	Aldrin	0.056	< 0.056 U
1024-57-3	Heptachlor Epoxide	0.056	< 0.056 U
959-98-8	Endosulfan I	0.056	< 0.056 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.56	< 0.56 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.056	< 0.056 U
5103-71-9	cis-Chlordane $	0.056	< 0.056 U
8001-35-2	Toxaphene	5.6	< 5.6 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	64.0%
Tetrachlorometaxylene	44.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

FORM I

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/05/12 00:06
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 470 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.053	< 0.053 U
319-85-7	beta-BHC	0.053	< 0.053 U
319-86-8	delta-BHC	0.053	< 0.053 U
58-89-9	gamma-BHC (Lindane)	0.053	< 0.053 U
76-44-8	Heptachlor	0.053	< 0.053 U
309-00-2	Aldrin	0.053	< 0.053 U
1024-57-3	Heptachlor Epoxide	0.053	< 0.053 U
959-98-8	Endosulfan I	0.053	< 0.053 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.53	< 0.53 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.053	< 0.053 U
5103-71-9	cis-Chlordane $	0.053	< 0.053 U
8001-35-2	Toxaphene	5.3	< 5.3 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	61.0%
Tetrachlorometaxylene	48.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

FORM I

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-DUP-092412
SAMPLE

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/05/12 00:24
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 440 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.057	< 0.057 U
319-85-7	beta-BHC	0.057	< 0.057 U
319-86-8	delta-BHC	0.057	< 0.057 U
58-89-9	gamma-BHC (Lindane)	0.057	< 0.057 U
76-44-8	Heptachlor	0.057	< 0.057 U
309-00-2	Aldrin	0.057	< 0.057 U
1024-57-3	Heptachlor Epoxide	0.057	< 0.057 U
959-98-8	Endosulfan I	0.057	< 0.057 U
60-57-1	Dieldrin	0.11	< 0.11 U
72-55-9	4,4'-DDE	0.11	< 0.11 U
72-20-8	Endrin	0.11	< 0.11 U
33213-65-9	Endosulfan II	0.11	< 0.11 U
72-54-8	4,4'-DDD	0.11	< 0.11 U
1031-07-8	Endosulfan Sulfate	0.11	< 0.11 U
50-29-3	4,4'-DDT	0.11	< 0.11 U
72-43-5	Methoxychlor	0.57	< 0.57 U
53494-70-5	Endrin Ketone	0.11	< 0.11 U
7421-93-4	Endrin Aldehyde	0.11	< 0.11 U
5103-74-2	trans-Chlordane #	0.057	< 0.057 U
5103-71-9	cis-Chlordane $	0.057	< 0.057 U
8001-35-2	Toxaphene	5.7	< 5.7 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	68.0%
Tetrachlorometaxylene	51.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65N
LIMS ID: 12-18418
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/05/12 00:41
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	64.2%
Tetrachlorometaxylene	48.0%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

FORM I

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65O
LIMS ID: 12-18419
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/29/12
Date Analyzed: 10/05/12 00:59
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	64.2%
Tetrachlorometaxylene	49.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

SW8081/PESTICIDE WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Client ID	DCBP	TCMX	TOT OUT
MB-092912	71.0%	43.0%	0
LCS-092912	68.5%	44.8%	0
LCSD-092912	62.2%	45.8%	0
MW-15D-092412	63.2%	46.0%	0
MW-16D-092412	75.5%	52.5%	0
MW-14D-092412	58.8%	39.5%	0
MW-15S-092412	57.5%	49.5%	0
MW-16S-092412	65.2%	42.2%	0
MW-14S-092412	61.8%	47.2%	0
MW-13S-092412	58.0%	45.5%	0
MW-12S-092412	55.0%	46.8%	0
MW-11S-092412	68.8%	48.2%	0
MW-12D-092412	43.0%	37.8%	0
MW-11D-092412	64.0%	44.8%	0
MW-13D-092412	61.0%	48.8%	0
MW-DUP-092412	68.0%	51.5%	0
MW-15S-092412	64.2%	48.0%	0
MW-13D-092412	64.2%	49.8%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(37-125)	(11-144)
(TCMX) = Tetrachlorometaxylene	(38-103)	(30-105)

Prep Method: SW3510C
Log Number Range: 12-18405 to 12-18419

FORM-II SW8081

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081B
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Sample ID: LCS-092912
LCS/LCSD

Lab Sample ID: LCS-092912
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted LCS/LCSD: 09/29/12

Date Analyzed LCS: 10/04/12 18:45
LCSD: 10/04/12 19:03
Instrument/Analyst LCS: ECD6/AAR
LCSD: ECD6/AAR
GPC Cleanup: No
Florisil Cleanup: No

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 5.0 mL
LCSD: 5.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00
Sulfur Cleanup: Yes
Silica Gel: Yes

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
alpha-BHC	0.128	0.200	64.0%	0.137	0.200	68.5%	6.8%
beta-BHC	0.138	0.200	69.0%	0.148	0.200	74.0%	7.0%
delta-BHC	0.0789	0.200	39.4%	0.0829	0.200	41.4%	4.9%
gamma-BHC (Lindane)	0.142	0.200	71.0%	0.152	0.200	76.0%	6.8%
Heptachlor	0.130	0.200	65.0%	0.140	0.200	70.0%	7.4%
Aldrin	0.125	0.200	62.5%	0.134	0.200	67.0%	6.9%
Heptachlor Epoxide	0.156	0.200	78.0%	0.164	0.200	82.0%	5.0%
Endosulfan I	0.158	0.200	79.0%	0.165	0.200	82.5%	4.3%
Dieldrin	0.316	0.400	79.0%	0.331	0.400	82.8%	4.6%
4,4'-DDE	0.315	0.400	78.8%	0.333	0.400	83.2%	5.6%
Endrin	0.332	0.400	83.0%	0.351	0.400	87.8%	5.6%
Endosulfan II	0.342	0.400	85.5%	0.352	0.400	88.0%	2.9%
4,4'-DDD	0.346	0.400	86.5%	0.356	0.400	89.0%	2.8%
Endosulfan Sulfate	0.298	0.400	74.5%	0.303	0.400	75.8%	1.7%
4,4'-DDT	0.343	0.400	85.8%	0.353	0.400	88.2%	2.9%
Methoxychlor	1.60	2.00	80.0%	1.62	2.00	81.0%	1.2%
Endrin Ketone	0.372	0.400	93.0%	0.373	0.400	93.2%	0.3%
Endrin Aldehyde	0.251	0.400	62.8%	0.244	0.400	61.0%	2.8%
trans-Chlordane	0.152	0.200	76.0%	0.160	0.200	80.0%	5.1%
cis-Chlordane	0.151	0.200	75.5%	0.159	0.200	79.5%	5.2%

Pest/PCB Surrogate Recovery

	LCS	**LCSD**
Decachlorobiphenyl	68.5%	62.2%
Tetrachlorometaxylene	44.8%	45.8%

Results reported in µg/L (ppb)
RPD calculated using sample concentrations per SW846.

FORM III

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-092912
METHOD BLANK

Lab Sample ID: MB-092912
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/05/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Date Extracted: 09/29/12
Date Analyzed: 10/04/12 18:28
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane	0.050	< 0.050 U
5103-71-9	cis-Chlordane	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	71.0%
Tetrachlorometaxylene	43.0%

FORM I

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RESOURCES
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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 11:12
Instrument/Analyst: ECD1/YZ

Sample Amount: 450 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.56	< 0.56 U
1918-00-9	Dicamba	0.56	< 0.56 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.6	< 5.6 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	95.0%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15D-092412
REEXTRACT

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/10/12 21:52
Instrument/Analyst: ECD1/YZ

Sample Amount: 450 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.56	< 0.56 U
1918-00-9	Dicamba	0.56	< 0.56 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.6	< 5.6 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	83.6%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-16D-092412
SAMPLE

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 11:48
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	94.4%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-16D-092412
REEXTRACT

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/10/12 22:29
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	79.8%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-14D-092412
SAMPLE

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 12:24
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	84.2%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-14D-092412
REEXTRACT

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/10/12 23:05
Instrument/Analyst: ECD1/YZ

Sample Amount: 440 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.57	< 0.57 U
1918-00-9	Dicamba	0.57	< 0.57 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.7	< 5.7 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	87.1%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 13:00
Instrument/Analyst: ECD1/YZ

Sample Amount: 445 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.56	< 0.56 U
1918-00-9	Dicamba	0.56	< 0.56 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.6	< 5.6 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	93.6%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15S-092412
REEXTRACT

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/10/12 23:41
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	82.4%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-16S-092412
SAMPLE

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 13:37
Instrument/Analyst: ECD1/YZ

Sample Amount: 420 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.30	< 0.30 U
93-76-5	2,4,5-T	0.30	< 0.30 U
88-85-7	Dinoseb	0.60	< 0.60 U
1918-00-9	Dicamba	0.60	< 0.60 U
94-75-7	2,4-D	1.2	< 1.2 U
94-82-6	2,4-DB	6.0	< 6.0 U
75-99-0	Dalapon	1.2	< 1.2 U
94-74-6	MCPA	300	< 300 U
120-36-5	Dichloroprop	1.2	< 1.2 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	88.0%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-16S-092412
REEXTRACT

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 00:17
Instrument/Analyst: ECD1/YZ

Sample Amount: 475 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.26	< 0.26 U
93-76-5	2,4,5-T	0.26	< 0.26 U
88-85-7	Dinoseb	0.53	< 0.53 U
1918-00-9	Dicamba	0.53	< 0.53 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.3	< 5.3 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	260	< 260 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid 83.9%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-14S-092412
SAMPLE

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 14:13
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	84.8%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-14S-092412
REEXTRACT

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 02:06
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	83.2%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 16:02
Instrument/Analyst: ECD1/YZ

Sample Amount: 455 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.55	< 0.55 U
1918-00-9	Dicamba	0.55	< 0.55 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.5	< 5.5 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	83.9%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-13S-092412
REEXTRACT

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 02:42
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	82.3%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-12S-092412
SAMPLE

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 16:38
Instrument/Analyst: ECD1/YZ

Sample Amount: 465 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	87.5%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-12S-092412
REEXTRACT

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 03:19
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	86.0%

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Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-11S-092412
SAMPLE

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 17:14
Instrument/Analyst: ECD1/YZ

Sample Amount: 440 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.57	< 0.57 U
1918-00-9	Dicamba	0.57	< 0.57 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.7	< 5.7 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	112%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11S-092412
REEXTRACT

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 03:55
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	74.4%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12D-092412
SAMPLE

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 17:51
Instrument/Analyst: ECD1/YZ

Sample Amount: 440 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.57	< 0.57 U
1918-00-9	Dicamba	0.57	< 0.57 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.7	< 5.7 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	87.8%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12D-092412
REEXTRACT

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 04:31
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	114%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-092412
SAMPLE

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 18:27
Instrument/Analyst: ECD1/YZ

Sample Amount: 450 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.28	< 0.28 U
93-76-5	2,4,5-T	0.28	< 0.28 U
88-85-7	Dinoseb	0.56	< 0.56 U
1918-00-9	Dicamba	0.56	< 0.56 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.6	< 5.6 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	62.2%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-092412
REEXTRACT

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 05:07
Instrument/Analyst: ECD1/YZ

Sample Amount: 470 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.53	< 0.53 U
1918-00-9	Dicamba	0.53	< 0.53 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.3	< 5.3 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	56.4%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 19:03
Instrument/Analyst: ECD1/YZ

Sample Amount: 455 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.55	< 0.55 U
1918-00-9	Dicamba	0.55	< 0.55 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.5	< 5.5 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	87.9%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13D-092412
REEXTRACT

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 05:44
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	81.2%

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-DUP-092412
SAMPLE

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 19:39
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	93.2%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-DUP-092412
REEXTRACT

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 06:20
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	85.0%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65N
LIMS ID: 12-18418
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 20:16
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	83.1%

FORM I

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-15S-092412
REEXTRACT

Lab Sample ID: VK65N
LIMS ID: 12-18418
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 06:56
Instrument/Analyst: ECD1/YZ

Sample Amount: 460 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.54	< 0.54 U
1918-00-9	Dicamba	0.54	< 0.54 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.4	< 5.4 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	270	< 270 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	89.2%

FORM I

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65O
LIMS ID: 12-18419
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 20:52
Instrument/Analyst: ECD1/YZ

Sample Amount: 455 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.27	< 0.27 U
93-76-5	2,4,5-T	0.27	< 0.27 U
88-85-7	Dinoseb	0.55	< 0.55 U
1918-00-9	Dicamba	0.55	< 0.55 U
94-75-7	2,4-D	1.1	< 1.1 U
94-82-6	2,4-DB	5.5	< 5.5 U
75-99-0	Dalapon	1.1	< 1.1 U
94-74-6	MCPA	280	< 280 U
120-36-5	Dichloroprop	1.1	< 1.1 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	95.6%

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-13D-092412
REEXTRACT

Lab Sample ID: VK65O
LIMS ID: 12-18419
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted: 10/10/12
Date Analyzed: 10/11/12 07:33
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	111%

FORM I

SW8151A/HERBICIDE WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Client ID	DCPA	TOT OUT
MB-092812	81.6%	0
LCS-092812	88.5%	0
LCSD-092812	80.7%	0
MW-15D-092412	95.0%	0
MW-15D-092412 RE	83.6%	0
MB-101012	74.6%	0
LCS-101012	87.0%	0
LCSD-101012	94.8%	0
MW-16D-092412	94.4%	0
MW-16D-092412 RE	79.8%	0
MW-14D-092412	84.2%	0
MW-14D-092412 RE	87.1%	0
MW-15S-092412	93.6%	0
MW-15S-092412 RE	82.4%	0
MW-16S-092412	88.0%	0
MW-16S-092412 RE	83.9%	0
MW-14S-092412	84.8%	0
MW-14S-092412 RE	83.2%	0
MW-13S-092412	83.9%	0
MW-13S-092412 RE	82.3%	0
MW-12S-092412	87.5%	0
MW-12S-092412 RE	86.0%	0
MW-11S-092412	112%	0
MW-11S-092412 RE	74.4%	0
MW-12D-092412	87.8%	0
MW-12D-092412 RE	114%	0
MW-11D-092412	62.2%	0
MW-11D-092412 RE	56.4%	0
MW-13D-092412	87.9%	0
MW-13D-092412 RE	81.2%	0
MW-DUP-092412	93.2%	0
MW-DUP-092412 RE	85.0%	0
MW-15S-092412	83.1%	0
MW-15S-092412 RE	89.2%	0
MW-13D-092412	95.6%	0
MW-13D-092412 RE	111%	0

	LCS/MB LIMITS	QC LIMITS
(DCPA) = 2,4-Dichlorophenylacetic Acid	(66-112)	(28-140)

Log Number Range: 12-18405 to 12-18419

FORM-II SW8151A

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Page 1 of 1

Sample ID: LCS-092812
LCS/LCSD

Lab Sample ID: LCS-092812
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted LCS/LCSD: 09/28/12

Date Analyzed LCS: 10/05/12 09:23
LCSD: 10/05/12 09:59
Instrument/Analyst LCS: ECD1/YZ
LCSD: ECD1/YZ

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 50 mL
LCSD: 50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
2,4,5-TP (Silvex)	6.02	2.50	241%	6.17	2.50	247%	2.5%
2,4,5-T	< 0.25	0.625	NR%	0.330	0.625	52.8%	NR%
Dinoseb	1.58	1.25	126%	1.53	1.25	122%	3.2%
Dicamba	3.13	1.25	250%	3.27	1.25	262%	4.4%
2,4-D	< 1.00	2.50	NR%	1.42	2.50	56.8%	NR%
2,4-DB	44.5	12.5	356%	42.9	12.5	343%	3.7%
Dalapon	1.79	2.50	71.6%	2.86	2.50	114%	46.0%
Dichloroprop	6.36	2.50	254%	6.56	2.50	262%	3.1%

Herbicide Surrogate Recovery

	LCS	**LCSD**
2,4-Dichlorophenylacetic	88.5%	80.7%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

FORM III

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Page 1 of 1

Sample ID: LCS-101012
LCS/LCSD

Lab Sample ID: LCS-101012
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted LCS/LCSD: 10/10/12

Date Analyzed LCS: 10/11/12 09:21
LCSD: 10/11/12 12:59
Instrument/Analyst LCS: ECD1/YZ
LCSD: ECD1/YZ

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 50 mL
LCSD: 50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
2,4,5-TP (Silvex)	6.11	10.0	61.1%	7.22	10.0	72.2%	16.7%
2,4,5-T	0.540	2.50	21.6%	1.81	2.50	72.4%	108%
Dinoseb	2.04	5.00	40.8%	2.04	5.00	40.8%	0.0%
Dicamba	3.26	5.00	65.2%	4.20	5.00	84.0%	25.2%
2,4-D	1.88	10.0	18.8%	3.09	10.0	30.9%	48.7%
2,4-DB	43.0	50.0	86.0%	50.1	50.0	100%	15.3%
Dalapon	2.92	10.0	29.2%	4.99	10.0	49.9%	52.3%
Dichloroprop	5.85	10.0	58.5%	7.23	10.0	72.3%	21.1%

Herbicide Surrogate Recovery

	LCS	**LCSD**
2,4-Dichlorophenylacetic	87.0%	94.8%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

FORM III

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-092812
METHOD BLANK

Lab Sample ID: MB-092812
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Date Extracted: 09/28/12
Date Analyzed: 10/05/12 08:47
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	81.6%

FORM I

**ANALYTICAL
RESOURCES
INCORPORATED**

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-101012
METHOD BLANK

Lab Sample ID: MB-101012
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/11/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Date Extracted: 10/10/12
Date Analyzed: 10/10/12 19:27
Instrument/Analyst: ECD1/YZ

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	74.6%

FORM I

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Extraction Method: SW3510C
Page 1 of 2

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Matrix: Water

Data Release Authorized:
Reported: 10/01/12

ARI ID	**Sample ID**	**Extraction Date**	**Analysis Date**	**DL**	**Range**	**Result**
MB-092712	Method Blank	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18405					Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	90.7%
VK65A	MW-15D-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18405	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	76.9%
VK65B	MW-16D-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18406	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	82.8%
VK65C	MW-14D-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18407	HC ID: **DRO/MOTOR OIL**				**Diesel**	**> 0.50**
					Oil	**> 0.50**
					o-Terphenyl	81.8%
VK65D	MW-15S-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18408	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	82.8%
VK65E	MW-16S-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18409	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	81.0%
VK65F	MW-14S-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18410	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	78.5%
VK65G	MW-13S-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18411	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	84.4%
VK65H	MW-12S-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18412	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	77.9%

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Extraction Method: SW3510C
Page 2 of 2

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Matrix: Water

Data Release Authorized:
Reported: 10/01/12

ARI ID	**Sample ID**	**Extraction Date**	**Analysis Date**	**DL**	**Range**	**Result**
VK65I	MW-11S-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18413	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	90.4%
VK65J	MW-12D-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18414	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	87.7%
VK65K	MW-11D-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18415	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	74.4%
VK65L	MW-13D-092412	09/27/12	09/28/12	1.0	**Gas**	**> 0.25**
12-18416	HC ID: **GRO/DRO/MOTOR OIL**				**Diesel**	**> 0.50**
					Oil	**> 0.50**
					o-Terphenyl	82.1%
VK65M	MW-DUP-092412	09/27/12	09/28/12	1.0	Gas	< 0.25 U
12-18417	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	76.1%

Reported in mg/L (ppm)

Gas value based on total peaks in the range from Toluene to C12.
Diesel value based on the total peaks in the range from C12 to C24.
Oil value based on the total peaks in the range from C24 to C38.

FORM I

```
                    Analytical Resources Inc.
                     TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a012.d       ARI ID: VK65MBW1
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: VK65MBW1
Instrument: fid4a.i                                    Injection: 28-SEP-2012 11:14
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                          FID:4A RESULTS
Compound       RT     Shift   Height     Area     Method   Range         Total Area   Conc
===========================================================================================
Toluene       1.290  -0.003   11583     21573 | WATPHG (Tol-C12)        336350      18.16
C8            1.544  -0.007    2955     12465 | WATPHD (C12-C24)         37480       2.34
C10           3.160  -0.006     624       475 | WATPHM (C24-C38)         66461       5.02
C12           4.075   0.001     266       551 |  AK102 (C10-C25)         65225       3.45
C14           4.757   0.000     183       185 |  AK103 (C25-C36)         47834       5.20
C16           5.346   0.004     202       158 |
C18           5.880  -0.025    1138      1208 |
C20           6.475   0.004     154       112 |  JET-A (C10-C18)         50728       9.37
C22           7.018  -0.004      80        23 |MIN.OIL (C24-C38)         66461       4.94
C24           7.554   0.011      76       104 |
C25           7.815   0.019    2678      2733 |
C26           8.039   0.002      92       121 |
C28           8.491  -0.001    1971      1877 |
C32           9.293  -0.007     456       220 |
C34           9.659  -0.014     542       308 |
Filter Peak  11.328   0.005    1978      3434 |BUNKERC (C10-C38)        131490      14.36
C36          10.061   0.028     852      1525 |
C38          10.375  -0.009    1151      2508 |
C40          10.757   0.034    1166       873 |
o-terph       6.045   0.001  961138    884853 |
Triacon Surr  8.925   0.008  855560    868698 |NAS DIES (C10-C24)        65029       3.55
===========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)     AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount    %Rec
  -----------------------------------------
    o-Terphenyl     884853      40.8     90.7
    Triacontane     868698      46.7    103.8

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
     ---------------------------------------
       o-Terph Surr    21670.6   25-SEP-2012
       Triacon Surr    18590.6   25-SEP-2012
       Gas             18517.9   28-SEP-2012
       Diesel          16014.3   25-SEP-2012
       Motor Oil       13234.2   25-SEP-2012
       AK102           18929.5   25-SEP-2012
       AK103            9202.1   25-SEP-2012
       JetA             5416.5   11-AUG-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       18324.0   24-AUG-2012
       Bunker C         9156.1   24-AUG-2012
```

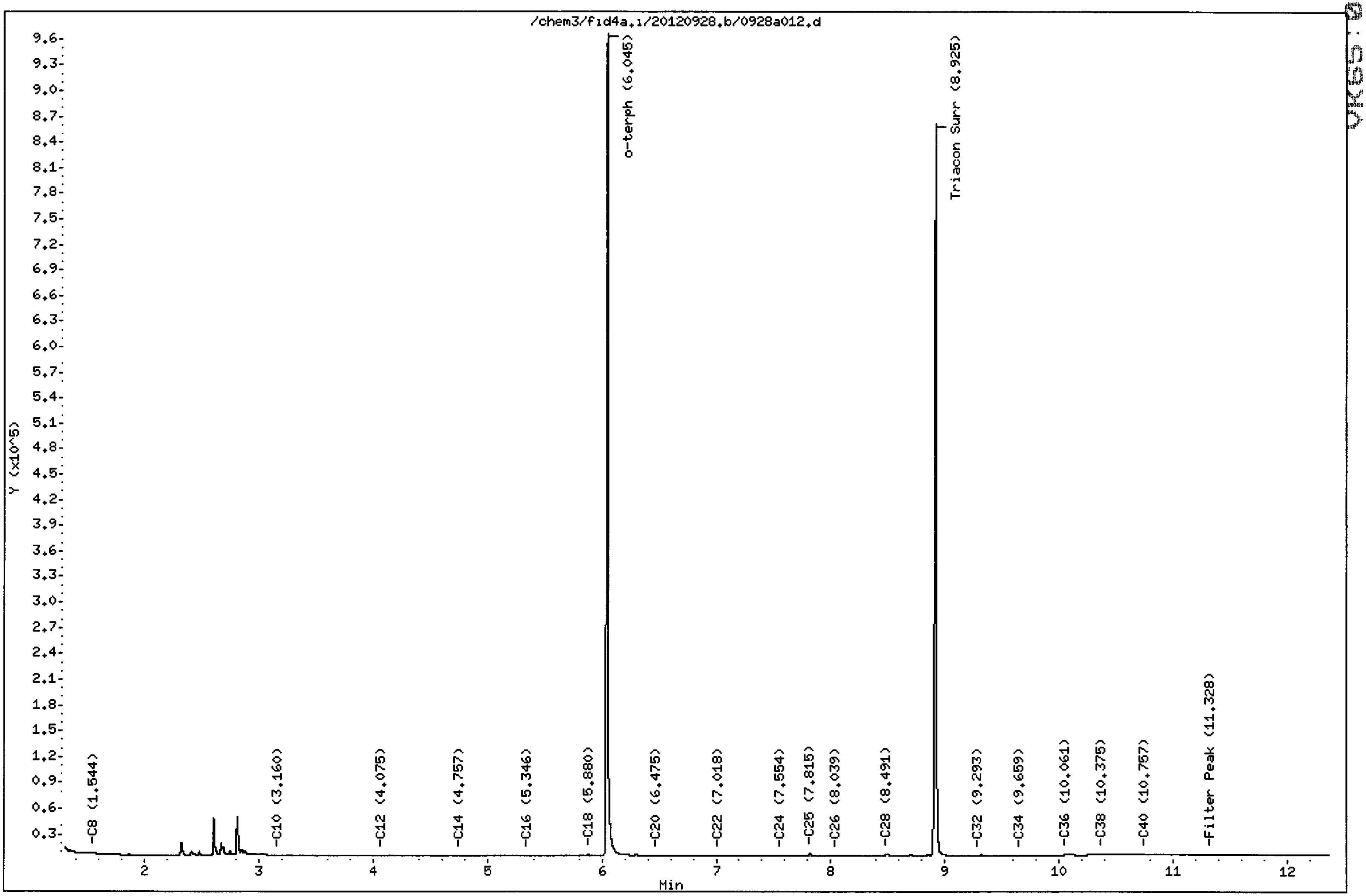
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a012.d
Date : 28-SEP-2012 11:14
Client ID: VK65MBW1
Sample Info: VK65MBW1

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



```
                    Analytical Resources Inc.
                     TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a015.d       ARI ID: VK65A
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: MW-15D-092412
Instrument: fid4a.i                                    Injection: 28-SEP-2012 12:18
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                          FID:4A RESULTS
Compound        RT     Shift    Height     Area     Method   Range          Total Area   Conc
=================================================================================================
Toluene        1.281  -0.012    13369     17372 | WATPHG (Tol-C12)        1276195     68.92
C8             1.539  -0.012     2115      6317 | WATPHD (C12-C24)        6592129    411.64
C10            3.181   0.015    14076     40203 | WATPHM (C24-C38)        1166288     88.13
C12            4.082   0.008    26282     43702 |  AK102 (C10-C25)        7608108    401.92
C14            4.746  -0.011    69734    127719 |  AK103 (C25-C36)         941054    102.27
C16            5.365   0.023    36434     68534 |
C18            5.919   0.015    32655    103622 |
C20            6.474   0.003    21418      9273 |  JET-A (C10-C18)        5398505    996.68
C22            7.018  -0.003    18132     21715 |MIN.OIL (C24-C38)        1166288     86.77
C24            7.567   0.024    18041     37537 |
C25            7.806   0.010    18453     35889 |
C26            8.028  -0.009    13610     34008 |
C28            8.504   0.012    19948     50630 |
C32            9.300  -0.001     6130     14319 |
C34            9.677   0.004     4873     14974 |
Filter Peak   11.311  -0.012     1981      9326 |BUNKERC (C10-C38)        8608735    940.22
C36           10.042   0.009     3653     12402 |
C38           10.402   0.017     2868      7805 |
C40           10.725   0.002     2059      1301 |
o-terph        6.046   0.001   908702    749522 |
Triacon Surr   8.918   0.001   714380    782439 |NAS DIES (C10-C24)       7442447    406.16
=================================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)   Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)     AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate        Area     Amount    %Rec
  ------------------------------------------
    o-Terphenyl     749522     34.6     76.9 M
    Triacontane     782439     42.1     93.5

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
     ---------------------------------------
       o-Terph Surr   21670.6   25-SEP-2012
       Triacon Surr   18590.6   25-SEP-2012
       Gas            18517.9   28-SEP-2012
       Diesel         16014.3   25-SEP-2012
       Motor Oil      13234.2   25-SEP-2012
       AK102          18929.5   25-SEP-2012
       AK103           9202.1   25-SEP-2012
       JetA            5416.5   11-AUG-2012
       Min Oil        13440.7   09-MAY-2012
       NAS Diesel      18324.0   24-AUG-2012
       Bunker C        9156.1   24-AUG-2012
```

JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a015.d

Date : 28-SEP-2012 12:18

Client ID: MW-15D-092412

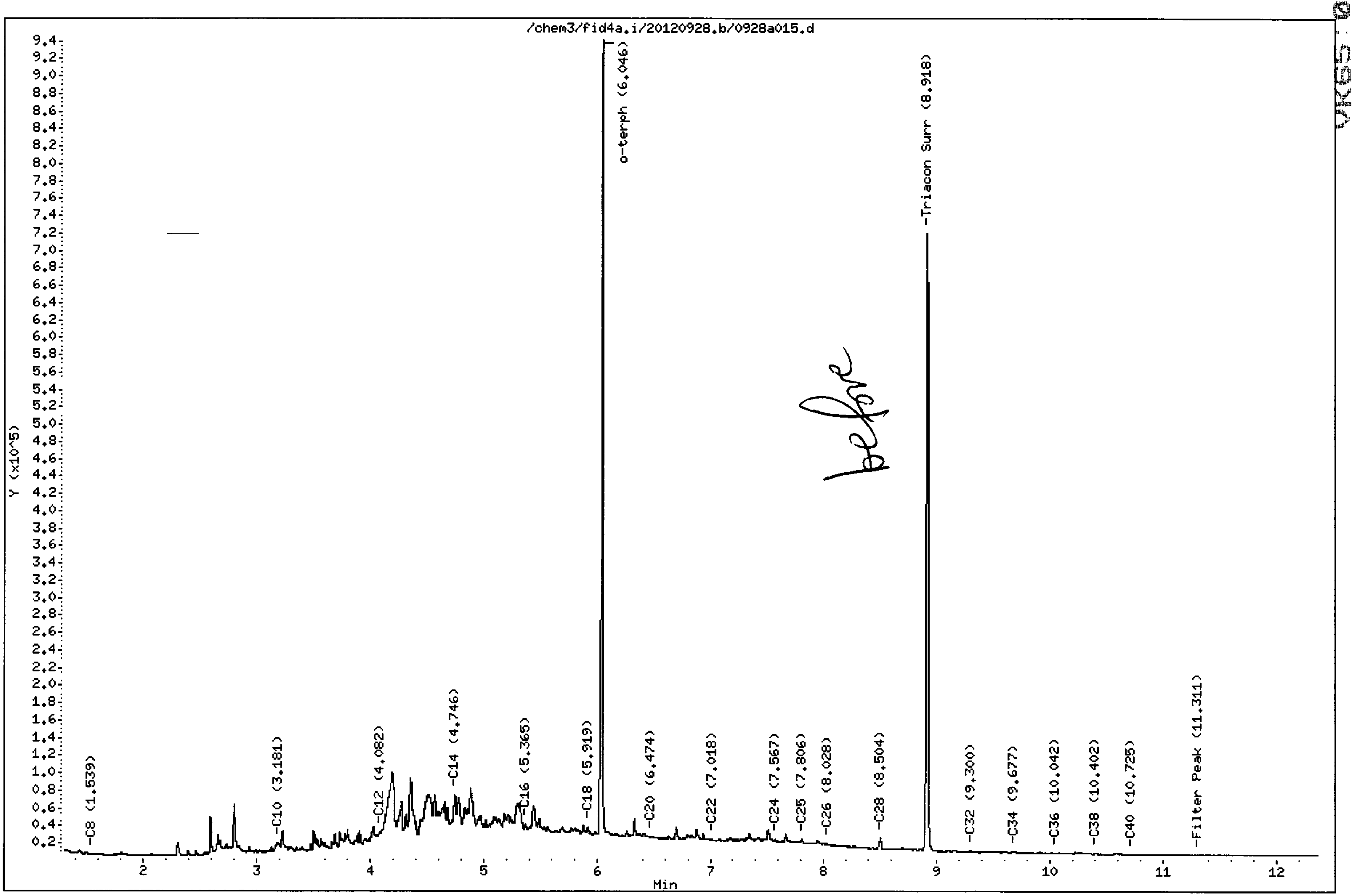
Sample Info: VK65A

Column phase: RTX-1

Instrument: fid4a.i

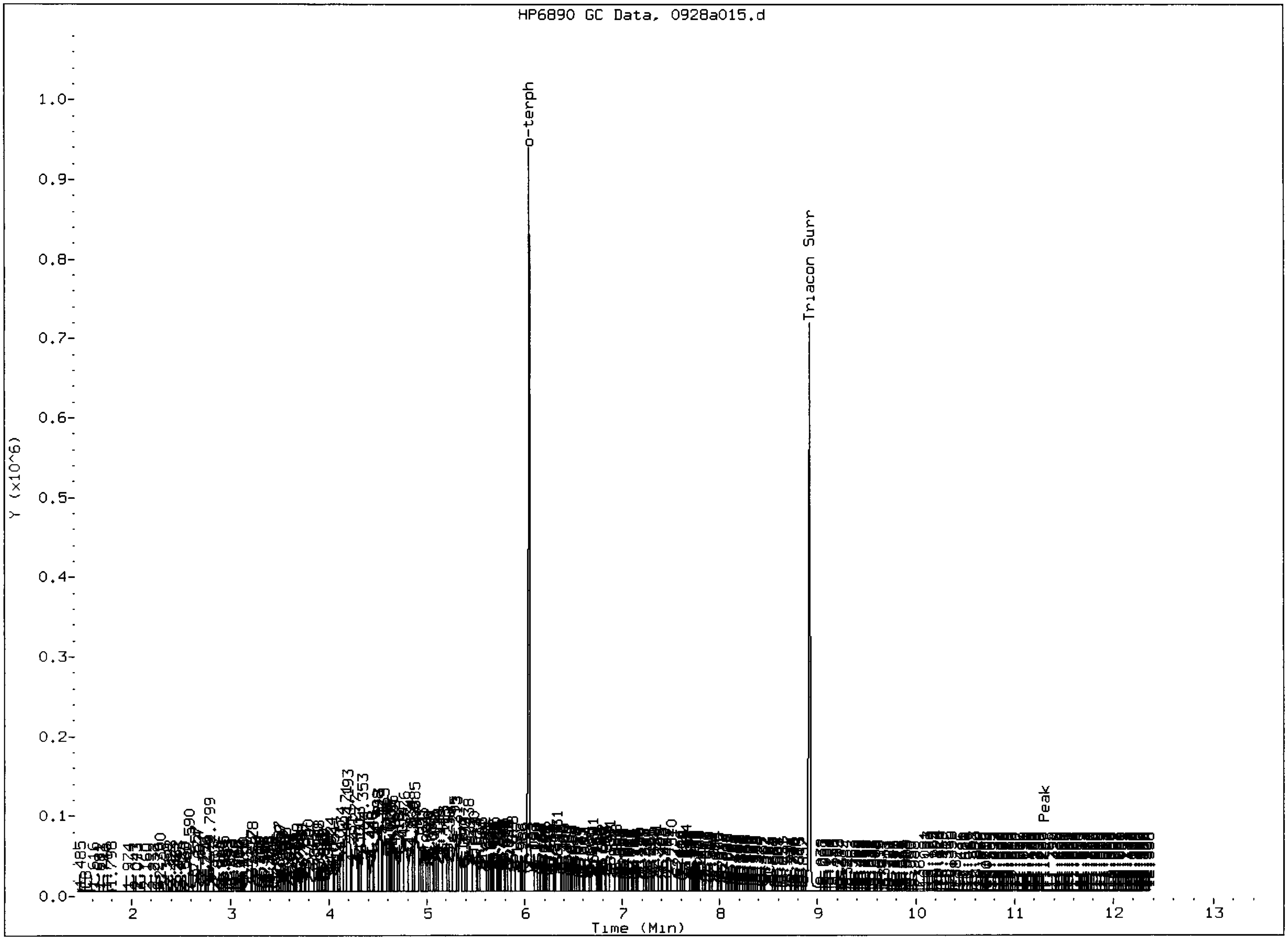
Operator: JR

Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65A FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: ____

Date: 10/01/12

```
                       Analytical Resources Inc.
                        TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a016.d        ARI ID: VK65B
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m          Client ID: MW-16D-092412
Instrument: fid4a.i                                     Injection: 28-SEP-2012 12:39
Operator: JR
Report Date: 10/01/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                  FID:4A RESULTS
Compound        RT     Shift    Height     Area    Method   Range         Total Area    Conc
==========================================================================================
Toluene       1.272  -0.021    10597     15323 | WATPHG (Tol-C12)          689004     37.21
C8            1.540  -0.011     7476     34031 | WATPHD (C12-C24)         4666532    291.40
C10           3.157  -0.009     1588      1478 | WATPHM (C24-C38)          973450     73.56
C12           4.086   0.012    12608     23001 |  AK102 (C10-C25)         5093356    269.07
C14           4.771   0.014    19008     13722 |  AK103 (C25-C36)          804354     87.41
C16           5.361   0.019    33056     53919 |
C18           5.909   0.004    27154     30214 |
C20           6.467  -0.004    22942      8599 |  JET-A (C10-C18)         2963642    547.15
C22           7.026   0.005    18608     24617 |MIN.OIL (C24-C38)          973450     72.43
C24           7.555   0.011    15861      4080 |
C25           7.796   0.000    14304      7298 |
C26           8.025  -0.012    11762     25779 |
C28           8.490  -0.002     9541      9503 |
C32           9.314   0.014     5271     16443 |
C34           9.679   0.006     3007      1412 |
Filter Peak  11.322  -0.001     1772       457 |BUNKERC (C10-C38)         5937018    648.42
C36          10.042   0.008     2108      1042 |
C38          10.380  -0.005     1883       674 |
C40          10.726   0.003     1680      1386 |
o-terph       6.045   0.001   991052    807970 |
Triacon Surr  8.927   0.010   775336    826436 |NAS DIES (C10-C24)        4963569    270.88
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)     AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl     807970      37.3      82.9 M
    Triacontane     826436      44.5      98.8

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
    -------------------------------------
     o-Terph Surr     21670.6   25-SEP-2012
     Triacon Surr     18590.6   25-SEP-2012
     Gas              18517.9   28-SEP-2012
     Diesel           16014.3   25-SEP-2012
     Motor Oil        13234.2   25-SEP-2012
     AK102            18929.5   25-SEP-2012
     AK103             9202.1   25-SEP-2012
     JetA              5416.5   11-AUG-2012
     Min Oil          13440.7   09-MAY-2012
     NAS Diesel        18324.0   24-AUG-2012
     Bunker C          9156.1   24-AUG-2012
```

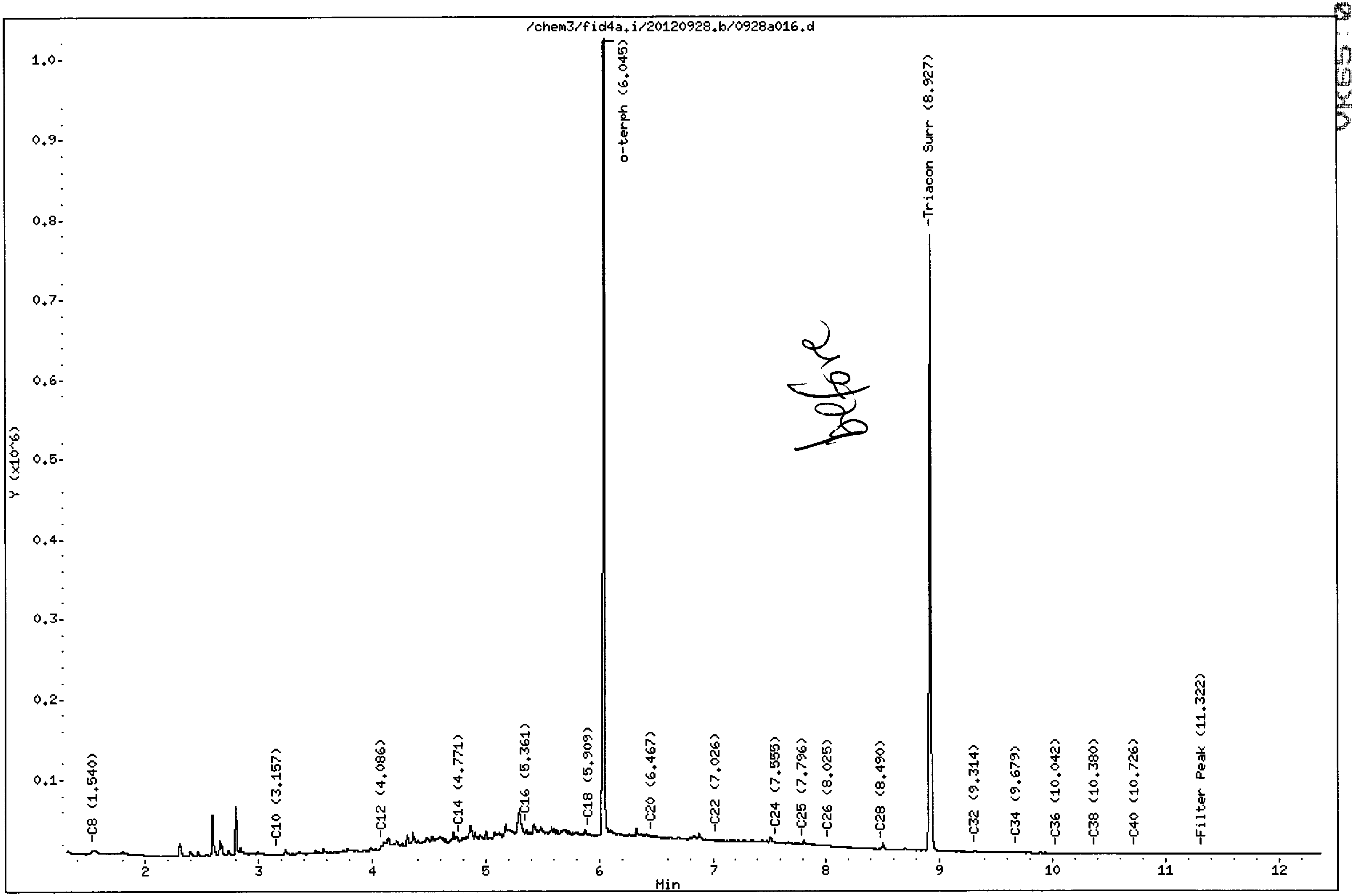
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a016.d
Date : 28-SEP-2012 12:39
Client ID: MW-16D-092412
Sample Info: VK65B

Column phase: RTX-1

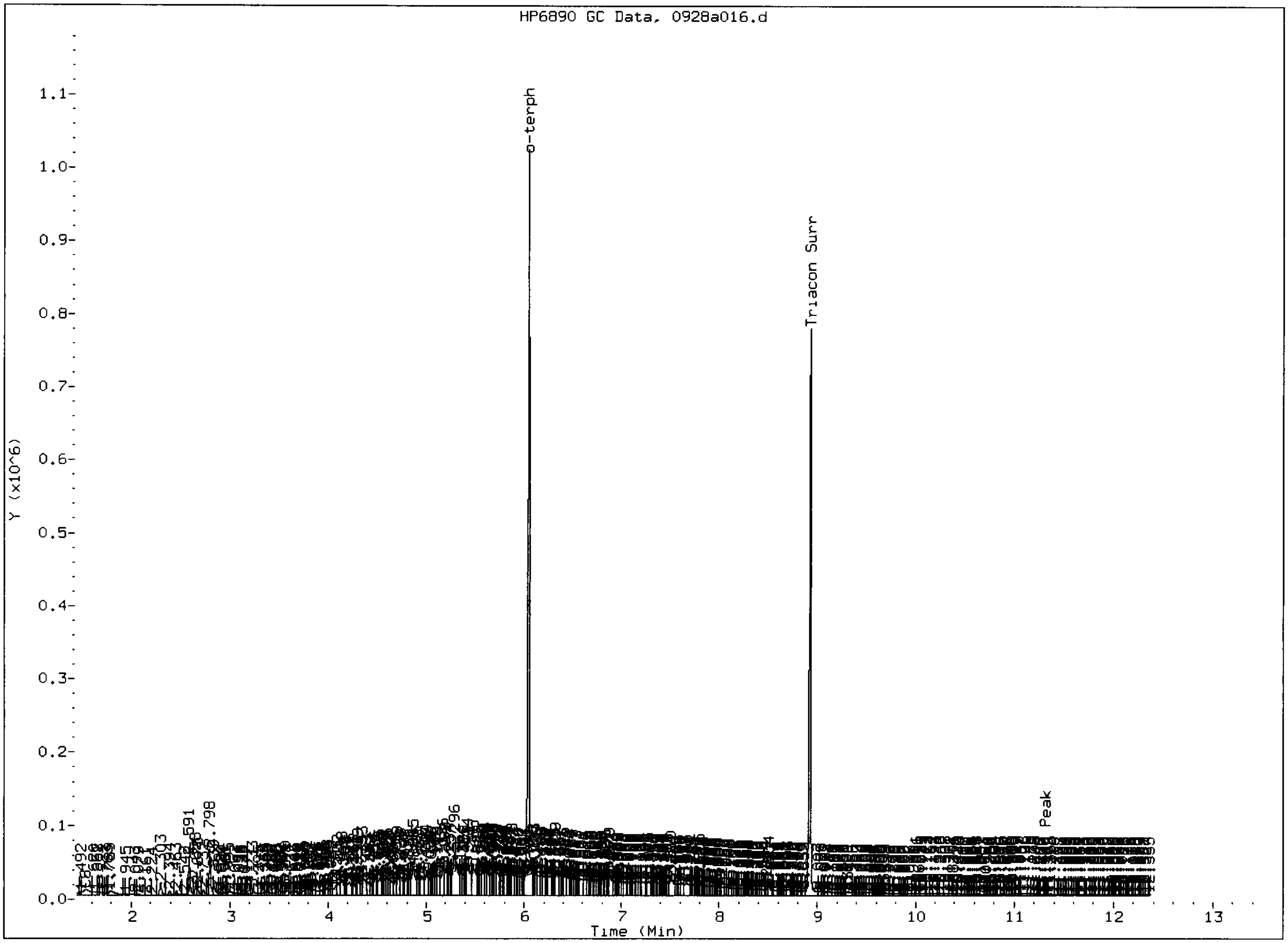
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65B FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: 7 Date: 10/01/12

```
                          Analytical Resources Inc.
                           TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a017.d        ARI ID: VK65C
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m          Client ID: MW-14D-092412
Instrument: fid4a.i                                     Injection: 28-SEP-2012 13:01
Operator: JR
Report Date: 10/01/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                      FID:4A RESULTS
Compound        RT     Shift    Height      Area     Method   Range          Total Area     Conc
================================================================================================
Toluene        1.272  -0.021    15513      21072 |  WATPHG  (Tol-C12)          899779      48.59
C8             1.543  -0.008     2402       6689 |  WATPHD  (C12-C24)         4956861     309.53
C10            3.156  -0.010     2967       2923 |  WATPHM  (C24-C38)         4427072     334.52
C12            4.075   0.001    14000      17936 |   AK102  (C10-C25)         5756202     304.09
C14            4.742  -0.015    28011      74320 |   AK103  (C25-C36)         3811756     414.23
C16            5.342  -0.001    22831      23605 |
C18            5.908   0.003    22335       7029 |
C20            6.481   0.010    22066      31186 |   JET-A  (C10-C18)         2982277     550.59
C22            7.018  -0.004    28919      51000 |MIN.OIL  (C24-C38)         4427072     329.38
C24            7.539  -0.004    49829      73071 |
C25            7.791  -0.005    50212     130557 |
C26            8.035  -0.002    50441     112429 |
C28            8.492   0.000    56416     120076 |
C32            9.289  -0.011    26696      21924 |
C34            9.655  -0.019    25016      33497 |
Filter Peak   11.324   0.001     3975       1572 |BUNKERC  (C10-C38)         9900936    1081.35
C36           10.030  -0.003    19005      18974 |
C38           10.382  -0.002    14868      25368 |
C40           10.733   0.010     8953       5607 |
o-terph        6.048   0.003   939638     797546 |
Triacon Surr   8.930   0.013   767923     806348 |NAS DIES (C10-C24)         5473863     298.73
================================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  ------------------------------------------
    o-Terphenyl     797546      36.8      81.8 M
    Triacontane     806348      43.4      96.4 M

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
    -------------------------------------
     o-Terph Surr     21670.6    25-SEP-2012
     Triacon Surr     18590.6    25-SEP-2012
     Gas              18517.9    28-SEP-2012
     Diesel           16014.3    25-SEP-2012
     Motor Oil        13234.2    25-SEP-2012
     AK102            18929.5    25-SEP-2012
     AK103             9202.1    25-SEP-2012
     JetA              5416.5    11-AUG-2012
     Min Oil          13440.7    09-MAY-2012
     NAS Diesel        18324.0    24-AUG-2012
     Bunker C          9156.1    24-AUG-2012
```

JR 10/01/12

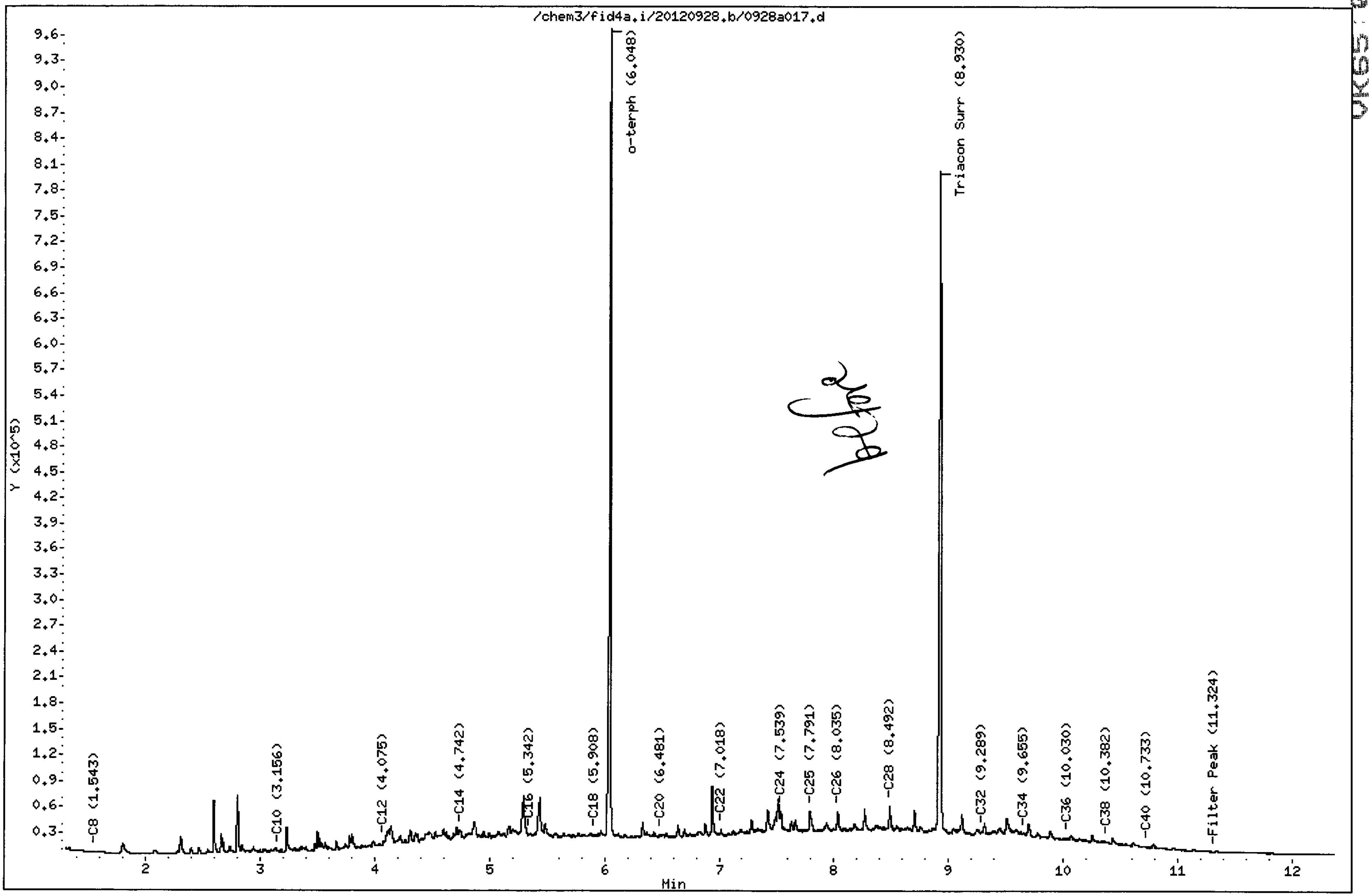
Data File: /chem3/fid4a.i/20120928.b/0928a017.d
Date : 28-SEP-2012 13:01
Client ID: MW-14D-092412
Sample Info: VK65C

Column phase: RTX-1

Instrument: fid4a.i

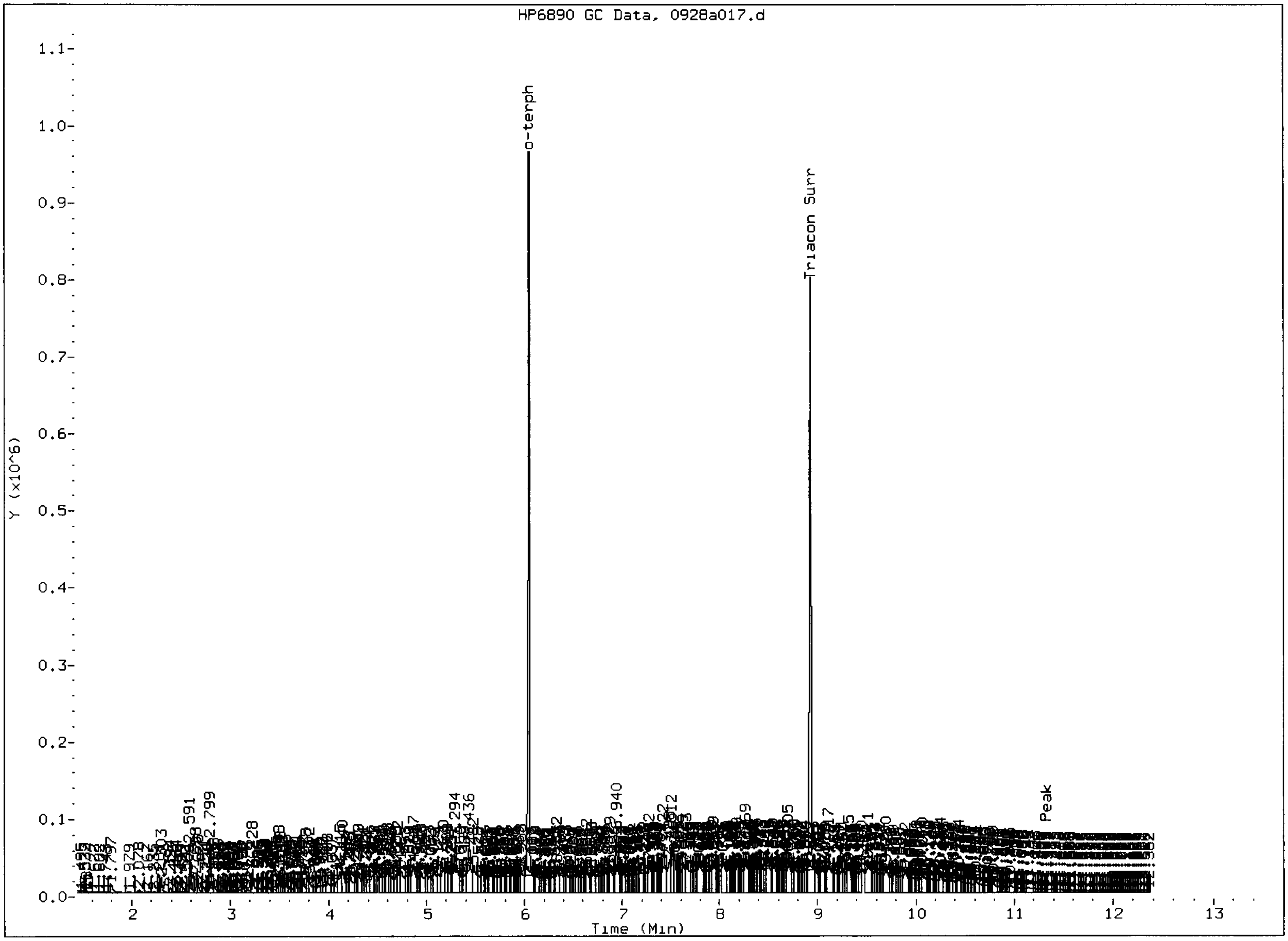
Operator: JR
Column diameter: 0.25

/chem3/fid4a.i/20120928.b/0928a017.d



before

FID:4A-2C/RTX-1 VK65C FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst:

Date: 10/01/12

```
                         Analytical Resources Inc.
                          TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a018.d       ARI ID: VK65D
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: MW-15S-092412
Instrument: fid4a.i                                    Injection: 28-SEP-2012 13:22
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                        FID:4A RESULTS
Compound         RT     Shift    Height     Area    Method   Range          Total Area    Conc
==========================================================================================
Toluene        1.272   -0.021     13926     18834 | WATPHG (Tol-C12)         1299428     70.17
C8             1.541   -0.010      3321      7976 | WATPHD (C12-C24)         6900155    430.87
C10            3.179    0.013      6362      7689 | WATPHM (C24-C38)         3051066    230.54
C12            4.068   -0.006     20993     26058 |  AK102 (C10-C25)         7986073    421.89
C14            4.757    0.000     47711    119003 |  AK103 (C25-C36)         2588482    281.29
C16            5.349    0.006     34498     12216 |
C18            5.905    0.000     31900     43249 |
C20            6.466   -0.005     27379     29661 |  JET-A (C10-C18)         4882872    901.48
C22            7.018   -0.004     27467     55570 |MIN.OIL (C24-C38)         3051066    227.00
C24            7.562    0.019     27985     38322 |
C25            7.791   -0.005     33569     32967 |
C26            8.032   -0.005     32156     86236 |
C28            8.489   -0.003     32421     67008 |
C32            9.292   -0.009     15596     12435 |
C34            9.679    0.005     14269      6630 |
Filter Peak   11.326    0.003      3116      1795 |BUNKERC (C10-C38)      10756217   1174.76
C36           10.032   -0.001     10908     16305 |
C38           10.392    0.008      8215     13611 |
C40           10.718   -0.004      5752      3067 |
o-terph        6.047    0.002    955089    807433 |
Triacon Surr   8.926    0.009    770797    807500 |NAS DIES (C10-C24)       7705151    420.50
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)   Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate        Area     Amount    %Rec
  -----------------------------------------
    o-Terphenyl     807433     37.3     82.8 M
    Triacontane     807500     43.4     96.5 M

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
    ---------------------------------------
     o-Terph Surr    21670.6   25-SEP-2012
     Triacon Surr    18590.6   25-SEP-2012
     Gas             18517.9   28-SEP-2012
     Diesel          16014.3   25-SEP-2012
     Motor Oil       13234.2   25-SEP-2012
     AK102           18929.5   25-SEP-2012
     AK103            9202.1   25-SEP-2012
     JetA             5416.5   11-AUG-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       18324.0   24-AUG-2012
     Bunker C         9156.1   24-AUG-2012
```

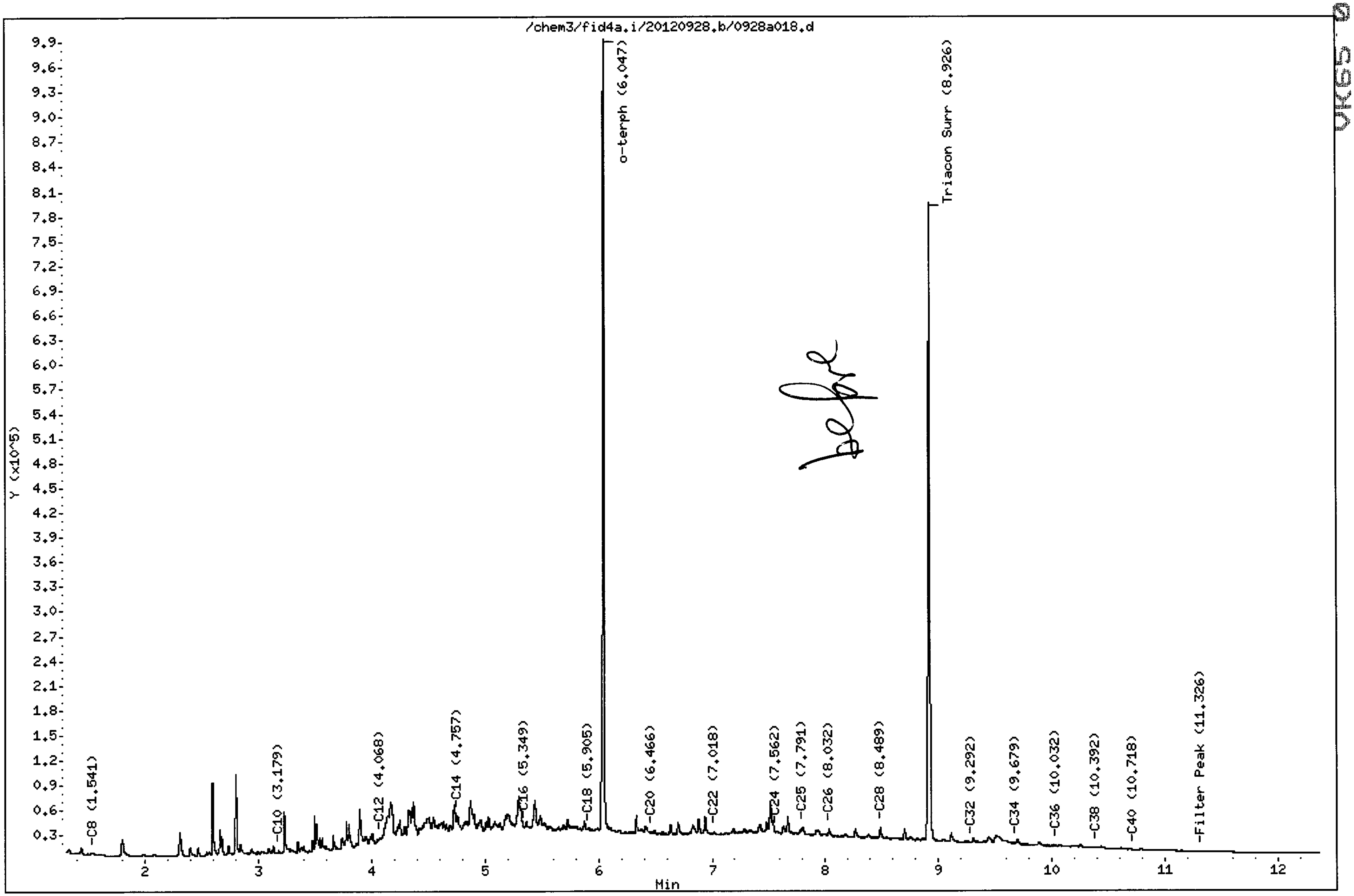
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a018.d
Date : 28-SEP-2012 13:22
Client ID: MW-15S-092412
Sample Info: VK65D

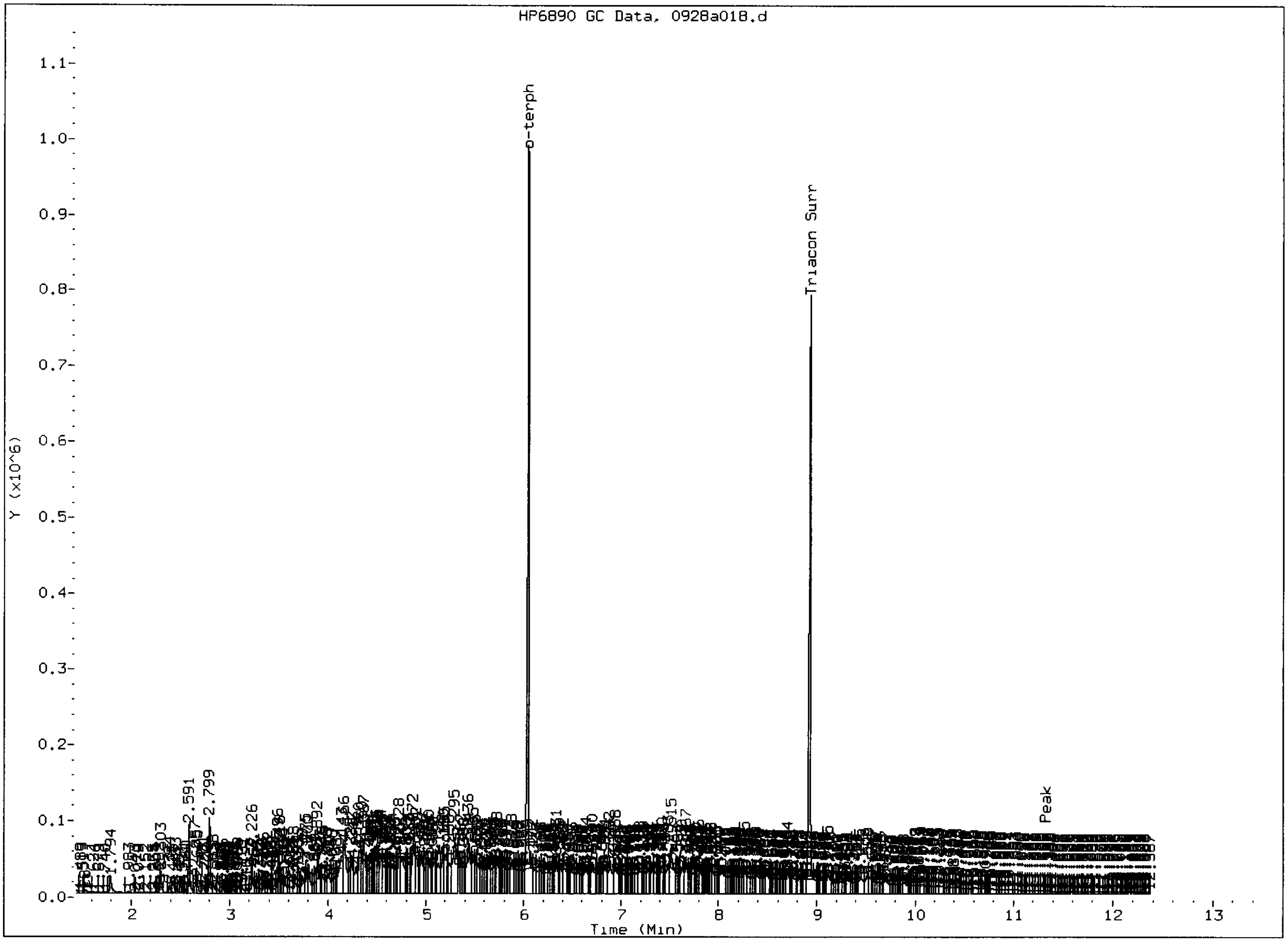
Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



FID:4A-2C/RTX-1 VK65D FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst:

Date: 10/01/12

```
                         Analytical Resources Inc.
                          TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a019.d       ARI ID: VK65E
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: MW-16S-092412
Instrument: fid4a.i                                    Injection: 28-SEP-2012 13:44
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                    FID:4A RESULTS
Compound        RT     Shift    Height     Area     Method   Range          Total Area   Conc
==========================================================================================
Toluene        1.282  -0.011     9652     15259  | WATPHG  (Tol-C12)         667764    36.06
C8             1.546  -0.005     2345      8864  | WATPHD  (C12-C24)        4633375   289.33
C10            3.192   0.026     2280      4384  | WATPHM  (C24-C38)        1231844    93.08
C12            4.090   0.016    13296     24034  |  AK102  (C10-C25)        5074408   268.07
C14            4.739  -0.018    23981     62946  |  AK103  (C25-C36)        1033913   112.36
C16            5.350   0.008    27630     20840  |
C18            5.897  -0.008    25626     14463  |
C20            6.469  -0.002    21799      9386  |  JET-A  (C10-C18)        2950572   544.74
C22            7.018  -0.004    20022     32226  |MIN.OIL  (C24-C38)        1231844    91.65
C24            7.540  -0.004    22358     31122  |
C25            7.791  -0.005    20218     28864  |
C26            8.034  -0.003    18602     44790  |
C28            8.490  -0.001    15113     18510  |
C32            9.296  -0.004     5254      4261  |
C34            9.686   0.012     4086      2923  |
Filter Peak   11.318  -0.005     2199      1698  |BUNKERC  (C10-C38)        6161134   672.90
C36           10.027  -0.006     3540      8781  |
C38           10.389   0.005     2645      1306  |
C40           10.726   0.004     2427      1436  |
o-terph        6.046   0.002   966565    790203  |
Triacon Surr   8.930   0.013   745525    829622  |NAS DIES (C10-C24)        4929290   269.01
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  ------------------------------------------
    o-Terphenyl     790203      36.5      81.0
    Triacontane     829622      44.6      99.2

M  Indicates the peak was manually integrated


      Analyte          RF       Curve Date
    -------------------------------------
     o-Terph Surr    21670.6    25-SEP-2012
     Triacon Surr    18590.6    25-SEP-2012
     Gas             18517.9    28-SEP-2012
     Diesel          16014.3    25-SEP-2012
     Motor Oil       13234.2    25-SEP-2012
     AK102           18929.5    25-SEP-2012
     AK103            9202.1    25-SEP-2012
     JetA             5416.5    11-AUG-2012
     Min Oil         13440.7    09-MAY-2012
     NAS Diesel       18324.0    24-AUG-2012
     Bunker C         9156.1    24-AUG-2012
```

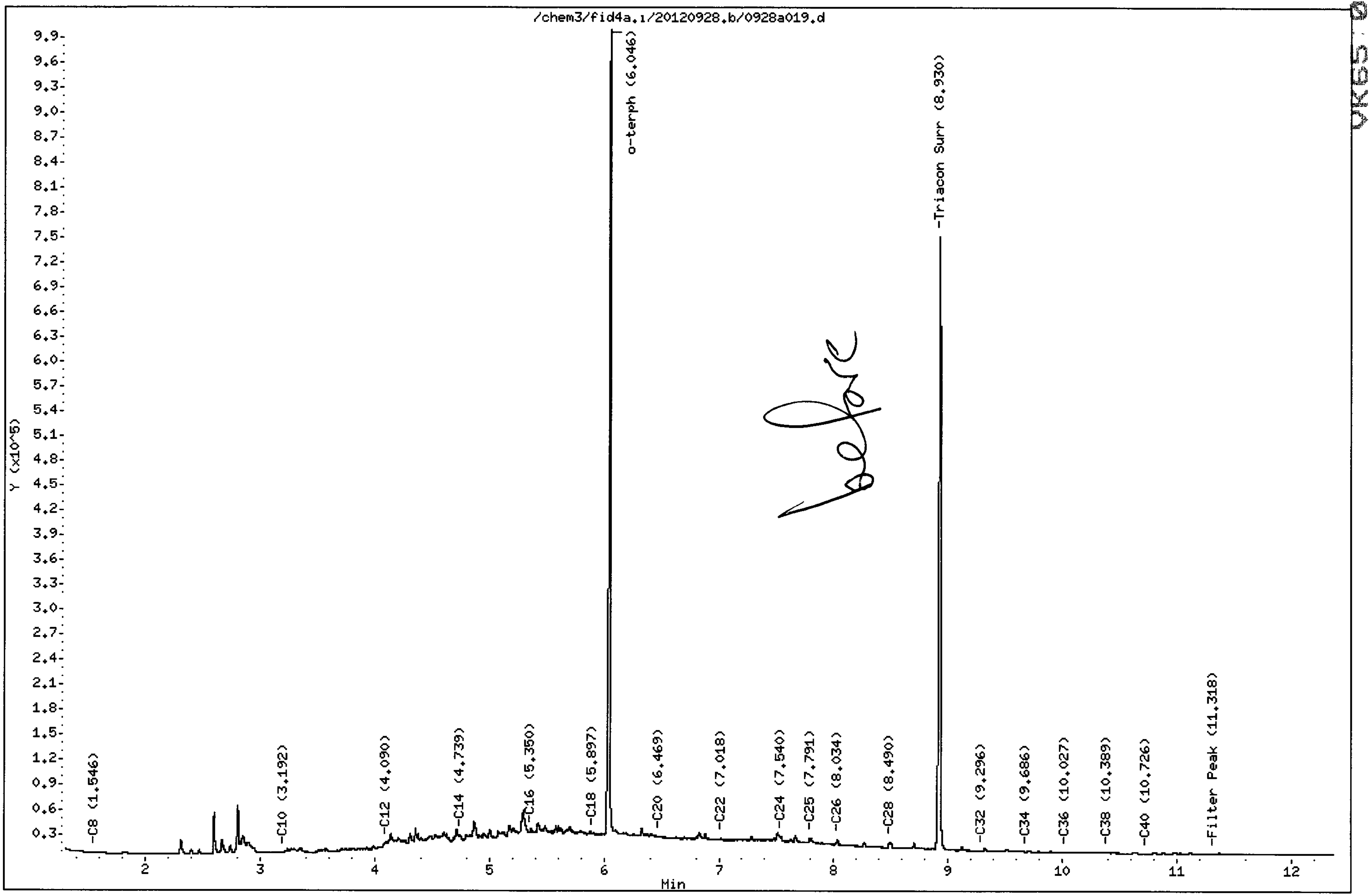
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a019.d
Date : 28-SEP-2012 13:44
Client ID: MW-16S-092412
Sample Info: VK65E

Column phase: RTX-1

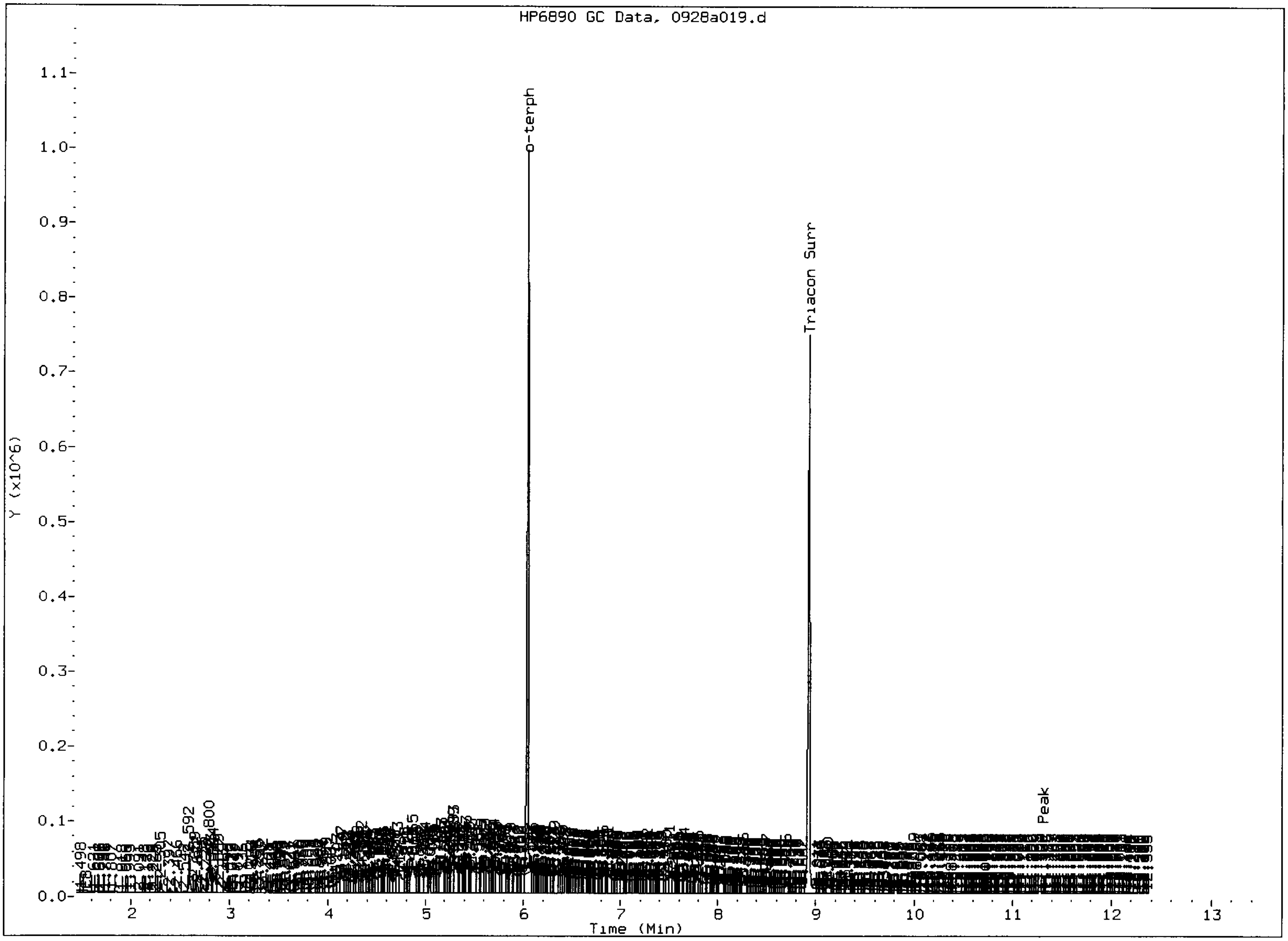
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65E FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: ________ Date: 10/01/12

```
                          Analytical Resources Inc.
                           TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a022.d        ARI ID: VK65F
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m          Client ID: MW-14S-092412
Instrument: fid4a.i                                     Injection: 28-SEP-2012 14:48
Operator: JR
Report Date: 10/01/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                       FID:4A RESULTS
Compound        RT     Shift    Height     Area      Method   Range          Total Area    Conc
==============================================================================================
Toluene        1.274  -0.018     12567     17727  |  WATPHG  (Tol-C12)        1144687      61.82
C8             1.551   0.000      2038      5577  |  WATPHD  (C12-C24)        5446831     340.12
C10            3.179   0.013      4214      5808  |  WATPHM  (C24-C38)        1101952      83.27
C12            4.082   0.008     19929     33541  |   AK102  (C10-C25)        6312417     333.47
C14            4.758   0.001     45733    113748  |   AK103  (C25-C36)         907718      98.64
C16            5.353   0.010     28536     14585  |
C18            5.913   0.008     24368     40579  |
C20            6.469  -0.002     18772     18848  |   JET-A  (C10-C18)        4346651     802.48
C22            7.020  -0.002     16839     25788  |MIN.OIL  (C24-C38)        1101952      81.99
C24            7.542  -0.002     16516     17258  |
C25            7.789  -0.007     14426     10146  |
C26            8.041   0.004     11951     14002  |
C28            8.488  -0.004     10879     13713  |
C32            9.289  -0.011      5982     14595  |
C34            9.680   0.007      3477      1936  |
Filter Peak   11.315  -0.008      1925      1790  |BUNKERC  (C10-C38)        7265537     793.52
C36           10.021  -0.012      2807      6895  |
C38           10.374  -0.011      2299      6947  |
C40           10.711  -0.011      2146      5708  |
o-terph        6.045   0.001    946622    765505  |
Triacon Surr   8.915  -0.002    748349    803080  |NAS DIES (C10-C24)        6163585     336.37
=============================================================================================
Range Times:  NW Diesel(4.074 - 7.543)     AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)     AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate         Area      Amount     %Rec
  -------------------------------------------
    o-Terphenyl     765505       35.3      78.5 M
    Triacontane     803080       43.2      96.0

M  Indicates the peak was manually integrated


      Analyte            RF      Curve Date
    --------------------------------------
     o-Terph Surr    21670.6    25-SEP-2012
     Triacon Surr    18590.6    25-SEP-2012
     Gas             18517.9    28-SEP-2012
     Diesel          16014.3    25-SEP-2012
     Motor Oil       13234.2    25-SEP-2012
     AK102           18929.5    25-SEP-2012
     AK103            9202.1    25-SEP-2012
     JetA             5416.5    11-AUG-2012
     Min Oil         13440.7    09-MAY-2012
     NAS Diesel       18324.0    24-AUG-2012
     Bunker C         9156.1    24-AUG-2012
```

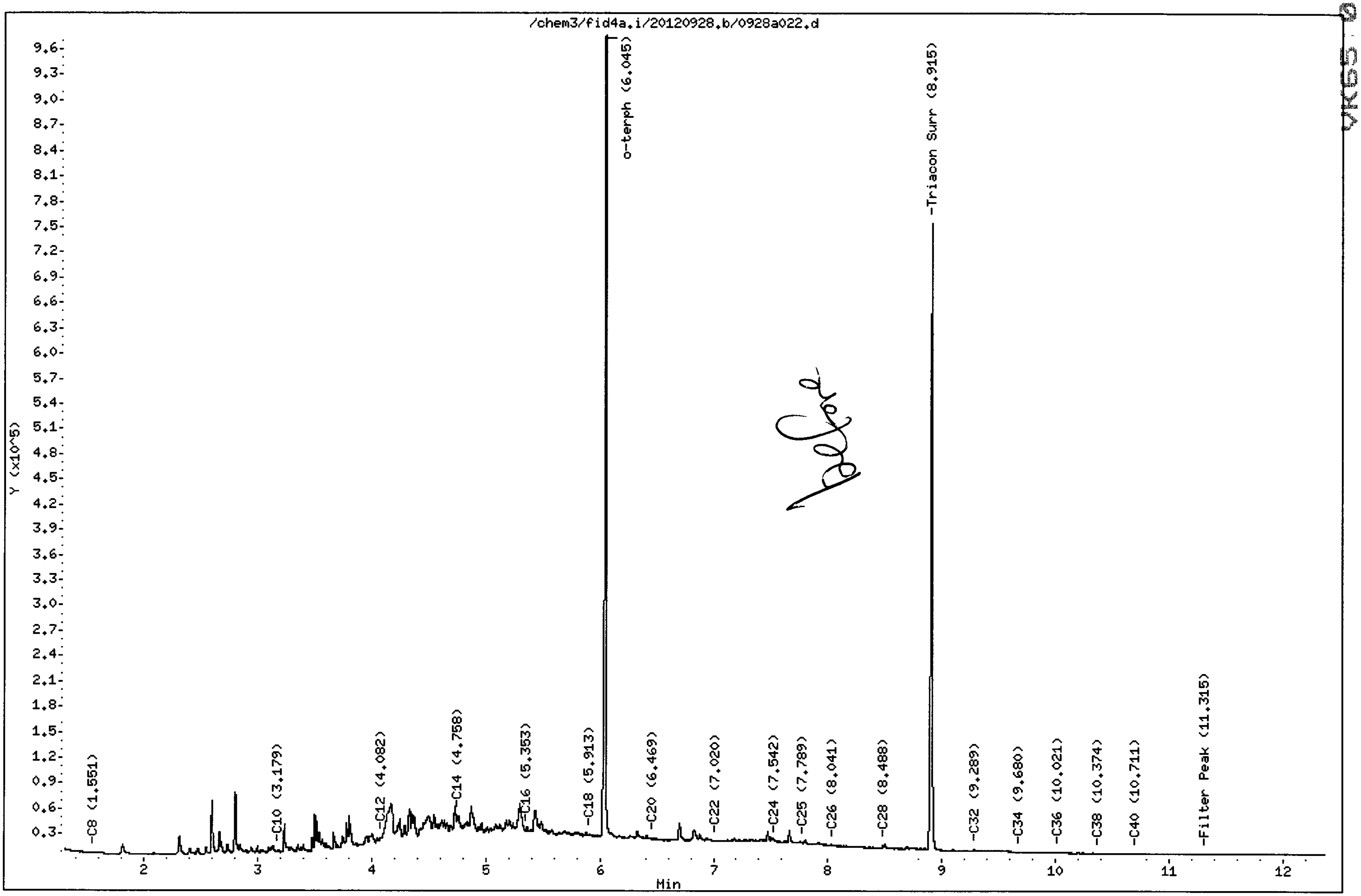
Jr 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a022.d
Date : 28-SEP-2012 14:48
Client ID: MW-14S-092412
Sample Info: VK65F

Column phase: RTX-1

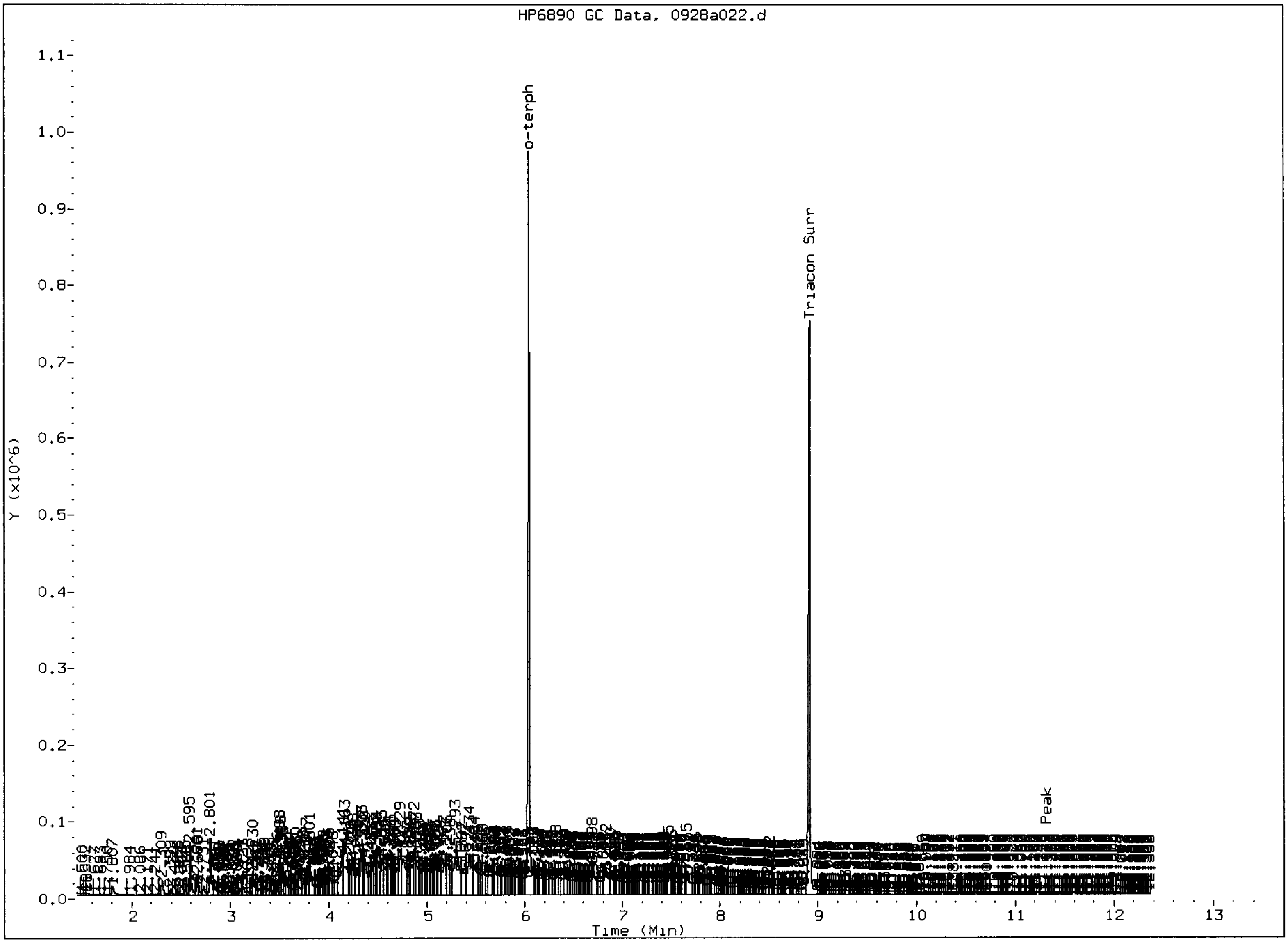
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65F FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: Date: 10/01/17

```
                       Analytical Resources Inc.
                         TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a023.d      ARI ID: VK65G
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m        Client ID: MW-13S-092412
Instrument: fid4a.i                                   Injection: 28-SEP-2012 15:10
Operator: JR
Report Date: 10/01/2012                              Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                  FID:4A RESULTS
Compound        RT     Shift    Height     Area    Method   Range          Total Area    Conc
==============================================================================================
Toluene        1.282  -0.011     11373     15051 | WATPHG (Tol-C12)          919293     49.64
C8             1.541  -0.010      1875      5118 | WATPHD (C12-C24)         3559171    222.25
C10            3.156  -0.010      2732      2552 | WATPHM (C24-C38)          745745     56.35
C12            4.082   0.008     15629     17074 |  AK102 (C10-C25)         4241311    224.06
C14            4.750  -0.007     33805     78484 |  AK103 (C25-C36)          611296     66.43
C16            5.360   0.018     21667     40797 |
C18            5.913   0.008     15223     25321 |
C20            6.470  -0.001     11135      9638 |  JET-A (C10-C18)         3036772    560.65
C22            7.017  -0.004     10668     19204 |MIN.OIL (C24-C38)          745745     55.48
C24            7.548   0.005     10368      7428 |
C25            7.792  -0.004      9352      8314 |
C26            8.032  -0.005      8344     19100 |
C28            8.488  -0.003      6301      9145 |
C32            9.306   0.006      4814     11525 |
C34            9.671  -0.003      2999      2067 |
Filter Peak   11.325   0.002      1847      1136 |BUNKERC (C10-C38)         4896190    534.75
C36           10.025  -0.008      2271      1754 |
C38           10.382  -0.002      2045      3077 |
C40           10.722  -0.001      1753       971 |
o-terph        6.046   0.002    967719    823374 |
Triacon Surr   8.923   0.006    779658    832927 |NAS DIES (C10-C24)        4150445    226.50
==============================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)   Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate       Area     Amount    %Rec
  ----------------------------------------
    o-Terphenyl    823374     38.0     84.4
    Triacontane    832927     44.8     99.6

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
     -------------------------------------
      o-Terph Surr    21670.6   25-SEP-2012
      Triacon Surr    18590.6   25-SEP-2012
      Gas             18517.9   28-SEP-2012
      Diesel          16014.3   25-SEP-2012
      Motor Oil       13234.2   25-SEP-2012
      AK102           18929.5   25-SEP-2012
      AK103            9202.1   25-SEP-2012
      JetA             5416.5   11-AUG-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       18324.0   24-AUG-2012
      Bunker C         9156.1   24-AUG-2012
```

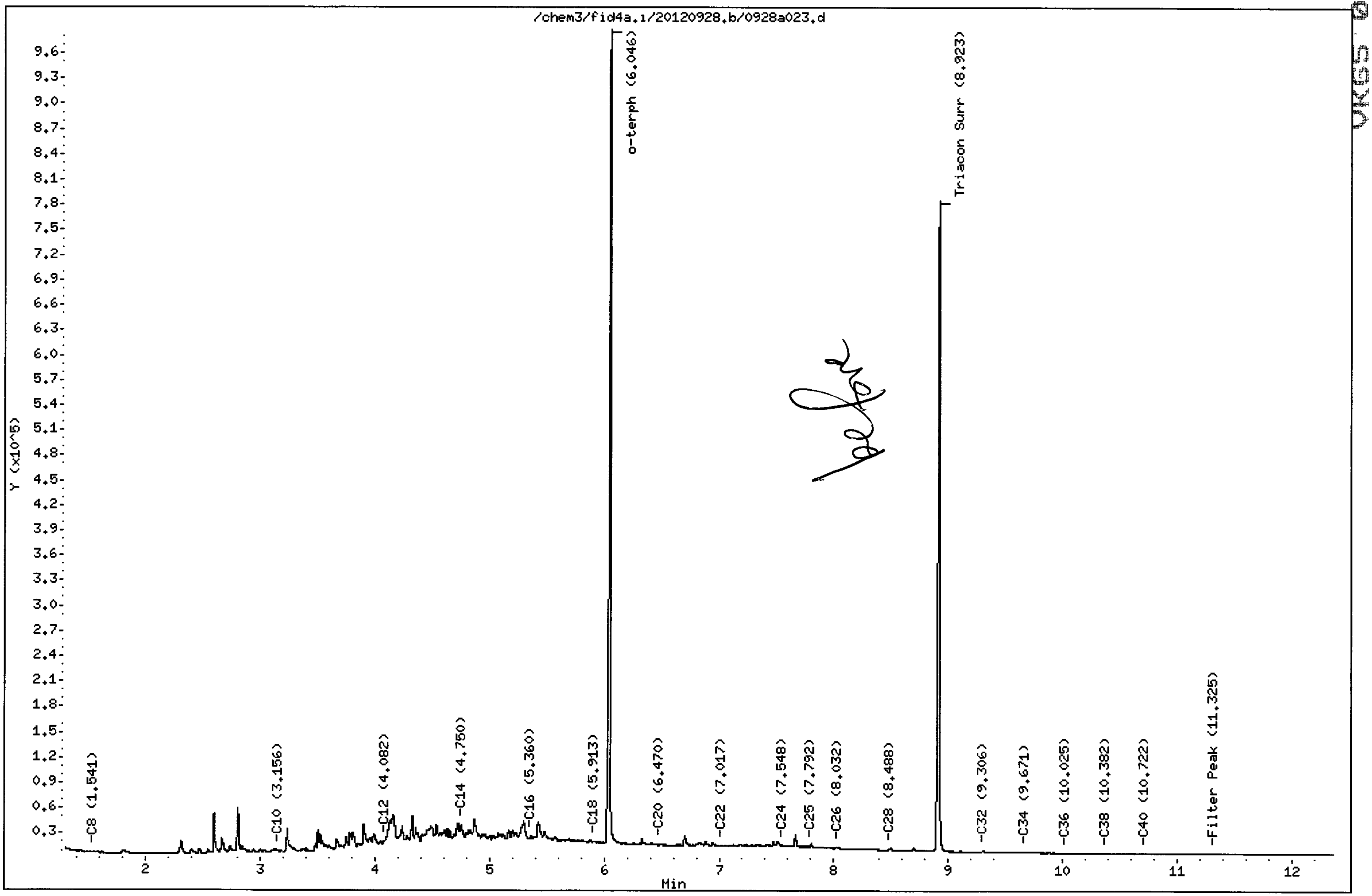
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a023.d
Date : 28-SEP-2012 15:10
Client ID: MW-13S-092412
Sample Info: VK65G

Column phase: RTX-1

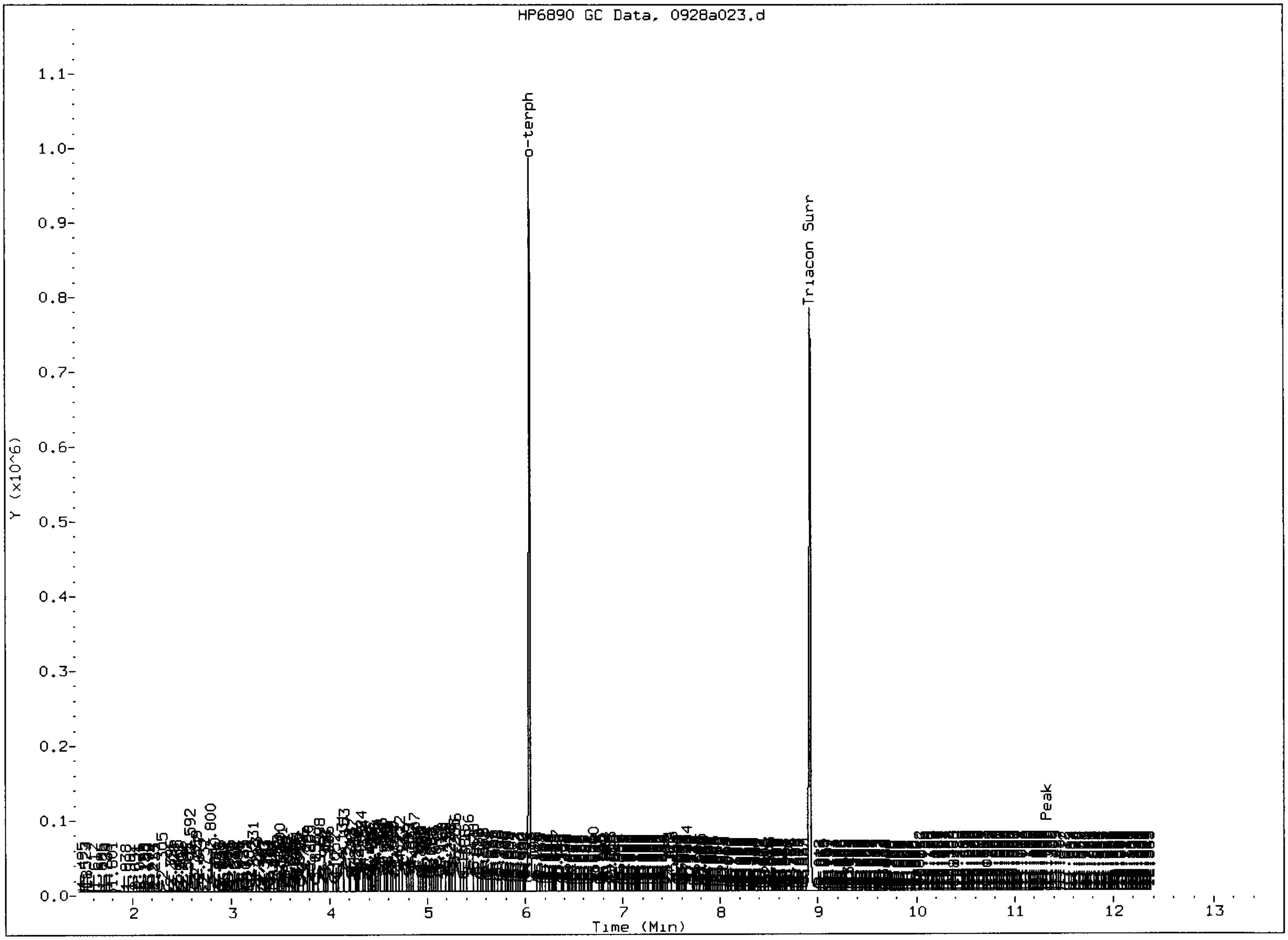
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65G FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: ________ Date: 10/01/12

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                         Analytical Resources Inc.
                          TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a024.d        ARI ID: VK65H
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m          Client ID: MW-12S-092412
Instrument: fid4a.i                                     Injection: 28-SEP-2012 15:31
Operator: JR
Report Date: 10/01/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                          FID:4A RESULTS
Compound        RT     Shift    Height      Area     Method    Range          Total Area    Conc
==========================================================================================
Toluene        1.271  -0.021    11377      20976 | WATPHG  (Tol-C12)        700597     37.83
C8             1.587   0.036     1049        567 | WATPHD  (C12-C24)       3652529    228.08
C10            3.183   0.017     2012       3617 | WATPHM  (C24-C38)        837655     63.29
C12            4.052  -0.022    10255      14157 |  AK102  (C10-C25)       4063519    214.67
C14            4.752  -0.005    34032      78157 |  AK103  (C25-C36)        707770     76.91
C16            5.345   0.002    17291       5792 |
C18            5.897  -0.007    14203       9872 |
C20            6.467  -0.004    12074      14964 |  JET-A  (C10-C18)       2738775    505.64
C22            7.019  -0.003    12555      13088 |MIN.OIL  (C24-C38)        837655     62.32
C24            7.537  -0.006    12802      17333 |
C25            7.794  -0.002    11134      13458 |
C26            8.027  -0.010     9355      12434 |
C28            8.490  -0.001     7282       8509 |
C32            9.310   0.010     4801      10518 |
C34            9.671  -0.002     2775        988 |
Filter Peak   11.320  -0.003     1661        759 |BUNKERC  (C10-C38)       4806904    524.99
C36           10.039   0.005     2021       1939 |
C38           10.388   0.003     1805       3177 |
C40           10.734   0.011     1540        794 |
o-terph        6.045   0.001   946896     759870 |
Triacon Surr   8.927   0.009   739020     786215 |NAS DIES (C10-C24)       3969248    216.61
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl     759870      35.1      77.9
    Triacontane     786215      42.3      94.0

M  Indicates the peak was manually integrated


        Analyte          RF       Curve Date
     -----------------------------------
      o-Terph Surr    21670.6    25-SEP-2012
      Triacon Surr    18590.6    25-SEP-2012
      Gas             18517.9    28-SEP-2012
      Diesel          16014.3    25-SEP-2012
      Motor Oil       13234.2    25-SEP-2012
      AK102           18929.5    25-SEP-2012
      AK103            9202.1    25-SEP-2012
      JetA             5416.5    11-AUG-2012
      Min Oil         13440.7    09-MAY-2012
      NAS Diesel       18324.0    24-AUG-2012
      Bunker C         9156.1    24-AUG-2012
```

JR 10/01/12

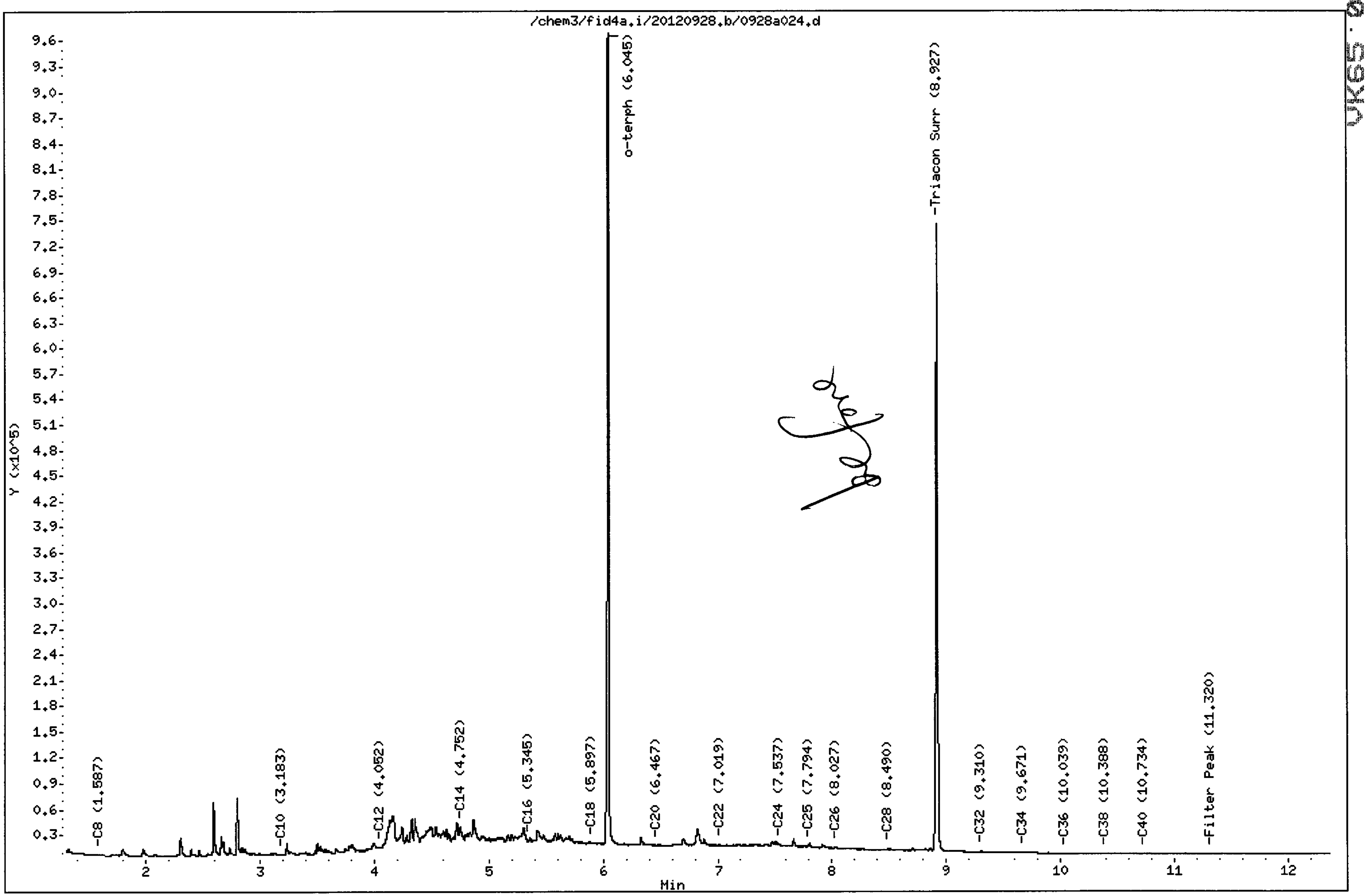
Data File: /chem3/fid4a.i/20120928.b/0928a024.d
Date : 28-SEP-2012 15:31
Client ID: MW-12S-092412
Sample Info: VK65H

Column phase: RTX-1

Page 1

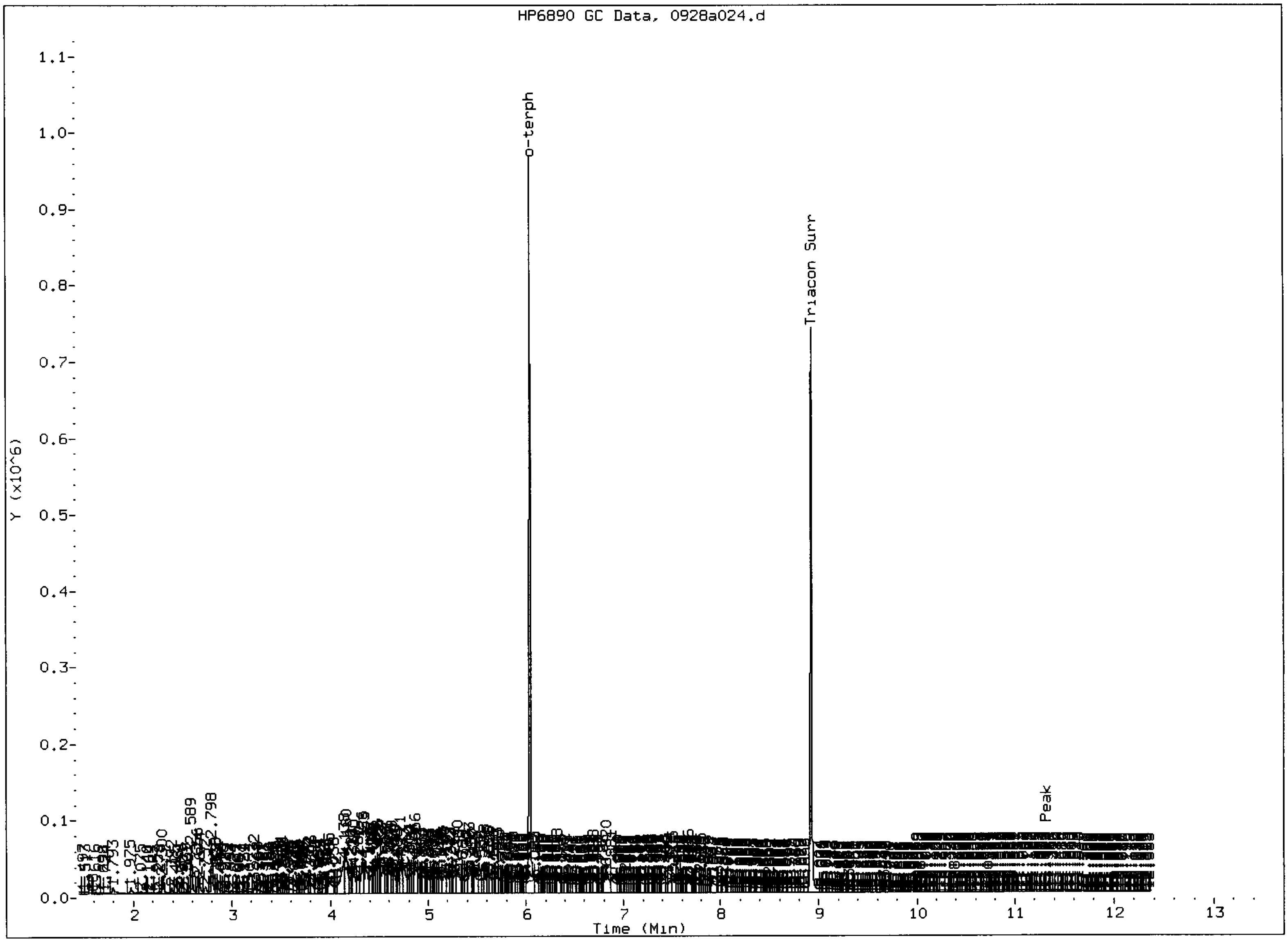
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65H FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: ________ Date: 10/01/12

```
                     Analytical Resources Inc.
                       TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a025.d       ARI ID: VK65I
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: MW-11S-092412
Instrument: fid4a.i                                    Injection: 28-SEP-2012 15:53
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                      FID:4A RESULTS
Compound         RT     Shift    Height     Area     Method   Range          Total Area    Conc
==========================================================================================
Toluene         1.293   0.000    12883     12272 | WATPHG (Tol-C12)          547807     29.58
C8              1.538  -0.013     2479      6940 | WATPHD (C12-C24)         1894326    ~~118.29~~
C10             3.159  -0.007     1137      1146 | WATPHM (C24-C38)          722686     ~~54.61~~
C12             4.092   0.018     7783     17659 |  AK102 (C10-C25)         2127734    112.40
C14             4.769   0.012     7350      1754 |  AK103 (C25-C36)          599505     65.15
C16             5.341  -0.001     8889      7751 |
C18             5.919   0.014     9376      6270 |
C20             6.469  -0.002    13689     30741 |  JET-A (C10-C18)         1036875    191.43
C22             7.016  -0.006    10600     14955 |MIN.OIL (C24-C38)          722686     53.77
C24             7.558   0.015     9395      3721 |
C25             7.790  -0.006     8539      3944 |
C26             8.033  -0.004     6869      9941 |
C28             8.489  -0.002     6437     11253 |
C32             9.305   0.005     4793     12261 |
C34             9.671  -0.003     2989      1522 |
Filter Peak    11.321  -0.002     2030      2821 |BUNKERC (C10-C38)         2771823    302.73
C36            10.021  -0.012     2356      2377 |
C38            10.371  -0.014     2292      4467 |
C40            10.726   0.003     1960      2280 |
o-terph         6.047   0.002   973773    881238 |
Triacon Surr    8.923   0.006   761635    832880 |NAS DIES (C10-C24)        2049137    111.83
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate         Area      Amount     %Rec
  ------------------------------------------
    o-Terphenyl     881238      40.7       90.4
    Triacontane     832880      44.8       99.6

M  Indicates the peak was manually integrated


       Analyte          RF      Curve Date
    -----------------------------------
     o-Terph Surr    21670.6    25-SEP-2012
     Triacon Surr    18590.6    25-SEP-2012
     Gas             18517.9    28-SEP-2012
     Diesel          16014.3    25-SEP-2012
     Motor Oil       13234.2    25-SEP-2012
     AK102           18929.5    25-SEP-2012
     AK103            9202.1    25-SEP-2012
     JetA             5416.5    11-AUG-2012
     Min Oil         13440.7    09-MAY-2012
     NAS Diesel       18324.0    24-AUG-2012
     Bunker C         9156.1    24-AUG-2012
```

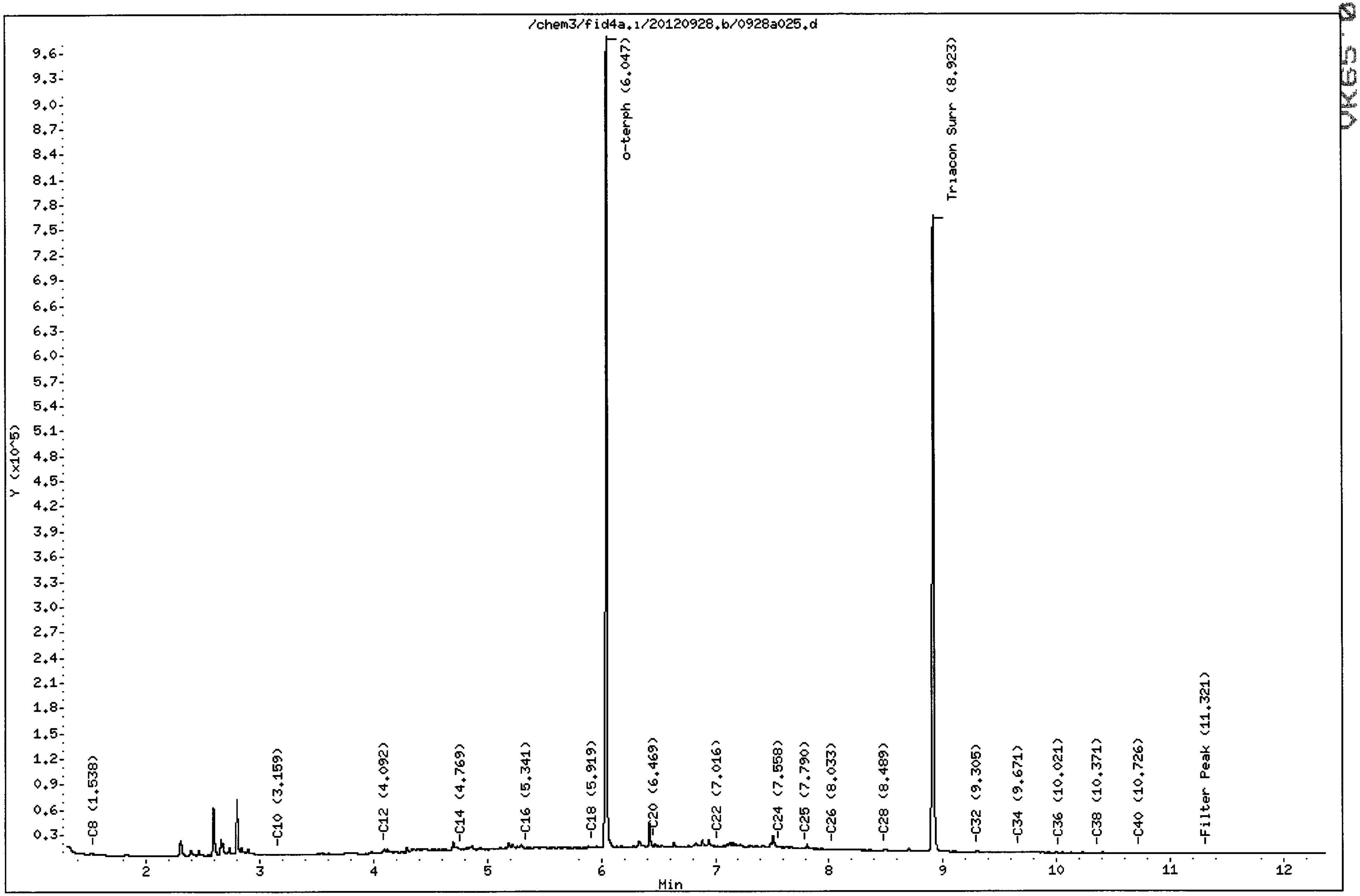
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a025.d
Date : 28-SEP-2012 15:53
Client ID: MW-11S-092412
Sample Info: VK65I

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



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                          Analytical Resources Inc.
                           TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a026.d       ARI ID: VK65J
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: MW-12D-092412
Instrument: fid4a.i                                    Injection: 28-SEP-2012 16:14
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                      FID:4A RESULTS
Compound        RT     Shift    Height     Area     Method   Range          Total Area    Conc
=================================================================================================
Toluene       1.281  -0.012    13897     18441 | WATPHG (Tol-C12)           598110      32.30
C8            1.521  -0.030     1759      3976 | WATPHD (C12-C24)          1731454     108.12
C10           3.159  -0.007     3256      4540 | WATPHM (C24-C38)          1071695      80.98
C12           4.065  -0.009     4732      6128 |  AK102 (C10-C25)          2069554     109.33
C14           4.743  -0.014     7749      4097 |  AK103 (C25-C36)           896851      97.46
C16           5.347   0.005    12339     17501 |
C18           5.896  -0.009     9160     11177 |
C20           6.491   0.020    10750     17179 |  JET-A (C10-C18)          1014994     187.39
C22           7.019  -0.003    12113     18288 |MIN.OIL (C24-C38)          1071695      79.74
C24           7.539  -0.004    17131     34921 |
C25           7.792  -0.004    17899     19524 |
C26           8.032  -0.005    16389     38247 |
C28           8.489  -0.002    15676     35878 |
C32           9.296  -0.004     8227     14560 |
C34           9.669  -0.004     6995     20033 |
Filter Peak  11.301  -0.022     1885      9231 |BUNKERC (C10-C38)          3026542     330.55
C36          10.034   0.001     4123     12240 |
C38          10.390   0.006     3393      9488 |
C40          10.736   0.013     2761      9591 |
o-terph       6.048   0.004   986764    855128 |
Triacon Surr  8.920   0.003   773123    830429 |NAS DIES (C10-C24)         1954847     106.68
=================================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)     AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl     855128      39.5      87.7
    Triacontane     830429      44.7      99.3

M  Indicates the peak was manually integrated


        Analyte          RF       Curve Date
     -------------------------------------
      o-Terph Surr    21670.6    25-SEP-2012
      Triacon Surr    18590.6    25-SEP-2012
      Gas             18517.9    28-SEP-2012
      Diesel          16014.3    25-SEP-2012
      Motor Oil       13234.2    25-SEP-2012
      AK102           18929.5    25-SEP-2012
      AK103            9202.1    25-SEP-2012
      JetA             5416.5    11-AUG-2012
      Min Oil         13440.7    09-MAY-2012
      NAS Diesel       18324.0    24-AUG-2012
      Bunker C         9156.1    24-AUG-2012
```

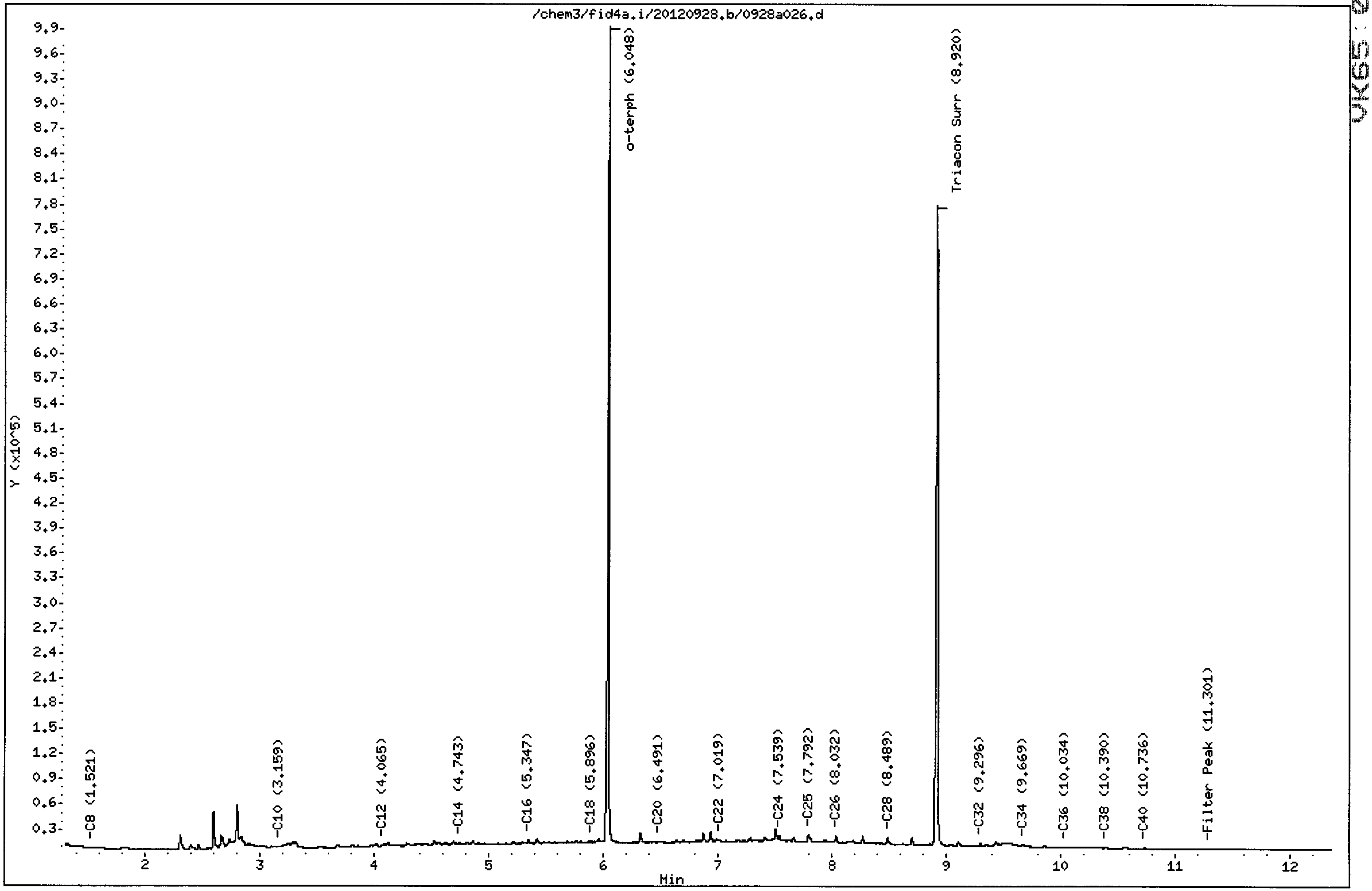
JL 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a026.d
Date : 28-SEP-2012 16:14
Client ID: MW-12D-092412
Sample Info: VK65J

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a027.d
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m
Instrument: fid4a.i
Operator: JR
Report Date: 10/01/2012
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012 Diesel:25-SEP-2012 M.Oil:25-SEP-2012

ARI ID: VK65K
Client ID: MW-11D-092412
Injection: 28-SEP-2012 16:36
Dilution Factor: 1

FID:4A RESULTS

Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc
Toluene	1.282	-0.011	15642	19540	WATPHG	(Tol-C12)	540365	29.18
C8	1.573	0.022	5170	8199	WATPHD	(C12-C24)	525934	32.84
C10	3.159	-0.007	1773	3104	WATPHM	(C24-C38)	399958	30.22
C12	4.075	0.001	1119	1320	AK102	(C10-C25)	714733	37.76
C14	4.751	-0.006	1479	933	AK103	(C25-C36)	342371	37.21
C16	5.332	-0.010	2629	4601				
C18	5.901	-0.003	3104	4652				
C20	6.475	0.004	2974	1951	JET-A	(C10-C18)	361276	66.70
C22	7.014	-0.008	3541	4351	MIN.OIL	(C24-C38)	399958	29.76
C24	7.562	0.019	4088	7891				
C25	7.807	0.011	7935	15357				
C26	8.046	0.009	3064	957				
C28	8.488	-0.004	4625	14320				
C32	9.301	0.000	2584	5744				
C34	9.678	0.005	3674	7854				
Filter Peak	11.313	-0.010	1811	4490	BUNKERC	(C10-C38)	1087117	118.73
C36	10.036	0.003	1698	2146				
C38	10.394	0.009	1414	1553				
C40	10.715	-0.008	1557	1712				
o-terph	6.046	0.002	872112	725560				
Triacon Surr	8.920	0.002	671398	678120	NAS DIES	(C10-C24)	687159	37.50

Range Times: NW Diesel(4.074 - 7.543) AK102(3.17 - 7.80) Jet A(3.17 - 5.90)
NW M.Oil(7.54 - 10.38) AK103(7.80 - 10.03) OR Diesel(3.17 - 8.49)

Surrogate	Area	Amount	%Rec
o-Terphenyl	725560	33.5	74.4
Triacontane	678120	36.5	81.1

10/01/12

M Indicates the peak was manually integrated

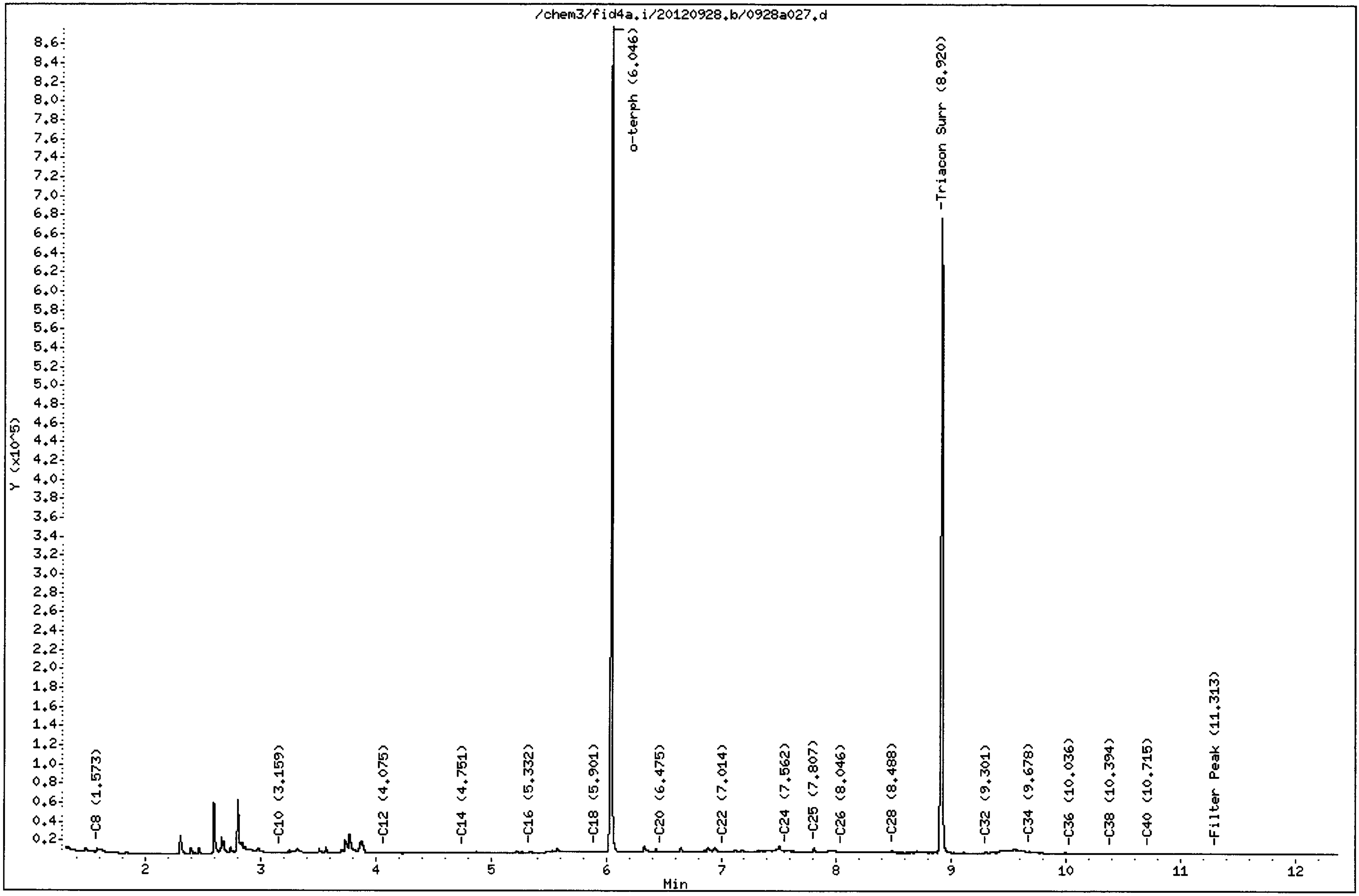
Analyte	RF	Curve Date
o-Terph Surr	21670.6	25-SEP-2012
Triacon Surr	18590.6	25-SEP-2012
Gas	18517.9	28-SEP-2012
Diesel	16014.3	25-SEP-2012
Motor Oil	13234.2	25-SEP-2012
AK102	18929.5	25-SEP-2012
AK103	9202.1	25-SEP-2012
JetA	5416.5	11-AUG-2012
Min Oil	13440.7	09-MAY-2012
NAS Diesel	18324.0	24-AUG-2012
Bunker C	9156.1	24-AUG-2012

Data File: /chem3/fid4a.i/20120928.b/0928a027.d
Date : 28-SEP-2012 16:36
Client ID: MW-11D-092412
Sample Info: VK65K

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



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                        Analytical Resources Inc.
                         TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a028.d       ARI ID: VK65L
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: MW-13D-092412
Instrument: fid4a.i                                    Injection: 28-SEP-2012 16:57
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:    1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                         FID:4A RESULTS
Compound          RT     Shift    Height      Area    Method    Range          Total Area    Conc
===============================================================================================
Toluene         1.272   -0.021    15393      21564 | WATPHG  (Tol-C12)        3626452    195.83
C8              1.537   -0.014     4500      10461 | WATPHD  (C12-C24)        6850604    ~~427.78~~
C10             3.176    0.010    13611      12954 | WATPHM  (C24-C38)        4783874    361.48
C12             4.070   -0.004    29029      55090 |  AK102  (C10-C25)       10137295    535.53
C14             4.767    0.010    52259      89003 |  AK103  (C25-C36)        4154781    451.50
C16             5.360    0.017    34148      41450 |
C18             5.898   -0.006    28121      18197 |
C20             6.469   -0.002    26796      39439 |  JET-A  (C10-C18)        7143359   1318.82
C22             7.020   -0.001    27504      34046 |MIN.OIL  (C24-C38)        4783874    355.92
C24             7.540   -0.004    44971      58150 |
C25             7.794   -0.002    43716      20341 |
C26             8.032   -0.005    44730      95901 |
C28             8.486   -0.005    44953      91954 |
C32             9.296   -0.005    35629      49685 |
C34             9.671   -0.002    34570     101632 |
Filter Peak    11.314   -0.009     3805       4971 |BUNKERC  (C10-C38)       14638654   1598.79
C36            10.026   -0.007    22579      34693 |
C38            10.376   -0.008    18026      26979 |
C40            10.715   -0.008    12265      28906 |
o-terph         6.047    0.002   971016     800255 |
Triacon Surr    8.920    0.002   785780     792167 |NAS DIES (C10-C24)       9854780    537.81
===============================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate        Area     Amount    %Rec
  ------------------------------------------
    o-Terphenyl     800255     36.9     82.1 M
    Triacontane     792167     42.6     94.7 M

M  Indicates the peak was manually integrated


      Analyte          RF      Curve Date
    -----------------------------------
     o-Terph Surr    21670.6   25-SEP-2012
     Triacon Surr    18590.6   25-SEP-2012
     Gas             18517.9   28-SEP-2012
     Diesel          16014.3   25-SEP-2012
     Motor Oil       13234.2   25-SEP-2012
     AK102           18929.5   25-SEP-2012
     AK103            9202.1   25-SEP-2012
     JetA             5416.5   11-AUG-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       18324.0   24-AUG-2012
     Bunker C         9156.1   24-AUG-2012
```

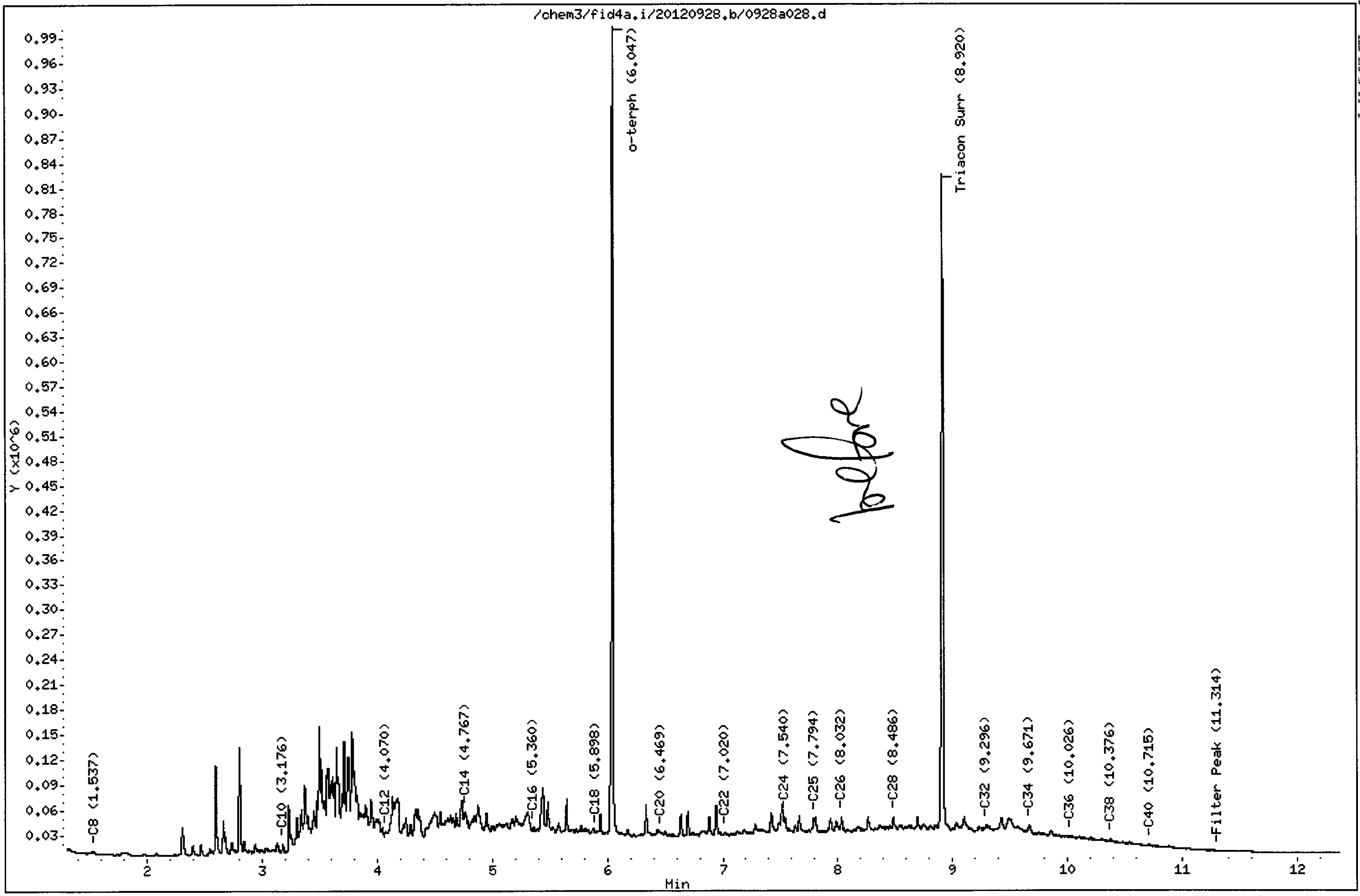
jr 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a028.d
Date : 28-SEP-2012 16:57
Client ID: MW-13D-092412
Sample Info: VK65L

Column phase: RTX-1

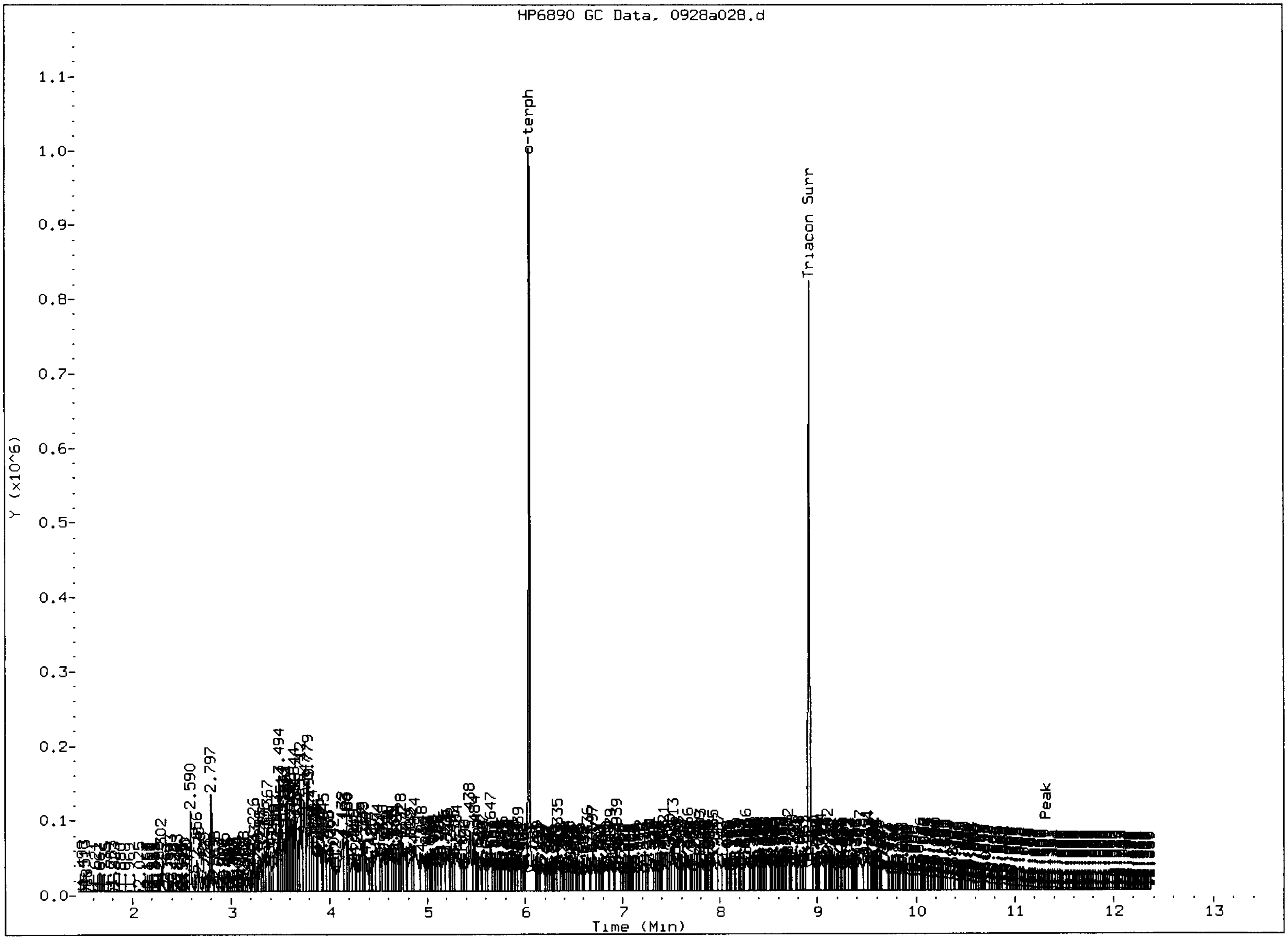
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65L FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: ______________ Date: 10/01/12

Analytical Resources Inc.
TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a029.d
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m
Instrument: fid4a.i
Operator: JR
Report Date: 10/01/2012
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012 Diesel:25-SEP-2012 M.Oil:25-SEP-2012

ARI ID: VK65M
Client ID: MW-DUP-092412
Injection: 28-SEP-2012 17:18

Dilution Factor: 1

FID:4A RESULTS

Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc
Toluene	1.281	-0.011	15623	22804	WATPHG	(Tol-C12)	1269693	68.57
C8	1.540	-0.011	2927	4231	WATPHD	(C12-C24)	7309937	~~456.46~~
C10	3.181	0.015	4654	8262	WATPHM	(C24-C38)	1331197	100.59
C12	4.078	0.004	26029	31525	AK102	(C10-C25)	8289004	437.89
C14	4.750	-0.007	77835	178381	AK103	(C25-C36)	1095021	119.00
C16	5.364	0.022	40512	85085				
C18	5.917	0.012	36397	96308				
C20	6.468	-0.003	22155	10493	JET-A	(C10-C18)	5985357	1105.02
C22	7.025	0.003	19666	31569	MIN.OIL	(C24-C38)	1331197	99.04
C24	7.567	0.024	20911	38991				
C25	7.804	0.008	20975	31579				
C26	8.029	-0.008	16043	21074				
C28	8.486	-0.006	11419	16684				
C32	9.289	-0.011	7104	16421				
C34	9.679	0.006	4910	6856				
Filter Peak	11.320	-0.003	2222	1322	BUNKERC	(C10-C38)	9442830	1031.32
C36	10.043	0.010	3413	3446				
C38	10.377	-0.008	2891	5519				
C40	10.737	0.014	2522	802				
o-terph	6.045	0.001	890012	742419				
Triacon Surr	8.915	-0.002	746919	784879	NAS DIES	(C10-C24)	8111632	442.68

Range Times: NW Diesel(4.074 - 7.543) AK102(3.17 - 7.80) Jet A(3.17 - 5.90)
NW M.Oil(7.54 - 10.38) AK103(7.80 - 10.03) OR Diesel(3.17 - 8.49)

Surrogate	Area	Amount	%Rec
o-Terphenyl	742419	34.3	76.1 M
Triacontane	784879	42.2	93.8

JR 10/01/12

M Indicates the peak was manually integrated

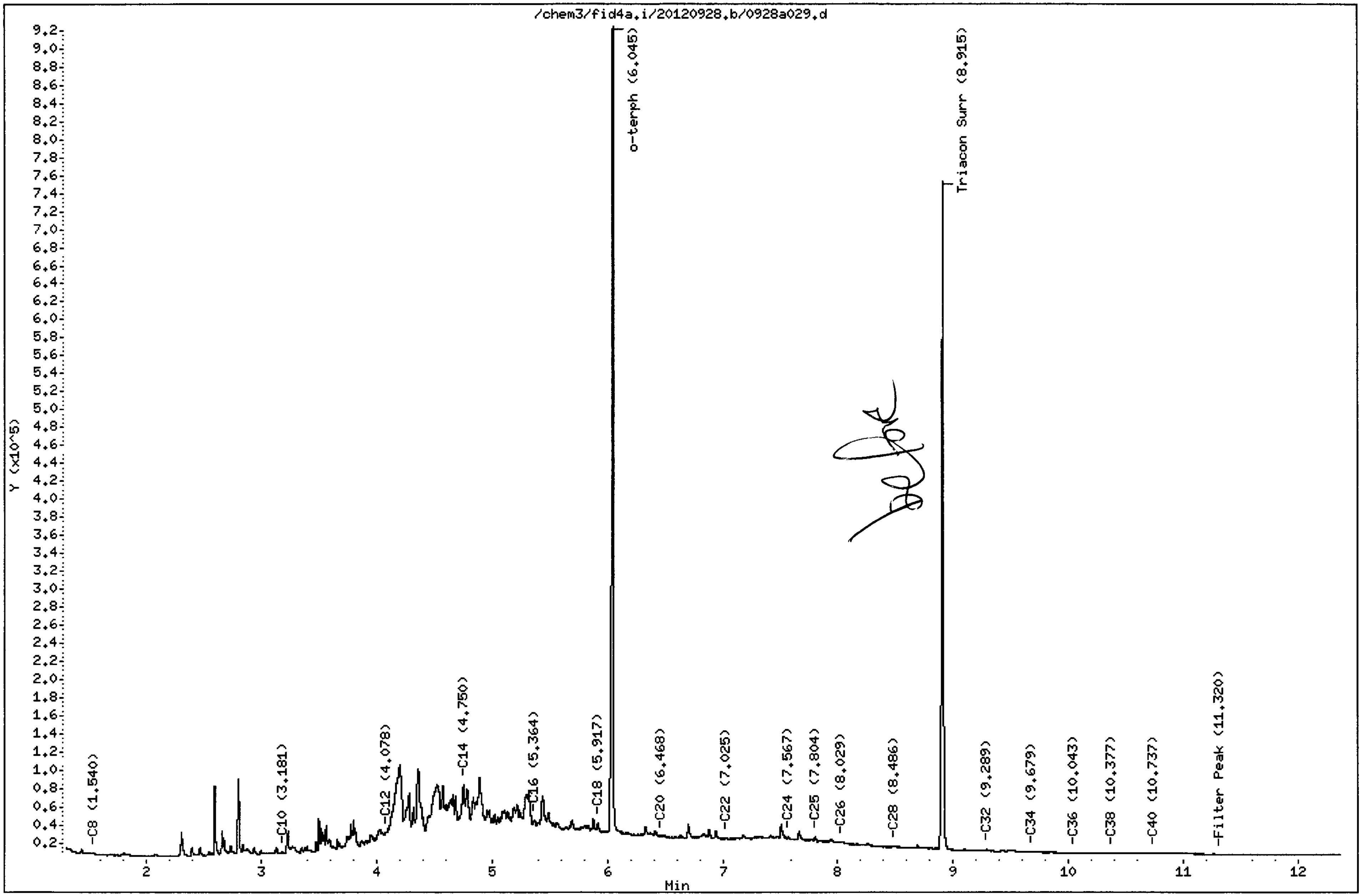
Analyte	RF	Curve Date
o-Terph Surr	21670.6	25-SEP-2012
Triacon Surr	18590.6	25-SEP-2012
Gas	18517.9	28-SEP-2012
Diesel	16014.3	25-SEP-2012
Motor Oil	13234.2	25-SEP-2012
AK102	18929.5	25-SEP-2012
AK103	9202.1	25-SEP-2012
JetA	5416.5	11-AUG-2012
Min Oil	13440.7	09-MAY-2012
NAS Diesel	18324.0	24-AUG-2012
Bunker C	9156.1	24-AUG-2012

Data File: /chem3/fid4a.i/20120928.b/0928a029.d
Date : 28-SEP-2012 17:18
Client ID: MW-DUP-092412
Sample Info: VK65M

Column phase: RTX-1

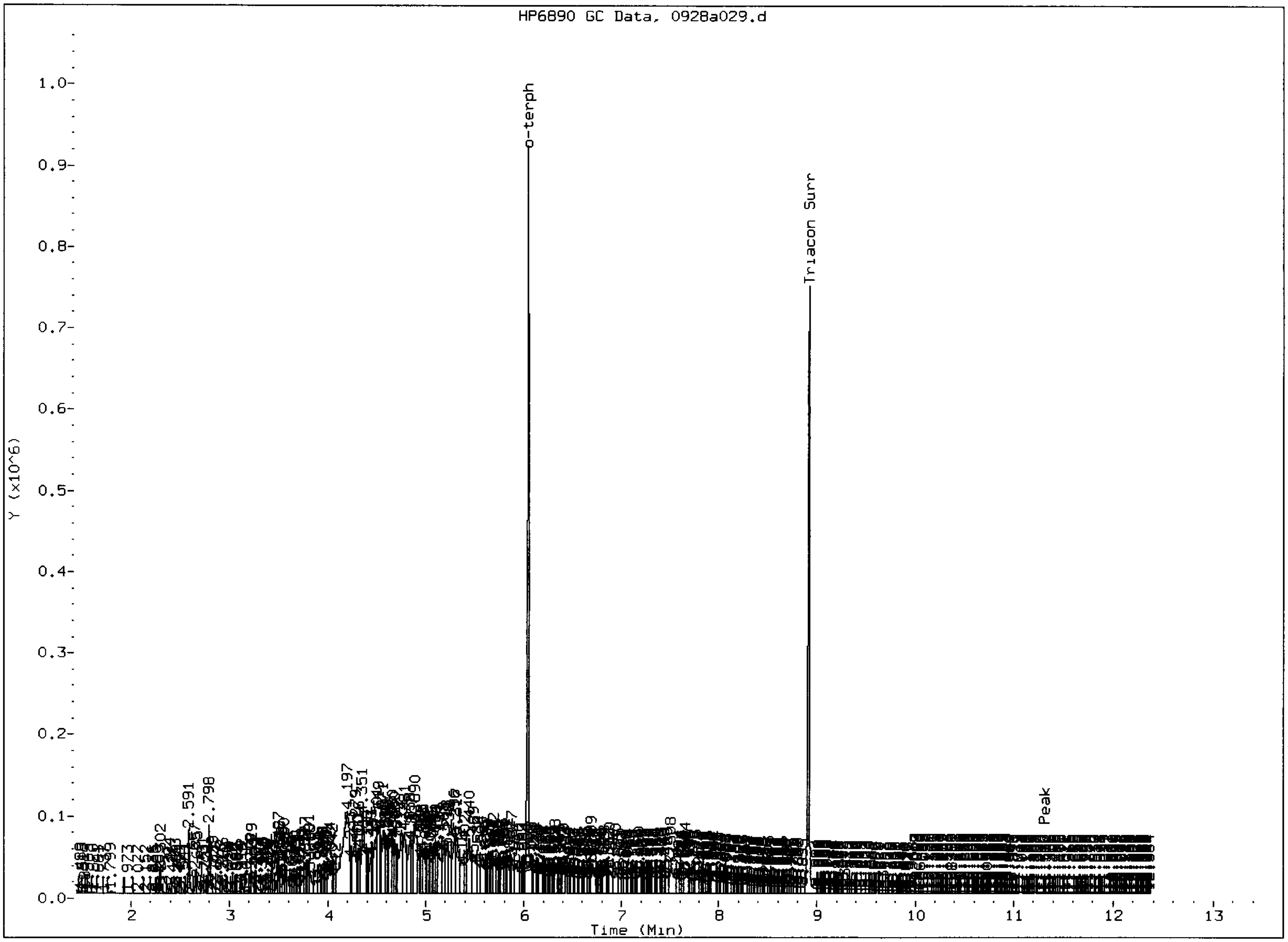
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65M FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: Date: 10/01/12

HCID SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510

Client ID	O-TER	TOT OUT
MB-092712	90.7%	0
LCS-092712	81.8%	0
LCSD-092712	81.3%	0
MW-15D-092412	76.9%	0
MW-16D-092412	82.8%	0
MW-14D-092412	81.8%	0
MW-15S-092412	82.8%	0
MW-16S-092412	81.0%	0
MW-14S-092412	78.5%	0
MW-13S-092412	84.4%	0
MW-12S-092412	77.9%	0
MW-11S-092412	90.4%	0
MW-12D-092412	87.7%	0
MW-11D-092412	74.4%	0
MW-13D-092412	82.1%	0
MW-DUP-092412	76.1%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(55-110)	(50-150)

Prep Method: SW3510C
Log Number Range: 12-18405 to 12-18417

FORM-II HCID

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Page 1 of 1

Sample ID: LCS-092712
LCS/LCSD

Lab Sample ID: LCS-092712
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/01/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted LCS/LCSD: 09/27/12

Date Analyzed LCS: 09/28/12 11:35
LCSD: 09/28/12 11:57
Instrument/Analyst LCS: FID/JGR
LCSD: FID/JGR

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Diesel	2.51	3.00	83.7%	2.47	3.00	82.3%	1.6%

HCID Surrogate Recovery

	LCS	**LCSD**
o-Terphenyl	81.8%	81.3%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

FORM III

```
                          Analytical Resources Inc.
                           TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a013.d        ARI ID: VK65LCSW1
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m          Client ID: VK65LCSW1
Instrument: fid4a.i                                     Injection: 28-SEP-2012 11:35
Operator: JR
Report Date: 10/01/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                     FID:4A RESULTS
Compound         RT     Shift    Height     Area      Method   Range          Total Area    Conc
===========================================================================================
Toluene        1.273   -0.020     11187     15853 | WATPHG  (Tol-C12)        4420504     238.72
C8             1.577    0.026      7142     16426 | WATPHD  (C12-C24)       20104764    1255.42
C10            3.172    0.006     81651     77382 | WATPHM  (C24-C38)         233961      17.68
C12            4.073   -0.001    198129    186941 |  AK102  (C10-C25)       22919768    1210.80
C14            4.754   -0.003    341854    456347 |  AK103  (C25-C36)         156118      16.97
C16            5.345    0.003    560695    712642 |
C18            5.911    0.006    449890    667073 |
C20            6.473    0.002    311569    500025 |  JET-A  (C10-C18)       16841902    3109.37
C22            7.021   -0.001    163956    255929 |MIN.OIL  (C24-C38)         233961      17.41
C24            7.543   -0.001     41422     76047 |
C25            7.794   -0.002     16561     21463 |
C26            8.037    0.000      6782     12544 |
C28            8.492    0.000      2734      2062 |
C32            9.288   -0.012       141        66 |
C34            9.696    0.022       278       721 |
Filter Peak   11.328    0.005      1695      4771 |BUNKERC  (C10-C38)       23086975    2521.48
C36           10.063    0.029       443      1576 |
C38           10.369   -0.016      1450      2315 |
C40           10.733    0.011       724       639 |
o-terph        6.050    0.006    920081    797909 |
Triacon Surr   8.924    0.007    778653    816421 |NAS DIES (C10-C24)       22853014    1247.16
===========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)    AK103(7.80 - 10.03)    OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl    797909      36.8      81.8 M
    Triacontane    816421      43.9      97.6

M  Indicates the peak was manually integrated


       Analyte           RF       Curve Date
    -------------------------------------
     o-Terph Surr     21670.6    25-SEP-2012
     Triacon Surr     18590.6    25-SEP-2012
     Gas              18517.9    28-SEP-2012
     Diesel           16014.3    25-SEP-2012
     Motor Oil        13234.2    25-SEP-2012
     AK102            18929.5    25-SEP-2012
     AK103             9202.1    25-SEP-2012
     JetA              5416.5    11-AUG-2012
     Min Oil          13440.7    09-MAY-2012
     NAS Diesel        18324.0    24-AUG-2012
     Bunker C          9156.1    24-AUG-2012
```

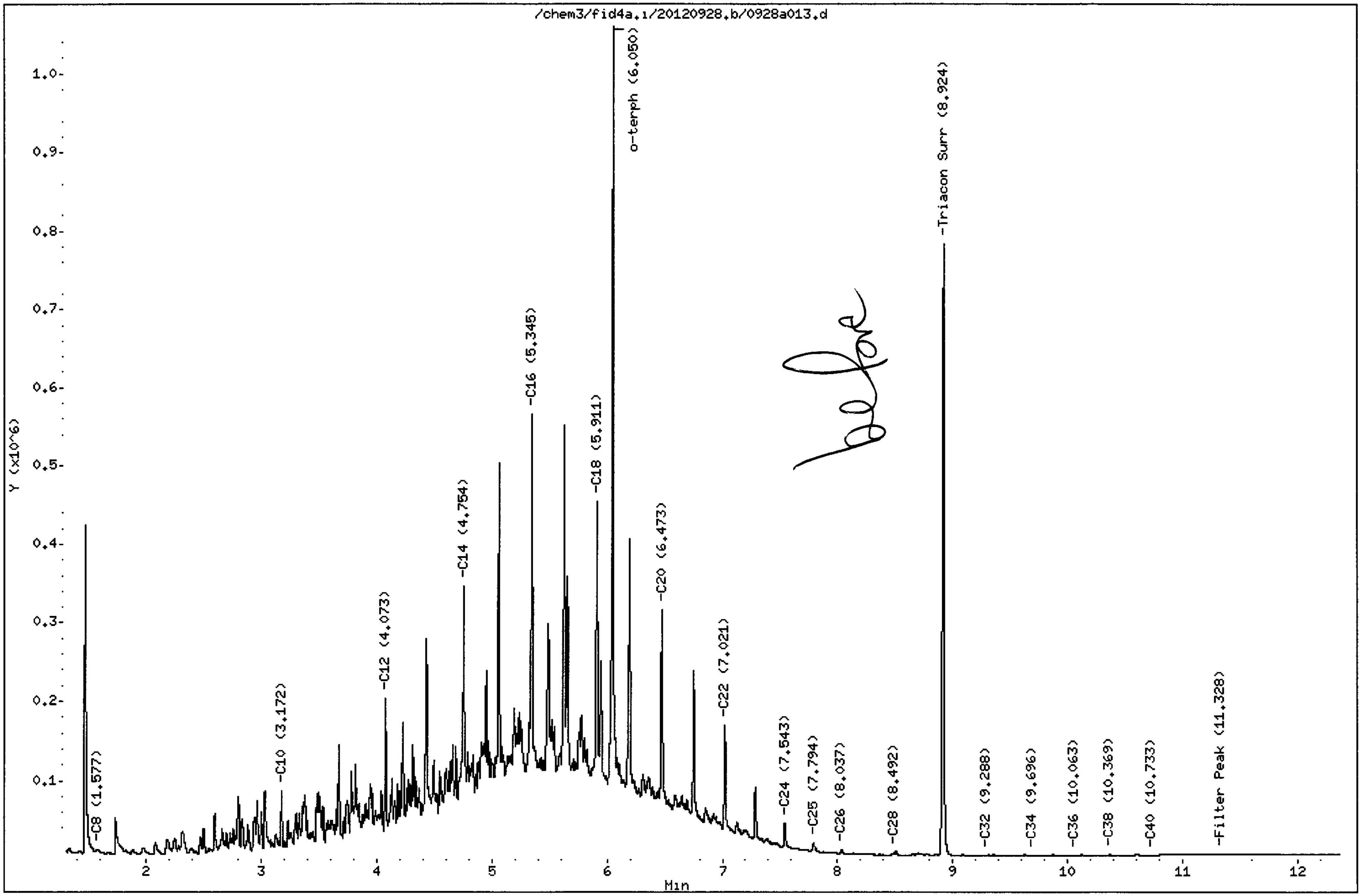
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a013.d
Date : 28-SEP-2012 11:35
Client ID: VK65LCSW1
Sample Info: VK65LCSW1

Column phase: RTX-1

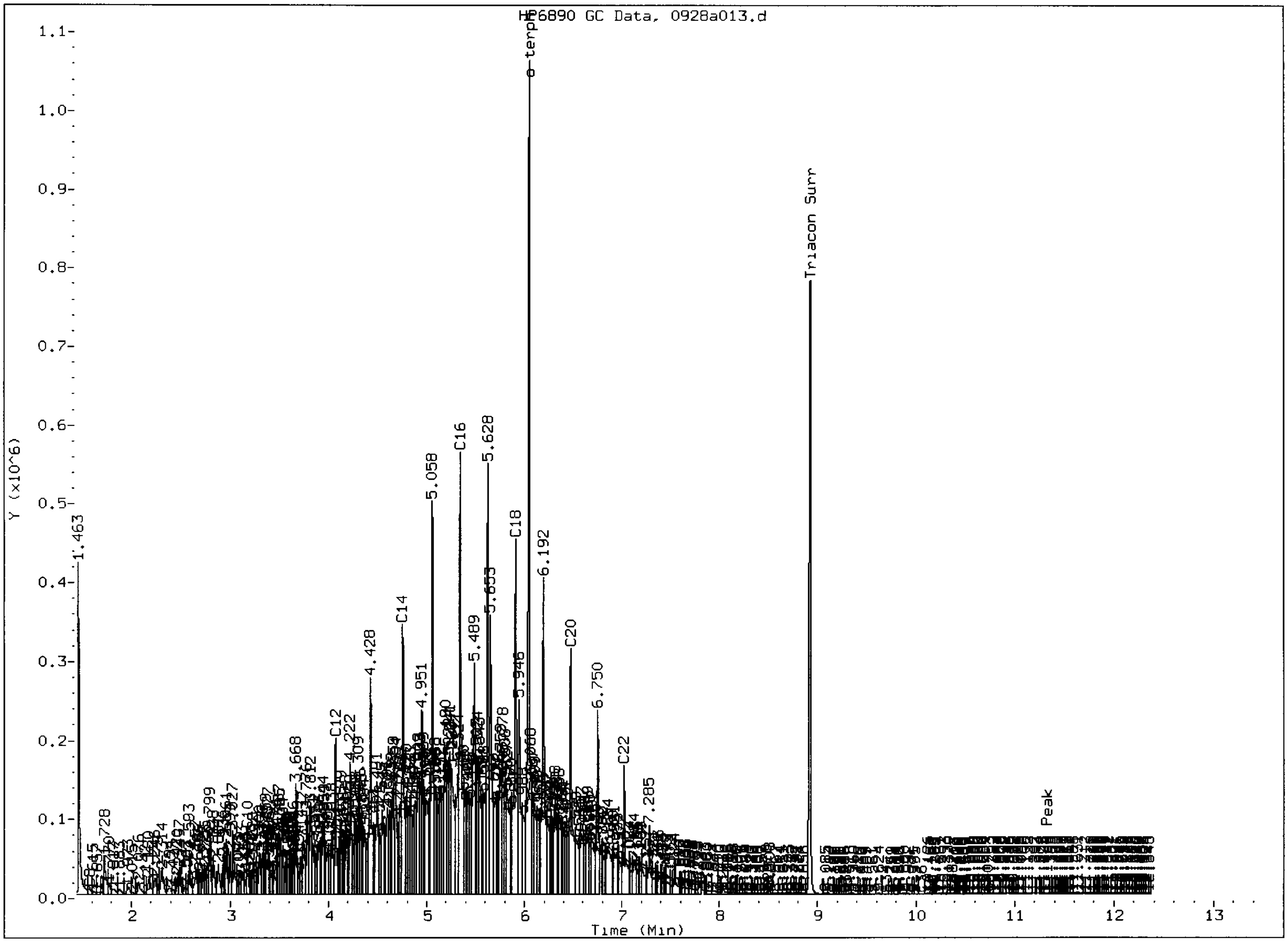
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



before

FID:4A-2C/RTX-1 VK65LCSW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: ______

Date: 10/01/12

```
                        Analytical Resources Inc.
                         TPH Quantitation Report

Data file: /chem3/fid4a.i/20120928.b/0928a014.d       ARI ID: VK65LCSDW1
Method: /chem3/fid4a.i/20120928.b/ftphfid4a.m         Client ID: VK65LCSDW1
Instrument: fid4a.i                                     Injection: 28-SEP-2012 11:57
Operator: JR
Report Date: 10/01/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                    FID:4A RESULTS
Compound        RT     Shift    Height     Area     Method   Range          Total Area    Conc
==========================================================================================
Toluene        1.280  -0.013     8734     11590  | WATPHG (Tol-C12)          4581612    247.42
C8             1.569   0.018     6813     15574  | WATPHD (C12-C24)         19740148   1232.65
C10            3.171   0.005    86150     79551  | WATPHM (C24-C38)           234908     17.75
C12            4.072  -0.002   202407    187564  |  AK102 (C10-C25)         22638662   1195.95
C14            4.753  -0.004   367019    354215  |  AK103 (C25-C36)           156114     16.97
C16            5.344   0.002   571989    571428  |
C18            5.908   0.004   440300    561720  |
C20            6.472   0.001   318809    523384  |  JET-A (C10-C18)         16697090   3082.64
C22            7.019  -0.002   154706    234946  |MIN.OIL (C24-C38)           234908     17.48
C24            7.542  -0.001    40500     55462  |
C25            7.792  -0.004    15903     20592  |
C26            8.035  -0.002     6944     13608  |
C28            8.490  -0.002     3012      1833  |
C32            9.292  -0.008      160        78  |
C34            9.700   0.027      307       725  |
Filter Peak   11.318  -0.005     1293      1117  |BUNKERC (C10-C38)         22804871   2490.67
C36           10.037   0.004      302       156  |
C38           10.384  -0.001     1561      2383  |
C40           10.731   0.008      722       513  |
o-terph        6.049   0.005   974464    792520  |
Triacon Surr   8.923   0.005   779171    804823  |NAS DIES (C10-C24)        22569962   1231.72
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.80)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.38)     AK103(7.80 - 10.03)   OR Diesel(3.17 - 8.49)


    Surrogate       Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl    792520      36.6      81.3 M
    Triacontane    804823      43.3      96.2

M  Indicates the peak was manually integrated


        Analyte           RF       Curve Date
     -------------------------------------
      o-Terph Surr     21670.6    25-SEP-2012
      Triacon Surr     18590.6    25-SEP-2012
      Gas              18517.9    28-SEP-2012
      Diesel           16014.3    25-SEP-2012
      Motor Oil        13234.2    25-SEP-2012
      AK102            18929.5    25-SEP-2012
      AK103             9202.1    25-SEP-2012
      JetA              5416.5    11-AUG-2012
      Min Oil          13440.7    09-MAY-2012
      NAS Diesel        18324.0    24-AUG-2012
      Bunker C          9156.1    24-AUG-2012
```

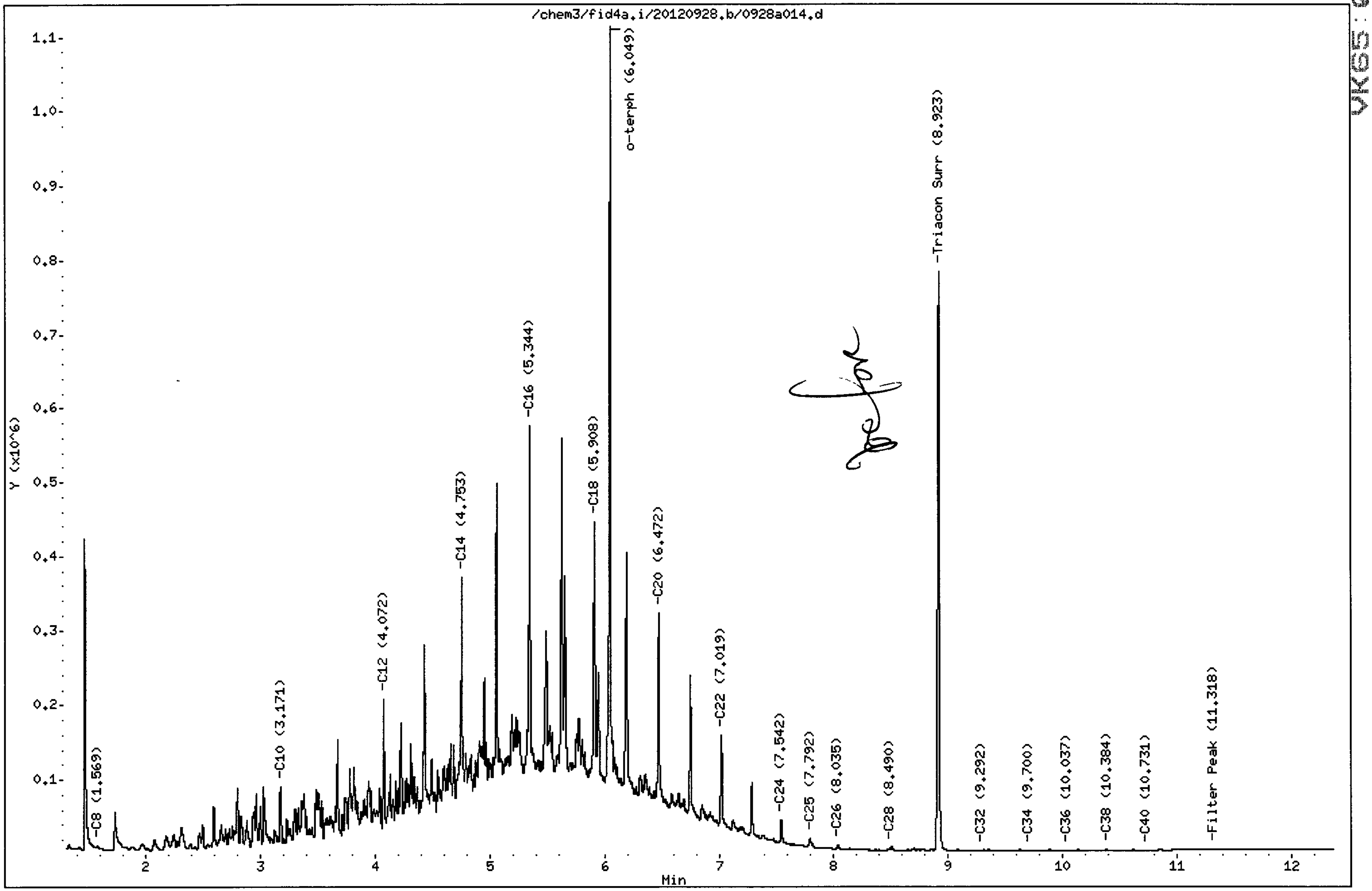
JR 10/01/12

Data File: /chem3/fid4a.i/20120928.b/0928a014.d
Date : 28-SEP-2012 11:57
Client ID: VK65LCSDW1
Sample Info: VK65LCSDW1

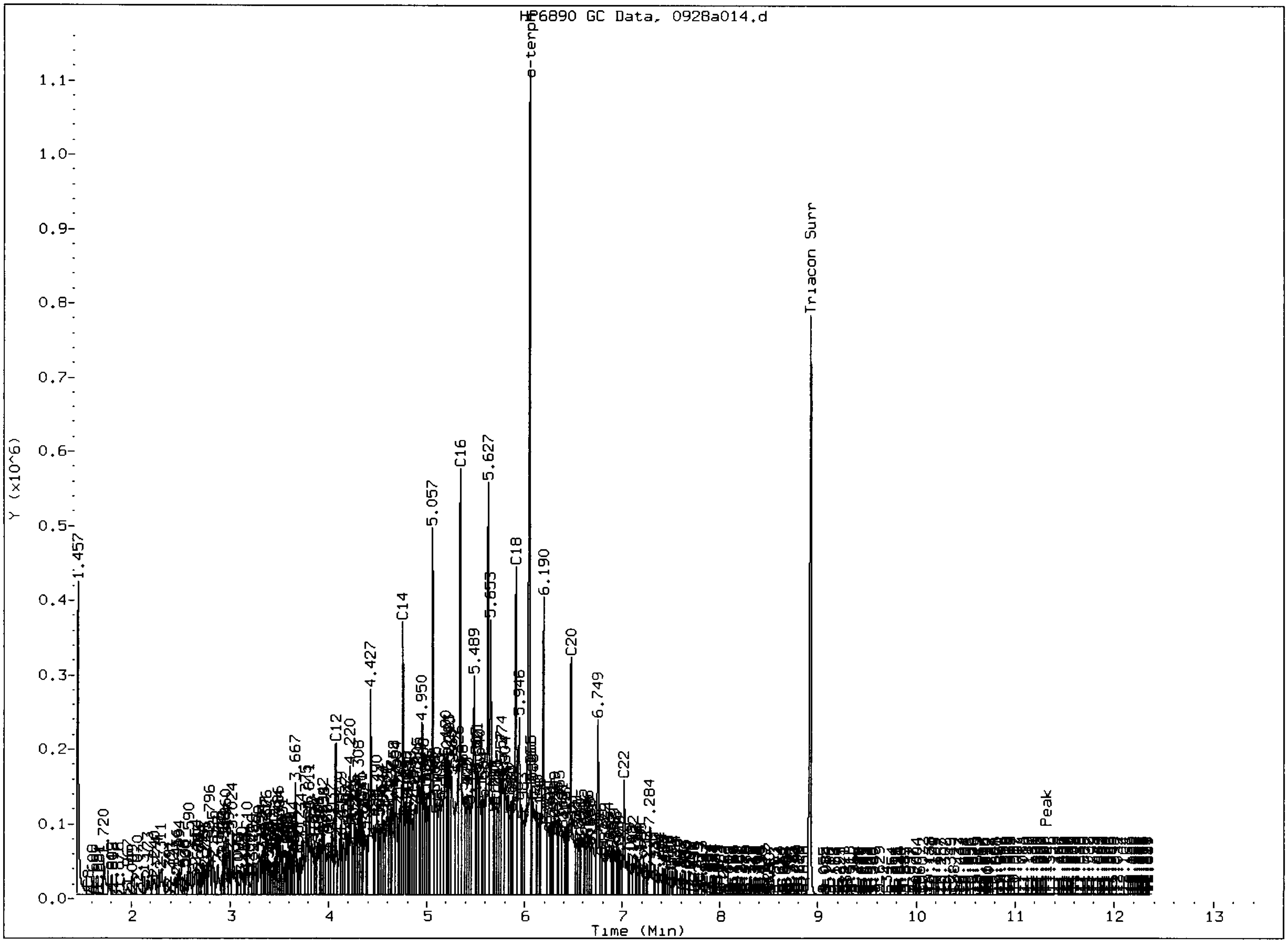
Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



FID:4A-2C/RTX-1 VK65LCSDW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: ________

Date: 10/01/12

TOTAL HCID RANGE HYDROCARBONS-EXTRACTION REPORT

Matrix: Water
Date Received: 09/25/12

ARI Job: VK65
Project: Cornwall
0001020.400-510

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
12-18405-092712MB	Method Blank	500 mL	1.00 mL	09/27/12
12-18405-092712LCS	Lab Control	500 mL	1.00 mL	09/27/12
12-18405-092712LCSD	Lab Control Dup	500 mL	1.00 mL	09/27/12
12-18405-VK65A	MW-15D-092412	500 mL	1.00 mL	09/27/12
12-18406-VK65B	MW-16D-092412	500 mL	1.00 mL	09/27/12
12-18407-VK65C	MW-14D-092412	500 mL	1.00 mL	09/27/12
12-18408-VK65D	MW-15S-092412	500 mL	1.00 mL	09/27/12
12-18409-VK65E	MW-16S-092412	500 mL	1.00 mL	09/27/12
12-18410-VK65F	MW-14S-092412	500 mL	1.00 mL	09/27/12
12-18411-VK65G	MW-13S-092412	500 mL	1.00 mL	09/27/12
12-18412-VK65H	MW-12S-092412	500 mL	1.00 mL	09/27/12
12-18413-VK65I	MW-11S-092412	500 mL	1.00 mL	09/27/12
12-18414-VK65J	MW-12D-092412	500 mL	1.00 mL	09/27/12
12-18415-VK65K	MW-11D-092412	500 mL	1.00 mL	09/27/12
12-18416-VK65L	MW-13D-092412	500 mL	1.00 mL	09/27/12
12-18417-VK65M	MW-DUP-092412	500 mL	1.00 mL	09/27/12

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TOTAL DIESEL RANGE HYDROCARBONS
NWTPHD by GC/FID-Silica and Acid Cleaned
Extraction Method:
Page 1 of 1

QC Report No: VL48-Landau Associates
Project: Cornwall
0001020.400-510

Matrix: Water
Data Release Authorized:
Reported: 10/03/12

ARI ID	**Sample ID**	**Extraction Date**	**Analysis Date**	**EFV DL**	**Range/Surrogate**	**RL**	**Result**
MB-100112	Method Blank	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18901	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		84.9%
VL48A	MW-15D-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18901	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		82.1%
VL48B	MW-16D-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18902	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		72.1%
VL48C	MW-14D-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18903	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		79.8%
VL48D	MW-15S-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18904	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		75.8%
VL48E	MW-16S-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18905	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		73.5%
VL48F	MW-14S-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18906	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		76.8%
VL48G	MW-13D-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18907	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		81.2%
VL48H	MW-DUP-092412	10/01/12	10/02/12	1.00	Diesel Range	0.10	< 0.10 U
12-18908	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		74.3%

Reported in mg/L (ppm)

EFV-Effective Final Volume in mL.
DL-Dilution of extract prior to analysis.
RL-Reporting limit.

Diesel range quantitation on total peaks in the range from C12 to C24.
Motor Oil range quantitation on total peaks in the range from C24 to C38.
HC ID: DRO/RRO indicate results of organics or additional hydrocarbons in ranges are not identifiable.

VC
10/3/12

```
                      Analytical Resources Inc.
                        TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a022.d        ARI ID: VL48MBW1
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                      Injection: 02-OCT-2012 13:52
Operator: JR
Report Date: 10/03/2012                                 Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                          FID:4A RESULTS
Compound         RT     Shift    Height     Area    Method    Range           Total Area    Conc
=========================================================================================
Toluene        1.282  -0.010     15774     21638 | WATPHG  (Tol-C12)          164297      8.87
C8             1.530  -0.020      2075      8525 | WATPHD  (C12-C24)           40420      2.52
C10            3.165   0.000       301       490 | WATPHM  (C24-C38)           70133      5.30
C12            4.065  -0.009        94        98 |  AK102  (C10-C25)           52273      2.76
C14            4.754  -0.001       225       292 |  AK103  (C25-C36)           51904      5.64
C16            5.365   0.023       776      2222 |
C18            5.902  -0.001       342       589 |
C20            6.463  -0.006       216       276 |  JET-A  (C10-C18)           38203      7.05
C22            7.010  -0.009       167       130 |MIN.OIL  (C24-C38)           70133      5.22
C24            7.554   0.011       183       278 |
C25            7.814   0.021      1745      2311 |
C26            8.039   0.003       187       374 |
C28            8.489  -0.001       668       544 |
C32            9.320   0.019      1035      2875 |
C34            9.671  -0.006       517       520 |
Filter Peak   11.365  -0.004      1793      3022 |BUNKERC  (C10-C38)          121307     13.25
C36           10.045   0.007       712       345 |
C38           10.393   0.000       882       856 |
C40           10.740   0.003      1250      1242 |
o-terph        6.044   0.001    878628    827789 |
Triacon Surr   8.921   0.005    783931    819191 |NAS DIES  (C10-C24)          51174      2.79
=========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate         Area      Amount     %Rec
  ------------------------------------------
    o-Terphenyl      827789      38.2      84.9
    Triacontane      819191      44.1      97.9

M  Indicates the peak was manually integrated

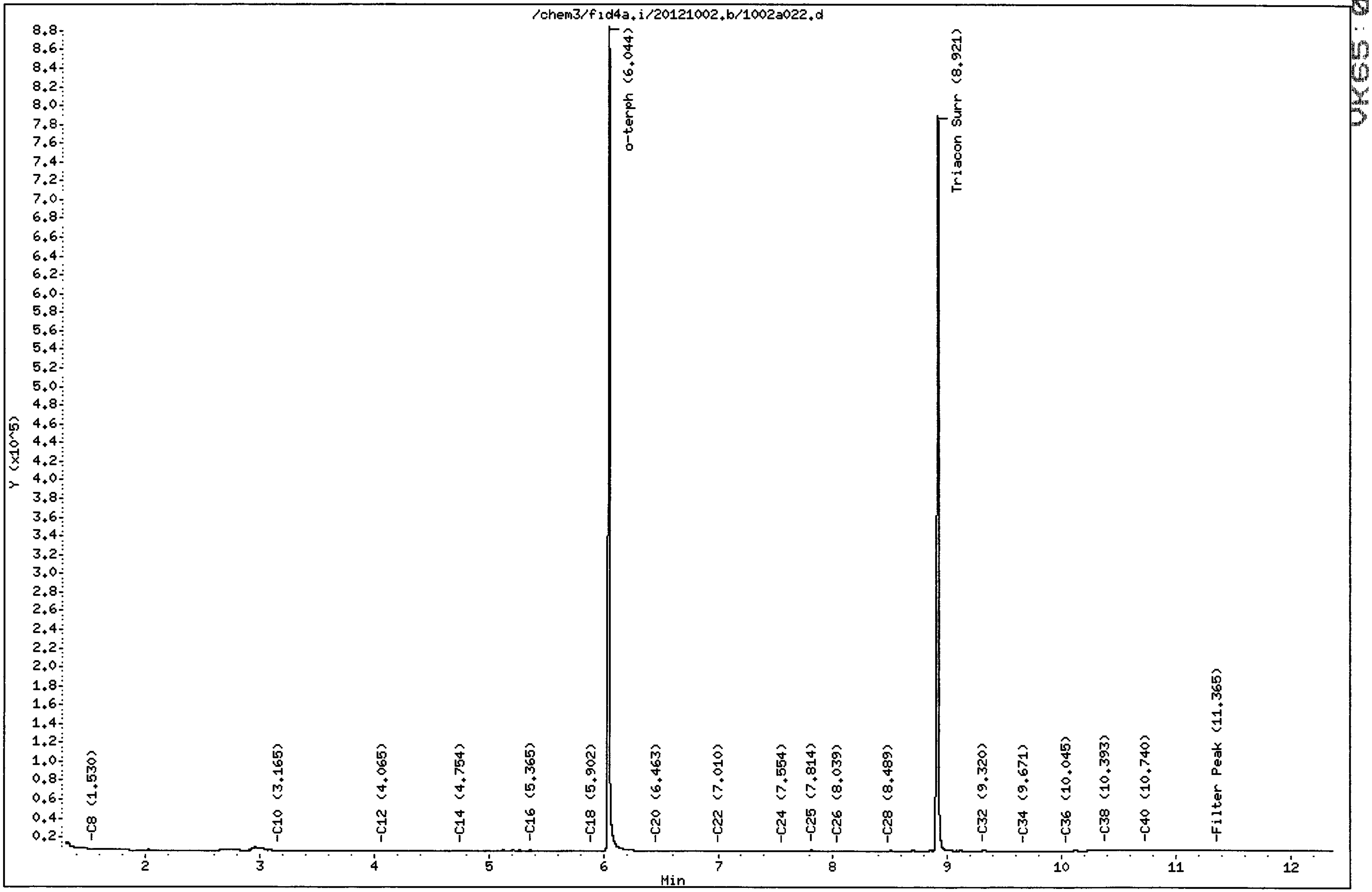

       Analyte            RF       Curve Date
     -------------------------------------
      o-Terph Surr     21670.6   25-SEP-2012
      Triacon Surr     18590.6   25-SEP-2012
      Gas              18517.9   28-SEP-2012
      Diesel           16014.3   25-SEP-2012
      Motor Oil        13234.2   25-SEP-2012
      AK102            18929.5   25-SEP-2012
      AK103             9202.1   25-SEP-2012
      JetA              5416.5   11-AUG-2012
      Min Oil          13440.7   09-MAY-2012
      NAS Diesel        18324.0   24-AUG-2012
      Bunker C          9156.1   24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a022.d
Date : 02-OCT-2012 13:52
Client ID:
Sample Info: VL48MBW1

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



RC 10/3/12

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                        Analytical Resources Inc.
                         TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a025.d        ARI ID: VL48A
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-OCT-2012 14:56
Operator: JR
Report Date: 10/03/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                  FID:4A RESULTS
Compound        RT     Shift    Height     Area     Method   Range          Total Area    Conc
==========================================================================================
Toluene        1.280  -0.012    10835     13360  |  WATPHG (Tol-C12)         307327      16.60
C8             1.493  -0.058     5657     11394  |  WATPHD (C12-C24)         194094      12.12
C10            3.177   0.011     1138      1201  |  WATPHM (C24-C38)          76727       5.80
C12            4.085   0.011     2848      4679  |   AK102 (C10-C25)         412527      21.79
C14            4.755  -0.001     2782      5227  |   AK103 (C25-C36)          59588       6.48
C16            5.350   0.008     1887      2008  |
C18            5.902  -0.001     1312      2129  |
C20            6.463  -0.007      722       591  |   JET-A (C10-C18)         362768      66.97
C22            7.034   0.015      792      2038  |MIN.OIL (C24-C38)          76727       5.71
C24            7.550   0.006      444      1098  |
C25            7.815   0.021     3950      5414  |
C26            8.037   0.001      404       639  |
C28            8.489  -0.001      966      1015  |
C32            9.311   0.010     1088      3343  |
C34            9.675  -0.002      469       272  |
Filter Peak   11.373   0.004     1469      1902  |BUNKERC (C10-C38)         486653      53.15
C36           10.043   0.004      607       247  |
C38           10.393   0.000      754       428  |
C40           10.753   0.016     1120      2815  |
o-terph        6.044   0.001   880757    800880  |
Triacon Surr   8.918   0.002   757300    792796  |NAS DIES (C10-C24)        409926      22.37
==========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
   ------------------------------------------
    o-Terphenyl     800880      37.0      82.1
    Triacontane     792796      42.6      94.8

M  Indicates the peak was manually integrated


        Analyte           RF       Curve Date
     --------------------------------------
      o-Terph Surr     21670.6    25-SEP-2012
      Triacon Surr     18590.6    25-SEP-2012
      Gas              18517.9    28-SEP-2012
      Diesel           16014.3    25-SEP-2012
      Motor Oil        13234.2    25-SEP-2012
      AK102            18929.5    25-SEP-2012
      AK103             9202.1    25-SEP-2012
      JetA              5416.5    11-AUG-2012
      Min Oil          13440.7    09-MAY-2012
      NAS Diesel        18324.0    24-AUG-2012
      Bunker C          9156.1    24-AUG-2012
```
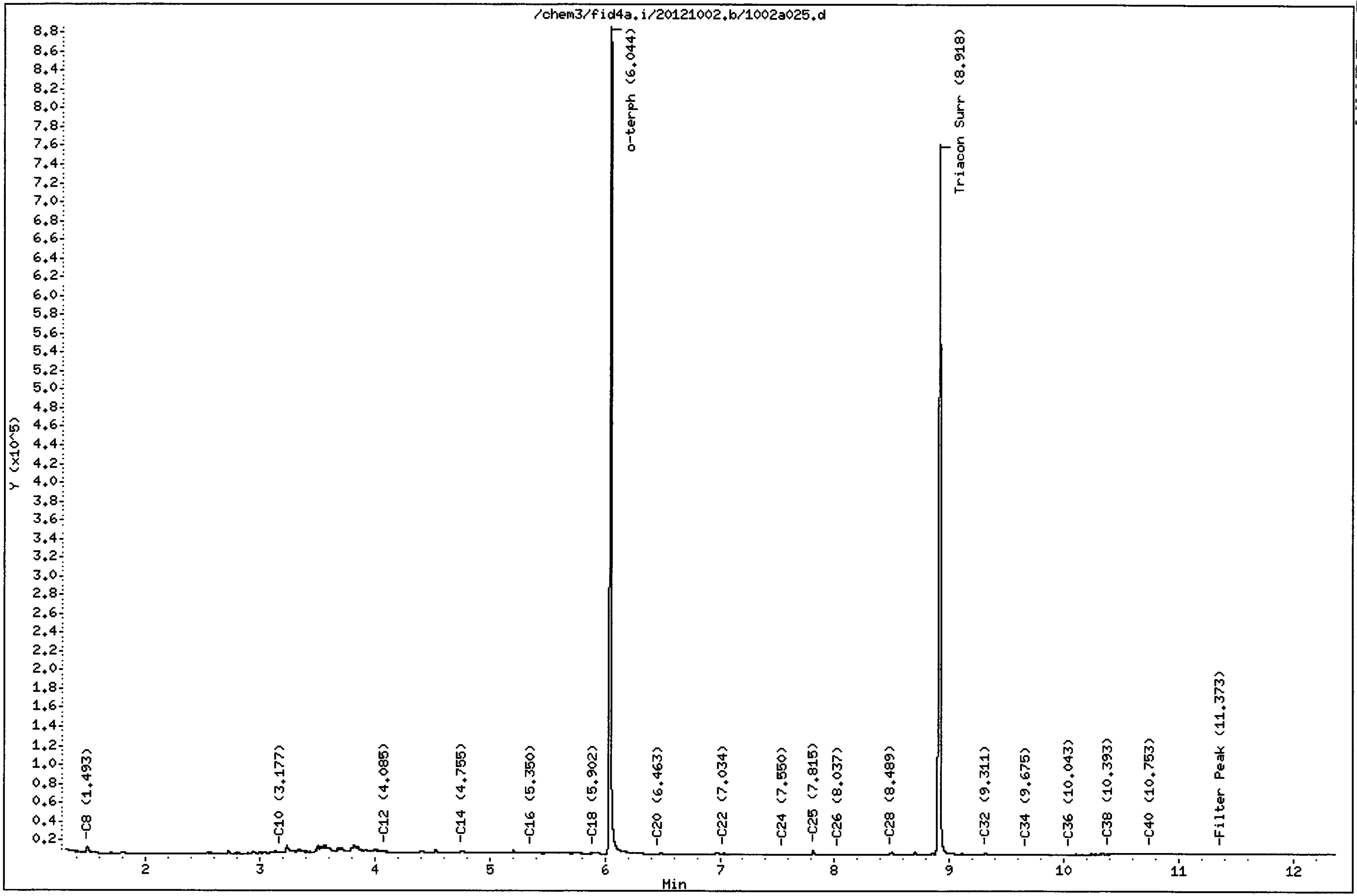

Data File: /chem3/fid4a.i/20121002.b/1002a025.d
Date : 02-OCT-2012 14:56
Client ID:
Sample Info: VL48A

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



PC
10/3/12

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                    Analytical Resources Inc.
                     TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a026.d       ARI ID: VL48B
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-OCT-2012 15:17
Operator: JR
Report Date: 10/03/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                     FID:4A RESULTS
Compound        RT     Shift    Height      Area     Method   Range          Total Area   Conc
===============================================================================================
Toluene       1.284   -0.008     10699     14580 | WATPHG  (Tol-C12)          157171     8.49
C8            1.615    0.065       921      2636 | WATPHD  (C12-C24)           65724     4.10
C10           3.178    0.013       320       448 | WATPHM  (C24-C38)           42288     3.20
C12           4.069   -0.005       783      1550 |  AK102  (C10-C25)          116114     6.13
C14           4.765    0.009       492       805 |  AK103  (C25-C36)           31669     3.44
C16           5.353    0.011       831       996 |
C18           5.903    0.000       514       790 |
C20           6.465   -0.004       275       239 |  JET-A  (C10-C18)           97115    17.93
C22           7.014   -0.005       202       115 |MIN.OIL  (C24-C38)           42288     3.15
C24           7.552    0.009       157       231 |
C25           7.776   -0.018       100        83 |
C26           8.041    0.005       131       136 |
C28           8.489   -0.001       719       649 |
C32           9.315    0.014       767      2192 |
C34           9.660   -0.017       237        82 |
Filter Peak  11.371    0.002      1339      1565 |BUNKERC  (C10-C38)          158165    17.27
C36          10.031   -0.008       380       272 |
C38          10.400    0.007       585       494 |
C40          10.733   -0.004       943       999 |
o-terph       6.043    0.000    776593    703113 |
Triacon Surr  8.916    0.001    727433    716687 |NAS DIES (C10-C24)          115876     6.32
==============================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)    AK103(7.79 - 10.04)    OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount    %Rec
  -------------------------------------------
    o-Terphenyl     703113      32.4     72.1
    Triacontane     716687      38.6     85.7

M  Indicates the peak was manually integrated

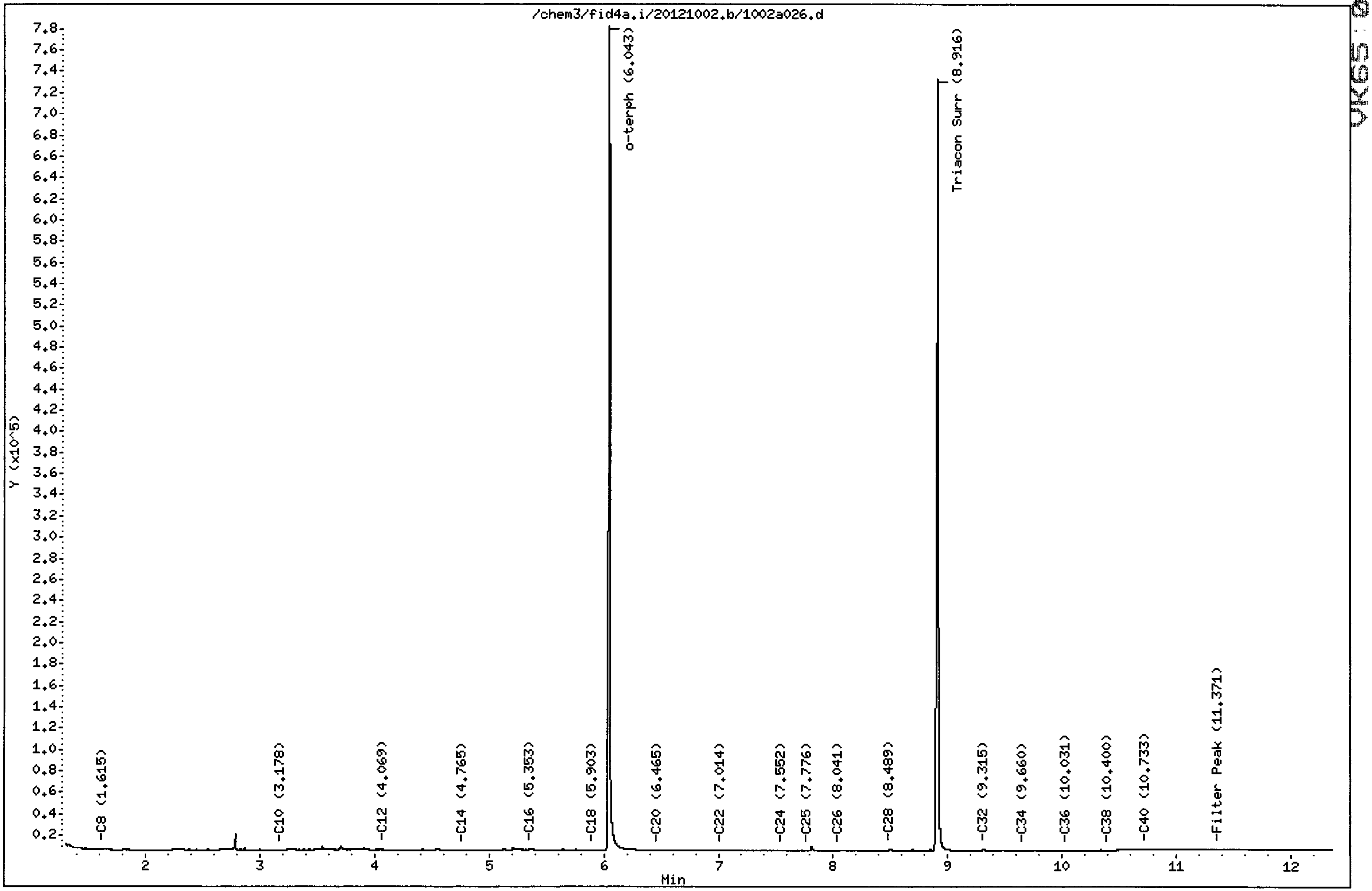

        Analyte          RF      Curve Date
     ---------------------------------------
      o-Terph Surr    21670.6   25-SEP-2012
      Triacon Surr    18590.6   25-SEP-2012
      Gas             18517.9   28-SEP-2012
      Diesel          16014.3   25-SEP-2012
      Motor Oil       13234.2   25-SEP-2012
      AK102           18929.5   25-SEP-2012
      AK103            9202.1   25-SEP-2012
      JetA             5416.5   11-AUG-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       18324.0   24-AUG-2012
      Bunker C         9156.1   24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a026.d
Date : 02-OCT-2012 15:17
Client ID:
Sample Info: VL48B

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



MC
10/3/12

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                    Analytical Resources Inc.
                     TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a027.d       ARI ID: VL48C
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-OCT-2012 15:38
Operator: JR
Report Date: 10/03/2012                               Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                      FID:4A RESULTS
Compound        RT     Shift    Height      Area      Method   Range          Total Area     Conc
=================================================================================================
Toluene        1.284  -0.009     9345      12133 | WATPHG  (Tol-C12)         208655       11.27
C8             1.531  -0.019     1352       4518 | WATPHD  (C12-C24)         147860        9.23
C10            3.191   0.025      961       1327 | WATPHM  (C24-C38)         153819       11.62
C12            4.077   0.003     1464        859 |  AK102  (C10-C25)         277464       14.66
C14            4.756   0.001     1468       1820 |  AK103  (C25-C36)         129331       14.05
C16            5.351   0.008     1197        950 |
C18            5.904   0.001      719       1245 |
C20            6.464  -0.005      523        355 |  JET-A  (C10-C18)         219770       40.57
C22            7.030   0.011      750       2125 |MIN.OIL  (C24-C38)         153819       11.44
C24            7.546   0.003      921       2068 |
C25            7.812   0.018    16548      20912 |
C26            8.037   0.001     1347       2960 |
C28            8.489  -0.002     1926       3149 |
C32            9.310   0.009     1798       4199 |
C34            9.688   0.011     1080       2884 |
Filter Peak   11.367  -0.002     1424       1612 |BUNKERC  (C10-C38)         426235       46.55
C36           10.043   0.005      934       1984 |
C38           10.398   0.005      963       2209 |
C40           10.736  -0.002     1138       1473 |
o-terph        6.043   0.000   864962     777684 |
Triacon Surr   8.919   0.004   747663     770524 |NAS DIES (C10-C24)         272416       14.87
=================================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate         Area      Amount     %Rec
  ------------------------------------------
    o-Terphenyl      777684      35.9      79.7
    Triacontane      770524      41.4      92.1

M  Indicates the peak was manually integrated


        Analyte          RF       Curve Date
     -------------------------------------
      o-Terph Surr    21670.6    25-SEP-2012
      Triacon Surr    18590.6    25-SEP-2012
      Gas             18517.9    28-SEP-2012
      Diesel          16014.3    25-SEP-2012
      Motor Oil       13234.2    25-SEP-2012
      AK102           18929.5    25-SEP-2012
      AK103            9202.1    25-SEP-2012
      JetA             5416.5    11-AUG-2012
      Min Oil         13440.7    09-MAY-2012
      NAS Diesel       18324.0    24-AUG-2012
      Bunker C         9156.1    24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a027.d

Date : 02-OCT-2012 15:38

Client ID:

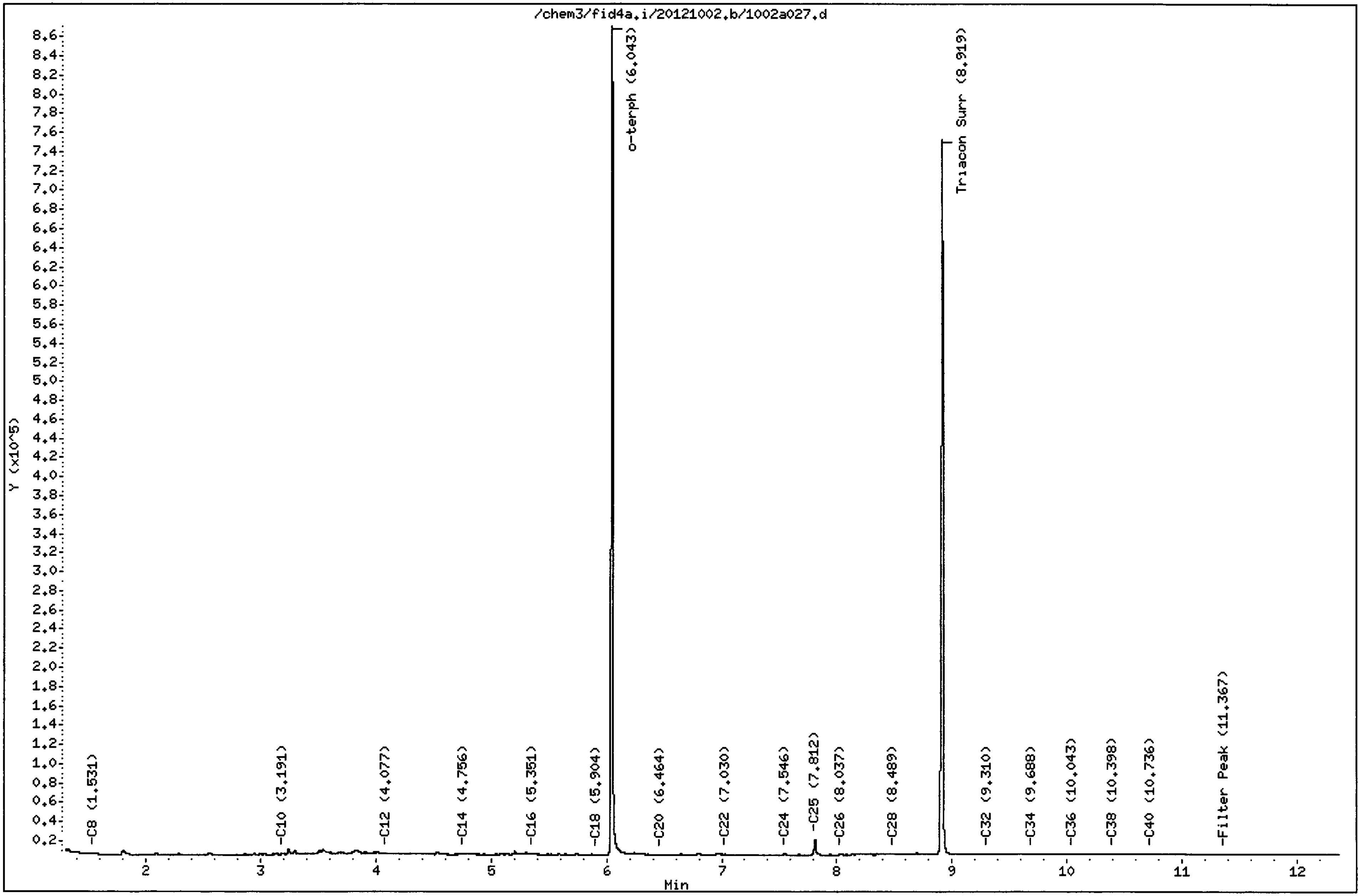
Sample Info: VL48C

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR

Column diameter: 0.25



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                 Analytical Resources Inc.
                   TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a028.d      ARI ID: VL48D
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m        Client ID:
Instrument: fid4a.i                                   Injection: 02-OCT-2012 16:00
Operator: JR
Report Date: 10/03/2012                              Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                   FID:4A RESULTS
Compound        RT     Shift    Height     Area    Method   Range          Total Area    Conc
===========================================================================================
Toluene        1.280  -0.012     8462     10763 | WATPHG (Tol-C12)          371132      20.04
C8             1.553   0.003      934      1547 | WATPHD (C12-C24)          233146      14.56
C10            3.187   0.021     1713      3093 | WATPHM (C24-C38)           81188       6.13
C12            4.099   0.025     2844      3647 |  AK102 (C10-C25)          497687      26.29
C14            4.753  -0.003     3897      9938 |  AK103 (C25-C36)           62524       6.79
C16            5.352   0.010     1637      1621 |
C18            5.903   0.000      955      1816 |
C20            6.462  -0.007      548       511 |  JET-A (C10-C18)          451528      83.36
C22            7.034   0.015      685      2162 |MIN.OIL (C24-C38)           81188       6.04
C24            7.553   0.010      454       864 |
C25            7.775  -0.019      305       271 |
C26            8.039   0.003      779      1340 |
C28            8.489  -0.001     1615      1585 |
C32            9.310   0.009     1072      2859 |
C34            9.684   0.007      535      1179 |
Filter Peak   11.374   0.005     1409      1395 |BUNKERC (C10-C38)          576217      62.93
C36           10.042   0.004      612      1500 |
C38           10.395   0.002      746       600 |
C40           10.734  -0.003     1050       702 |
o-terph        6.042  -0.001   781557    739440 |
Triacon Surr   8.915  -0.001   700480    729127 |NAS DIES (C10-C24)         495029      27.02
============================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)    AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
   ------------------------------------------
    o-Terphenyl     739440      34.1      75.8
    Triacontane     729127      39.2      87.2

M  Indicates the peak was manually integrated

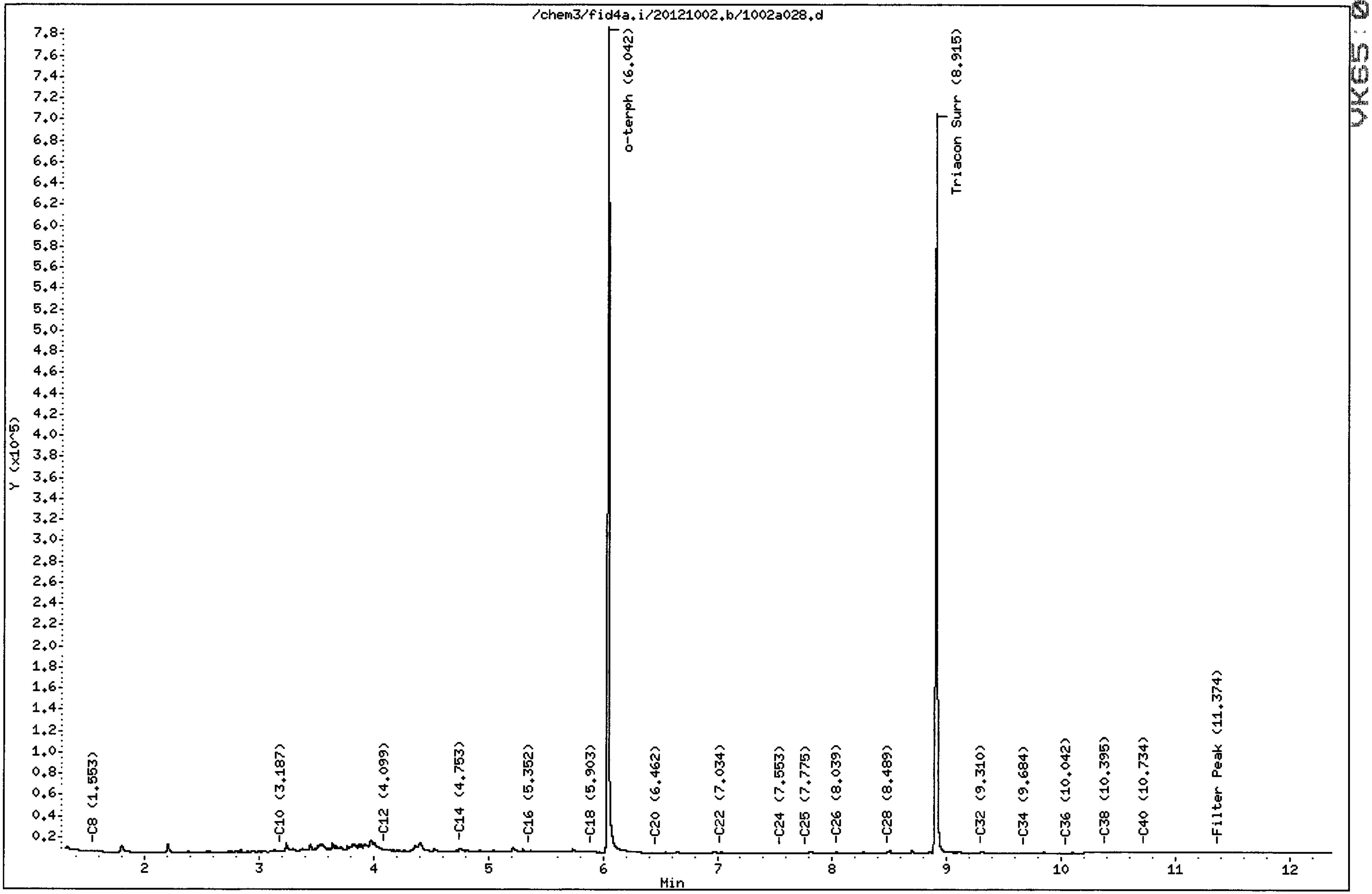

        Analyte          RF      Curve Date
      ---------------------------------------
       o-Terph Surr    21670.6    25-SEP-2012
       Triacon Surr    18590.6    25-SEP-2012
       Gas             18517.9    28-SEP-2012
       Diesel          16014.3    25-SEP-2012
       Motor Oil       13234.2    25-SEP-2012
       AK102           18929.5    25-SEP-2012
       AK103            9202.1    25-SEP-2012
       JetA             5416.5    11-AUG-2012
       Min Oil         13440.7    09-MAY-2012
       NAS Diesel       18324.0    24-AUG-2012
       Bunker C         9156.1    24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a028.d
Date : 02-OCT-2012 16:00
Client ID:
Sample Info: VL48D

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25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                    Analytical Resources Inc.
                     TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a029.d        ARI ID: VL48E
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-OCT-2012 16:21
Operator: JR
Report Date: 10/03/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                   FID:4A RESULTS
Compound        RT     Shift    Height     Area     Method  Range          Total Area    Conc
=================================================================================================
Toluene       1.282  -0.010    10809     14860 | WATPHG (Tol-C12)         143296      7.74
C8            1.544  -0.006     1370      1934 | WATPHD (C12-C24)         142172      8.88
C10           3.182   0.017      442       922 | WATPHM (C24-C38)          83335      6.30
C12           4.099   0.025      710       764 |  AK102 (C10-C25)         195942     10.35
C14           4.752  -0.003      939      1654 |  AK103 (C25-C36)          63797      6.93
C16           5.350   0.008     1389       852 |
C18           5.903   0.000      895      1718 |
C20           6.464  -0.005      640       198 |  JET-A (C10-C18)         147541     27.24
C22           7.007  -0.012      557       686 |MIN.OIL (C24-C38)          83335      6.20
C24           7.550   0.007      637      1357 |
C25           7.778  -0.016      385       217 |
C26           8.039   0.003      707      1498 |
C28           8.488  -0.002     1050      1269 |
C32           9.313   0.012     1037      2911 |
C34           9.663  -0.014      477       311 |
Filter Peak  11.363  -0.006     1513      1676 |BUNKERC (C10-C38)         275708     30.11
C36          10.032  -0.006      615       431 |
C38          10.388  -0.005      779       786 |
C40          10.736  -0.002     1115       572 |
o-terph       6.043   0.000   777941    716899 |
Triacon Surr  8.915   0.000   662504    703531 |NAS DIES (C10-C24)        192373     10.50
=================================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate        Area     Amount    %Rec
  -----------------------------------------
    o-Terphenyl     716899     33.1     73.5
    Triacontane     703531     37.8     84.1

M  Indicates the peak was manually integrated


      Analyte           RF      Curve Date
    -------------------------------------
     o-Terph Surr    21670.6   25-SEP-2012
     Triacon Surr    18590.6   25-SEP-2012
     Gas             18517.9   28-SEP-2012
     Diesel          16014.3   25-SEP-2012
     Motor Oil       13234.2   25-SEP-2012
     AK102           18929.5   25-SEP-2012
     AK103            9202.1   25-SEP-2012
     JetA             5416.5   11-AUG-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       18324.0   24-AUG-2012
     Bunker C         9156.1   24-AUG-2012
```
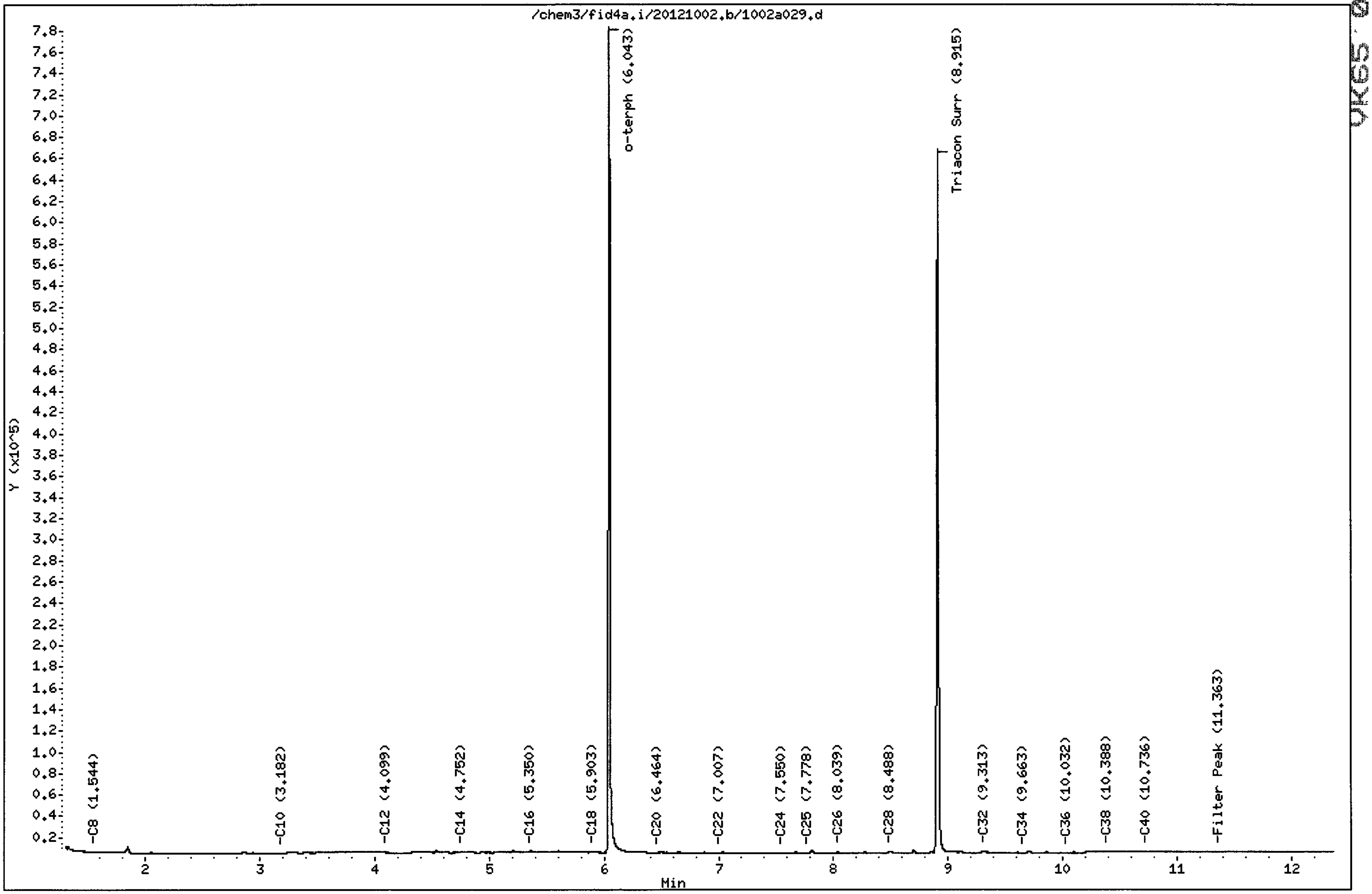

Data File: /chem3/fid4a.i/20121002.b/1002a029.d
Date : 02-OCT-2012 16:21
Client ID:
Sample Info: VL48E

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



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                          Analytical Resources Inc.
                           TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a030.d        ARI ID: VL48F
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-OCT-2012 16:42
Operator: JR
Report Date: 10/03/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                         FID:4A RESULTS
Compound        RT     Shift    Height     Area    Method   Range          Total Area    Conc
=====================================================================================
Toluene       1.270   -0.022    12419     21110 | WATPHG (Tol-C12)         409878     22.13
C8            1.546   -0.004     1231       840 | WATPHD (C12-C24)         224801     14.04
C10           3.184    0.019     1732      3068 | WATPHM (C24-C38)          47775      3.61
C12           4.080    0.006     3876      8439 |  AK102 (C10-C25)         512652     27.08
C14           4.749   -0.007     4455      7090 |  AK103 (C25-C36)          36132      3.93
C16           5.349    0.007     1687      1290 |
C18           5.903    0.000      854      1604 |
C20           6.467   -0.002      537       734 |  JET-A (C10-C18)         468293     86.46
C22           7.034    0.015      565       978 |MIN.OIL (C24-C38)          47775      3.55
C24           7.530   -0.013      272       578 |
C25           7.814    0.020     1535      2086 |
C26           8.038    0.002      142       151 |
C28           8.506    0.016     5849      5911 |
C32           9.315    0.014      866      2376 |
C34           9.688    0.011      343       957 |
Filter Peak  11.361   -0.008     1225       436 |BUNKERC (C10-C38)         558401     60.99
C36          10.050    0.011      471      1266 |
C38          10.392   -0.001      536       251 |
C40          10.740    0.002      811      1221 |
o-terph       6.043    0.000   834489    748446 |
Triacon Surr  8.918    0.002   751953    742684 |NAS DIES (C10-C24)        510626     27.87
=====================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)    AK103(7.79 - 10.04)    OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl     748446      34.5      76.7
    Triacontane     742684      39.9      88.8

M  Indicates the peak was manually integrated

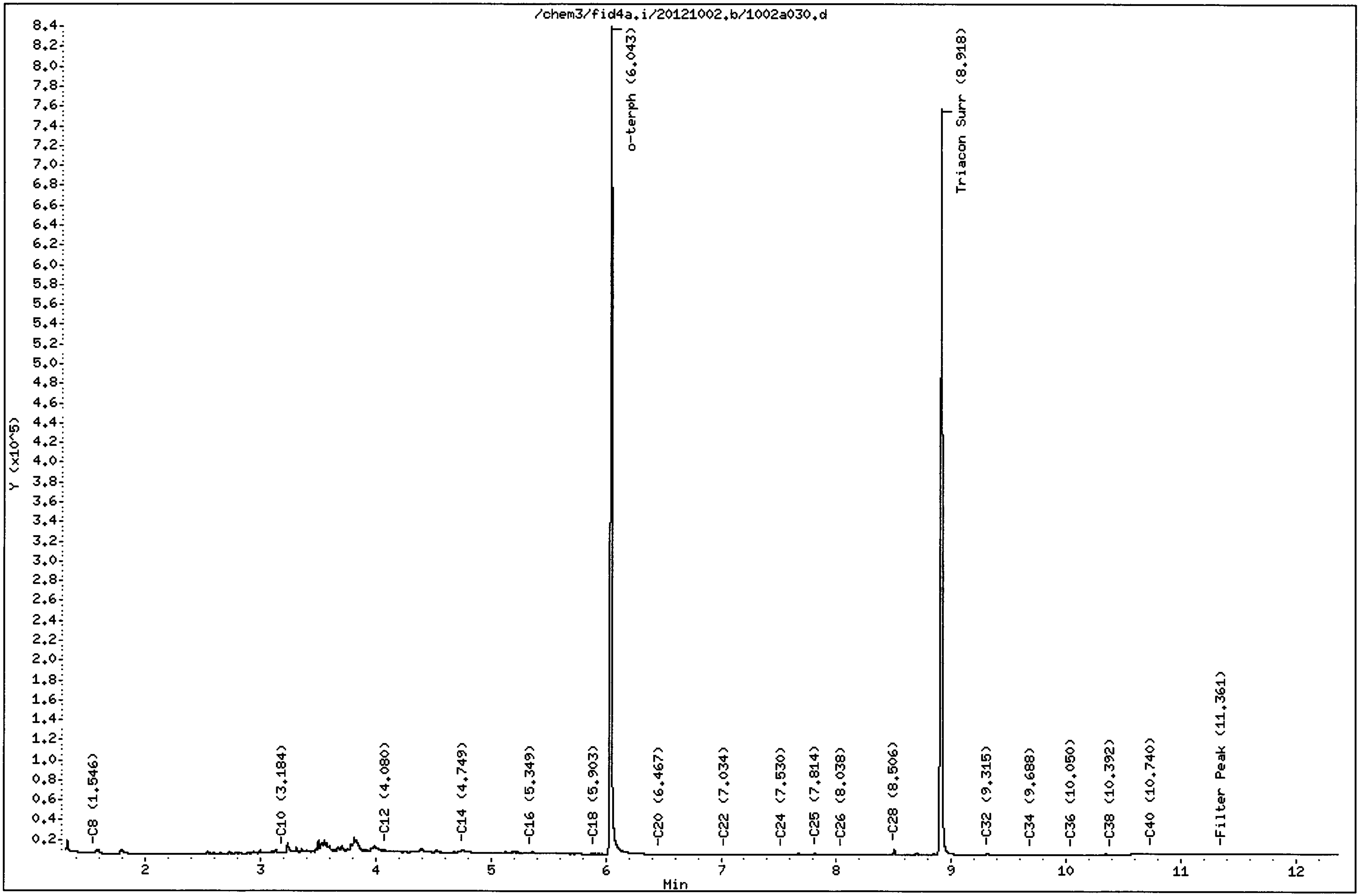

      Analyte           RF      Curve Date
    ------------------------------------
     o-Terph Surr    21670.6   25-SEP-2012
     Triacon Surr    18590.6   25-SEP-2012
     Gas             18517.9   28-SEP-2012
     Diesel          16014.3   25-SEP-2012
     Motor Oil       13234.2   25-SEP-2012
     AK102           18929.5   25-SEP-2012
     AK103            9202.1   25-SEP-2012
     JetA             5416.5   11-AUG-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       18324.0   24-AUG-2012
     Bunker C         9156.1   24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a030.d
Date : 02-OCT-2012 16:42
Client ID:
Sample Info: VL48F

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



NC 10/3/12

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                      Analytical Resources Inc.
                       TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a031.d        ARI ID: VL48G
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-OCT-2012 17:03
Operator: JR
Report Date: 10/03/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                         FID:4A RESULTS
Compound        RT     Shift   Height      Area     Method   Range          Total Area    Conc
===============================================================================================
Toluene       1.271  -0.021    13690      18241 | WATPHG (Tol-C12)         649170      35.06
C8            1.560   0.010     1060       2794 | WATPHD (C12-C24)         311185      19.43
C10           3.180   0.014     3295       3375 | WATPHM (C24-C38)         199006      15.04
C12           4.081   0.007     5394       6861 |  AK102 (C10-C25)         860545      45.46
C14           4.757   0.002     4858      12888 |  AK103 (C25-C36)         169712      18.44
C16           5.350   0.008     2114       2424 |
C18           5.902  -0.001     1358       1781 |
C20           6.475   0.006      945       1120 |  JET-A (C10-C18)         776110     143.29
C22           7.031   0.012     1003       2844 |MIN.OIL (C24-C38)         199006      14.81
C24           7.546   0.003     1523       3425 |
C25           7.794   0.001     2005       2068 |
C26           8.035  -0.001     2261       4195 |
C28           8.489  -0.001     2866       6509 |
C32           9.299  -0.002     2299       5404 |
C34           9.676  -0.001     1403       3030 |
Filter Peak  11.362  -0.007     1428        710 |BUNKERC (C10-C38)        1052454     114.95
C36          10.034  -0.004     1159       1710 |
C38          10.391  -0.001     1105        434 |
C40          10.745   0.008     1240       1351 |
o-terph       6.044   0.001   910251     791731 |
Triacon Surr  8.916   0.000   785369     790195 |NAS DIES (C10-C24)        853448      46.58
===============================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate        Area     Amount    %Rec
  ------------------------------------------
    o-Terphenyl     791731     36.5     81.2
    Triacontane     790195     42.5     94.5

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
      -------------------------------------
       o-Terph Surr    21670.6   25-SEP-2012
       Triacon Surr    18590.6   25-SEP-2012
       Gas             18517.9   28-SEP-2012
       Diesel          16014.3   25-SEP-2012
       Motor Oil       13234.2   25-SEP-2012
       AK102           18929.5   25-SEP-2012
       AK103            9202.1   25-SEP-2012
       JetA             5416.5   11-AUG-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       18324.0   24-AUG-2012
       Bunker C         9156.1   24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a031.d

Date : 02-OCT-2012 17:03

Client ID:

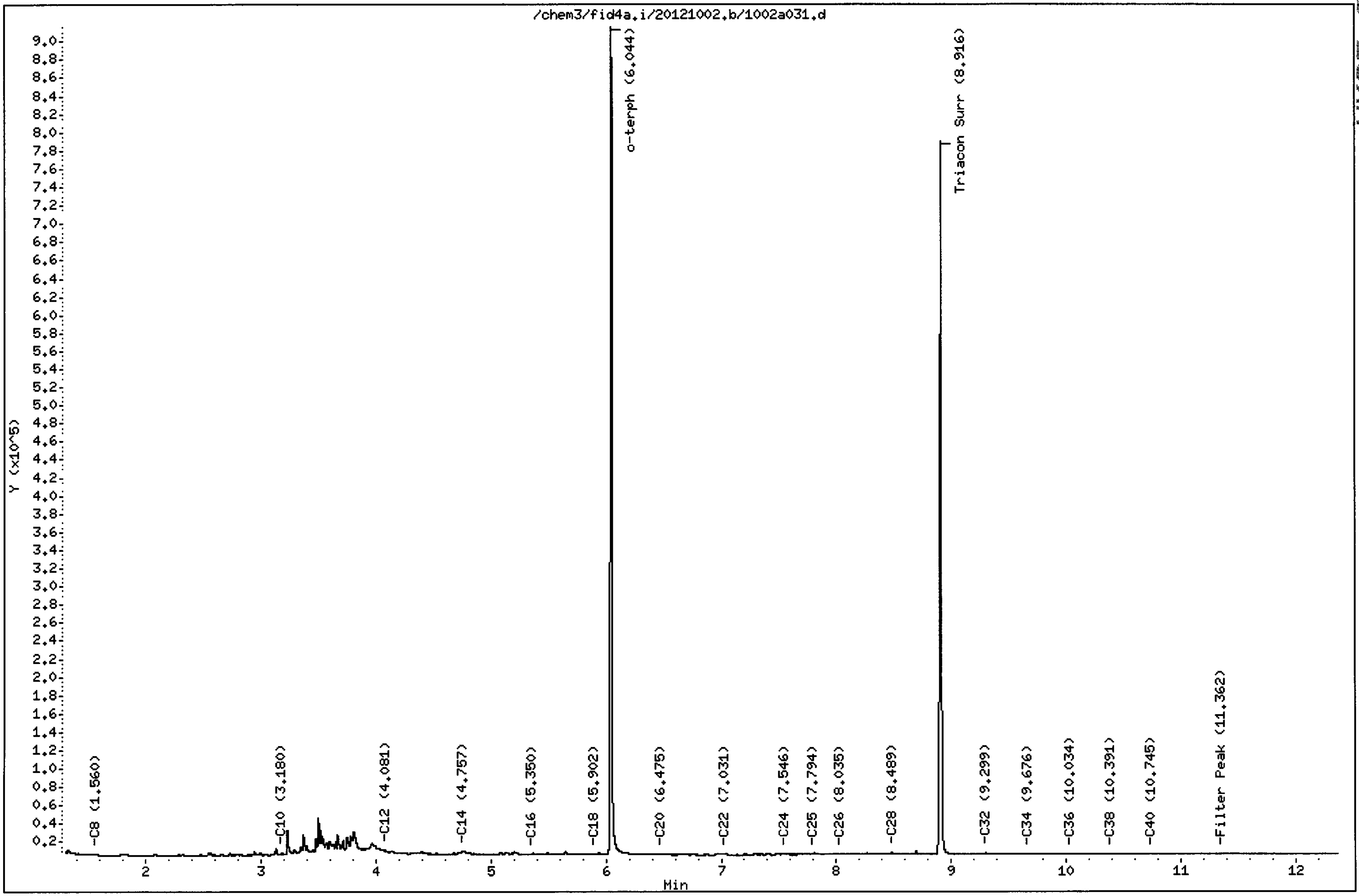
Sample Info: VL48G

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR

Column diameter: 0.25



PC
10/3/12

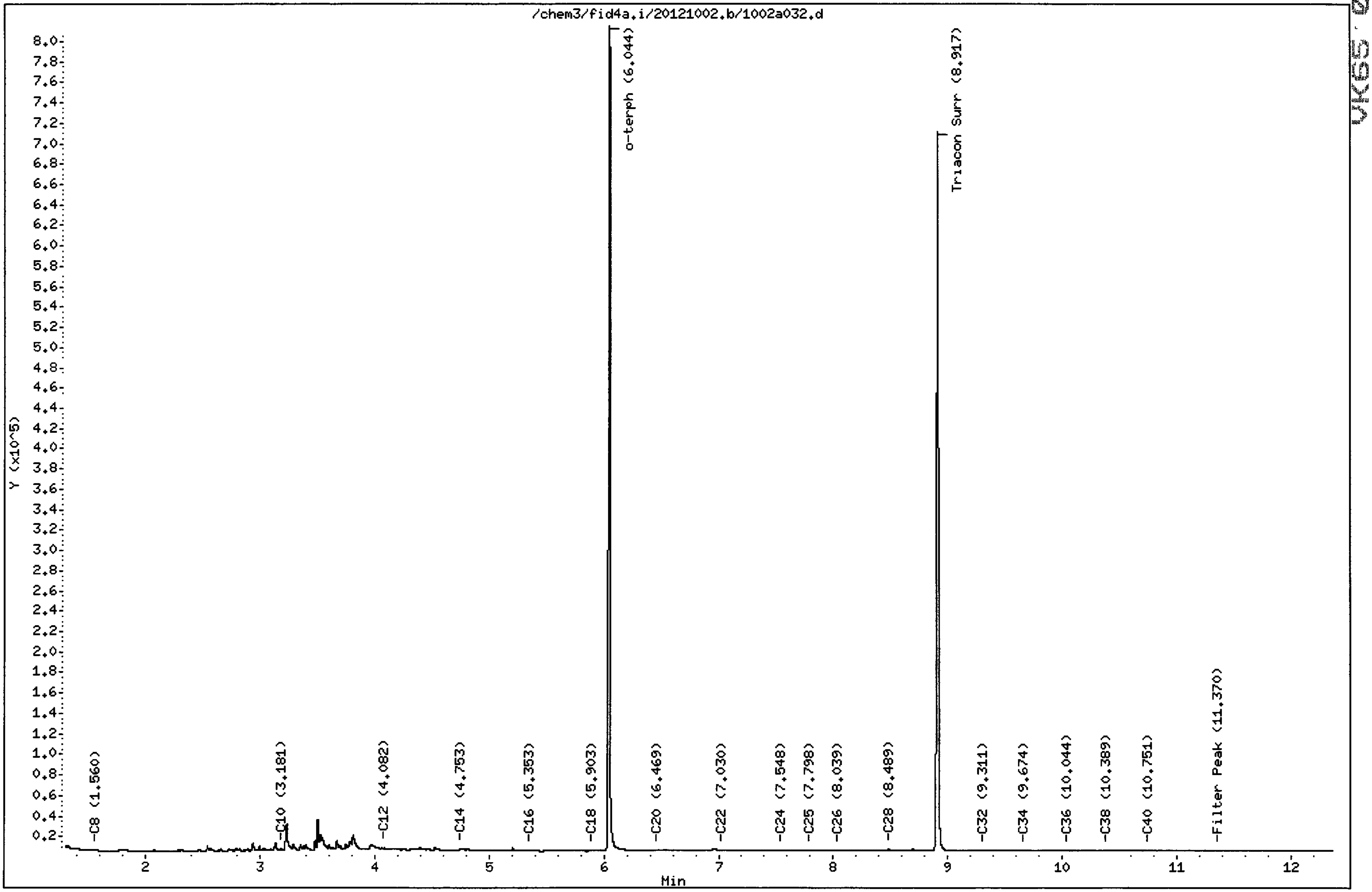
```
                         Analytical Resources Inc.
                          TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a032.d        ARI ID: VL48H
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-OCT-2012 17:24
Operator: JR
Report Date: 10/03/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                   FID:4A RESULTS
Compound        RT     Shift    Height     Area    Method   Range          Total Area    Conc
=========================================================================================
Toluene       1.272   -0.020    12785     17820 | WATPHG (Tol-C12)         432632      23.36
C8            1.560    0.010     1087      2788 | WATPHD (C12-C24)         250828      15.66
C10           3.181    0.016     2250      3003 | WATPHM (C24-C38)         172638      13.04
C12           4.082    0.008     3458      8946 |  AK102 (C10-C25)         566058      29.90
C14           4.753   -0.003     3260      8551 |  AK103 (C25-C36)         145883      15.85
C16           5.353    0.011     1491      1981 |
C18           5.903    0.000     1066      1845 |
C20           6.469    0.000     1067       792 |  JET-A (C10-C18)         471732      87.09
C22           7.030    0.011     1292      4047 |MIN.OIL (C24-C38)         172638      12.84
C24           7.548    0.005     1302      3137 |
C25           7.798    0.005     1424      1202 |
C26           8.039    0.003     1499      2426 |
C28           8.489   -0.001     2914      3592 |
C32           9.311    0.010     1895      4922 |
C34           9.674   -0.003     1066       522 |
Filter Peak  11.370    0.001     1392       605 |BUNKERC (C10-C38)         731914      79.94
C36          10.044    0.005     1034      1885 |
C38          10.389   -0.004      970       532 |
C40          10.751    0.014     1159      1956 |
o-terph       6.044    0.001   809291    724760 |
Triacon Surr  8.917    0.002   705773    718573 |NAS DIES (C10-C24)        559276      30.52
=========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)    AK103(7.79 - 10.04)    OR Diesel(3.17 - 8.49)


    Surrogate         Area      Amount     %Rec
  -----------------------------------------------
    o-Terphenyl     724760       33.4      74.3
    Triacontane     718573       38.7      85.9

M  Indicates the peak was manually integrated


       Analyte            RF      Curve Date
     --------------------------------------
      o-Terph Surr     21670.6    25-SEP-2012
      Triacon Surr     18590.6    25-SEP-2012
      Gas              18517.9    28-SEP-2012
      Diesel           16014.3    25-SEP-2012
      Motor Oil        13234.2    25-SEP-2012
      AK102            18929.5    25-SEP-2012
      AK103             9202.1    25-SEP-2012
      JetA              5416.5    11-AUG-2012
      Min Oil          13440.7    09-MAY-2012
      NAS Diesel        18324.0    24-AUG-2012
      Bunker C          9156.1    24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a032.d
Date : 02-OCT-2012 17:24
Client ID:
Sample Info: VL48H

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



CLEANED TPHD SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VL48-Landau Associates
Project: Cornwall
0001020.400-510

Client ID	OTER	TOT OUT
MB-100112	84.9%	0
LCS-100112	81.5%	0
LCSD-100112	79.9%	0
MW-15D-092412	82.1%	0
MW-16D-092412	72.1%	0
MW-14D-092412	79.8%	0
MW-15S-092412	75.8%	0
MW-16S-092412	73.5%	0
MW-14S-092412	76.8%	0
MW-13D-092412	81.2%	0
MW-DUP-092412	74.3%	0

	LCS/MB LIMITS	QC LIMITS
(OTER) = o-Terphenyl	(50-150)	(50-150)

Prep Method: SW3510C
Log Number Range: 12-18901 to 12-18908

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPHD by GC/FID-Silica and Acid Cleaned
Page 1 of 1

Sample ID: LCS-100112
LCS/LCSD

Lab Sample ID: LCS-100112
LIMS ID: 12-18901
Matrix: Water
Data Release Authorized:
Reported: 10/03/12

QC Report No: VL48-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Date Extracted LCS/LCSD: 10/01/12

Date Analyzed LCS: 10/02/12 14:13
LCSD: 10/02/12 14:34
Instrument/Analyst LCS: FID/PKC
LCSD: FID/PKC

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Diesel	2.22	3.00	74.0%	2.18	3.00	72.7%	1.8%

TPHD Surrogate Recovery

	LCS	LCSD
o-Terphenyl	81.5%	79.9%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

KG 10/3/12

```
                     Analytical Resources Inc.
                      TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a023.d        ARI ID: VL48LCSW1
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-OCT-2012 14:13
Operator: JR
Report Date: 10/03/2012                                Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                      FID:4A RESULTS
Compound          RT     Shift    Height      Area      Method   Range          Total Area    Conc
=========================================================================================
Toluene         1.279   -0.013    12527      15487 | WATPHG (Tol-C12)        3862290    208.57
C8              1.573    0.023     3941       9436 | WATPHD (C12-C24)       17763058   1109.20
C10             3.171    0.006    73249      81970 | WATPHM (C24-C38)         173918     13.14
C12             4.071   -0.003   200404     185704 |  AK102 (C10-C25)       20582162   1087.31
C14             4.751   -0.004   328140     497932 |  AK103 (C25-C36)         117426     12.76
C16             5.342    0.000   522718     617003 |
C18             5.908    0.005   426984     531269 |
C20             6.470    0.001   298653     423335 |  JET-A (C10-C18)       15432739   2849.21
C22             7.018   -0.001   145323     211315 |MIN.OIL (C24-C38)         173918     12.94
C24             7.542   -0.001    37079      77392 |
C25             7.793   -0.001    14557      34120 |
C26             8.037    0.001     5911      12141 |
C28             8.490    0.000     1523       2111 |
C32             9.316    0.015      627       1336 |
C34             9.675   -0.002      109         43 |
Filter Peak    11.370    0.001     1139       1339 |BUNKERC (C10-C38)       20705034   2261.34
C36            10.038   -0.001      162        175 |
C38            10.397    0.004      344        213 |
C40            10.744    0.007      660        377 |
o-terph         6.048    0.005   938190     794996 |
Triacon Surr    8.920    0.004   759176     750831 |NAS DIES (C10-C24)      20531116   1120.45
=========================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl     794996      36.7      81.5 M
    Triacontane     750831      40.4      89.8

M  Indicates the peak was manually integrated


        Analyte           RF       Curve Date
     ---------------------------------------
      o-Terph Surr     21670.6    25-SEP-2012
      Triacon Surr     18590.6    25-SEP-2012
      Gas              18517.9    28-SEP-2012
      Diesel           16014.3    25-SEP-2012
      Motor Oil        13234.2    25-SEP-2012
      AK102            18929.5    25-SEP-2012
      AK103             9202.1    25-SEP-2012
      JetA              5416.5    11-AUG-2012
      Min Oil          13440.7    09-MAY-2012
      NAS Diesel        18324.0    24-AUG-2012
      Bunker C          9156.1    24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a023.d

Date : 02-OCT-2012 14:13

Client ID:

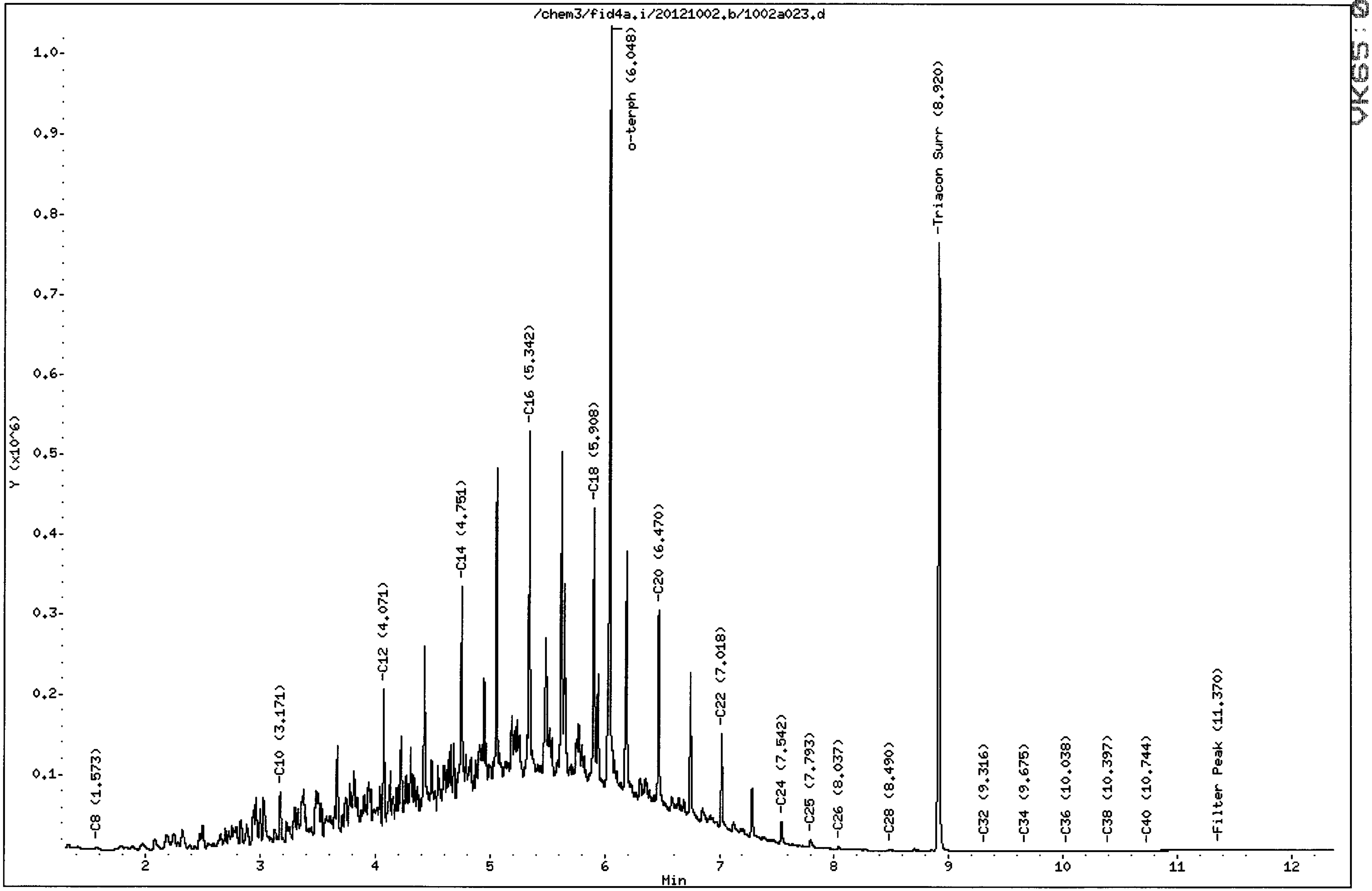
Instrument: fid4a.i

Sample Info: VL48LCSW1

Operator: JR

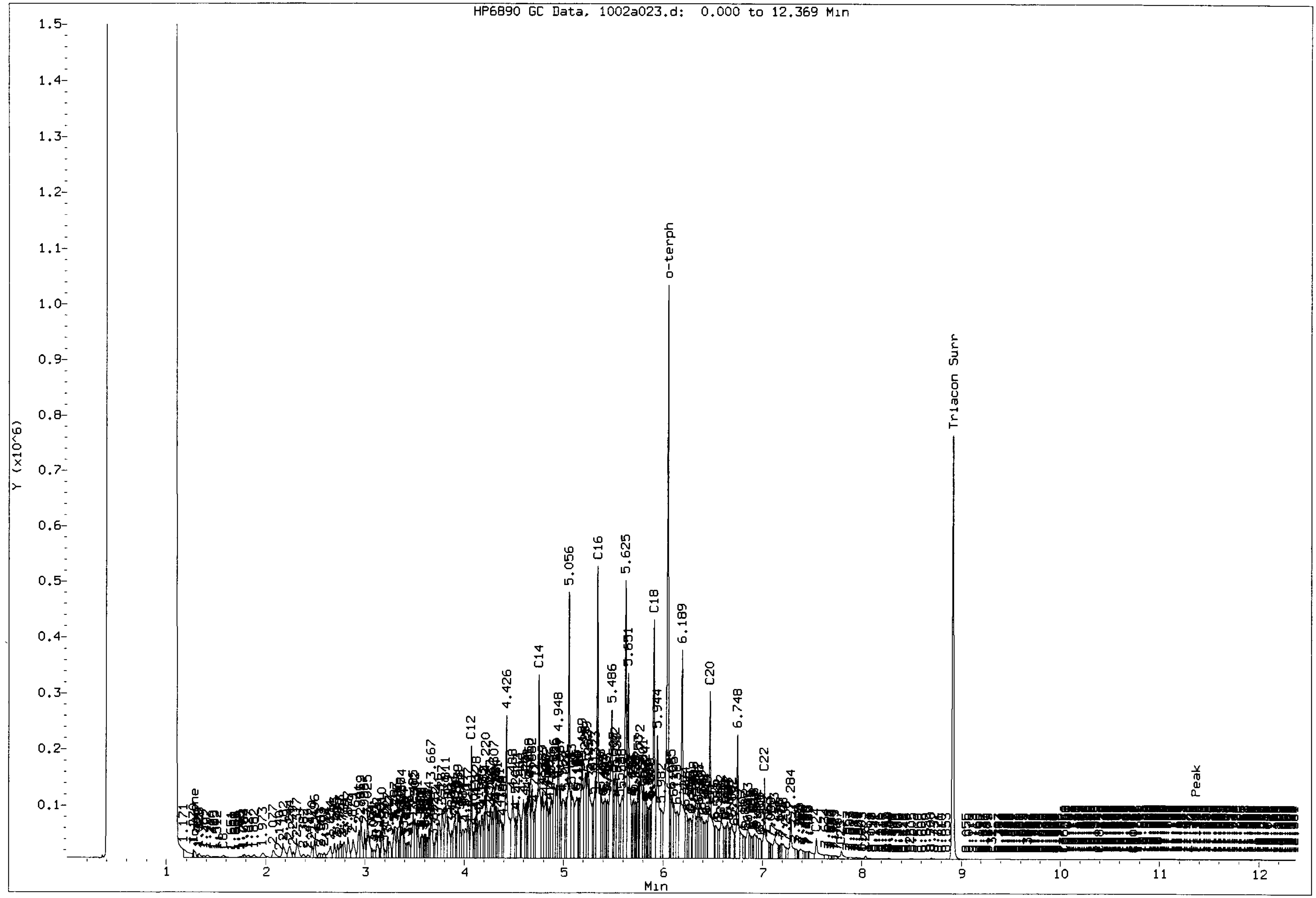
Column phase: RTX-1

Column diameter: 0.25

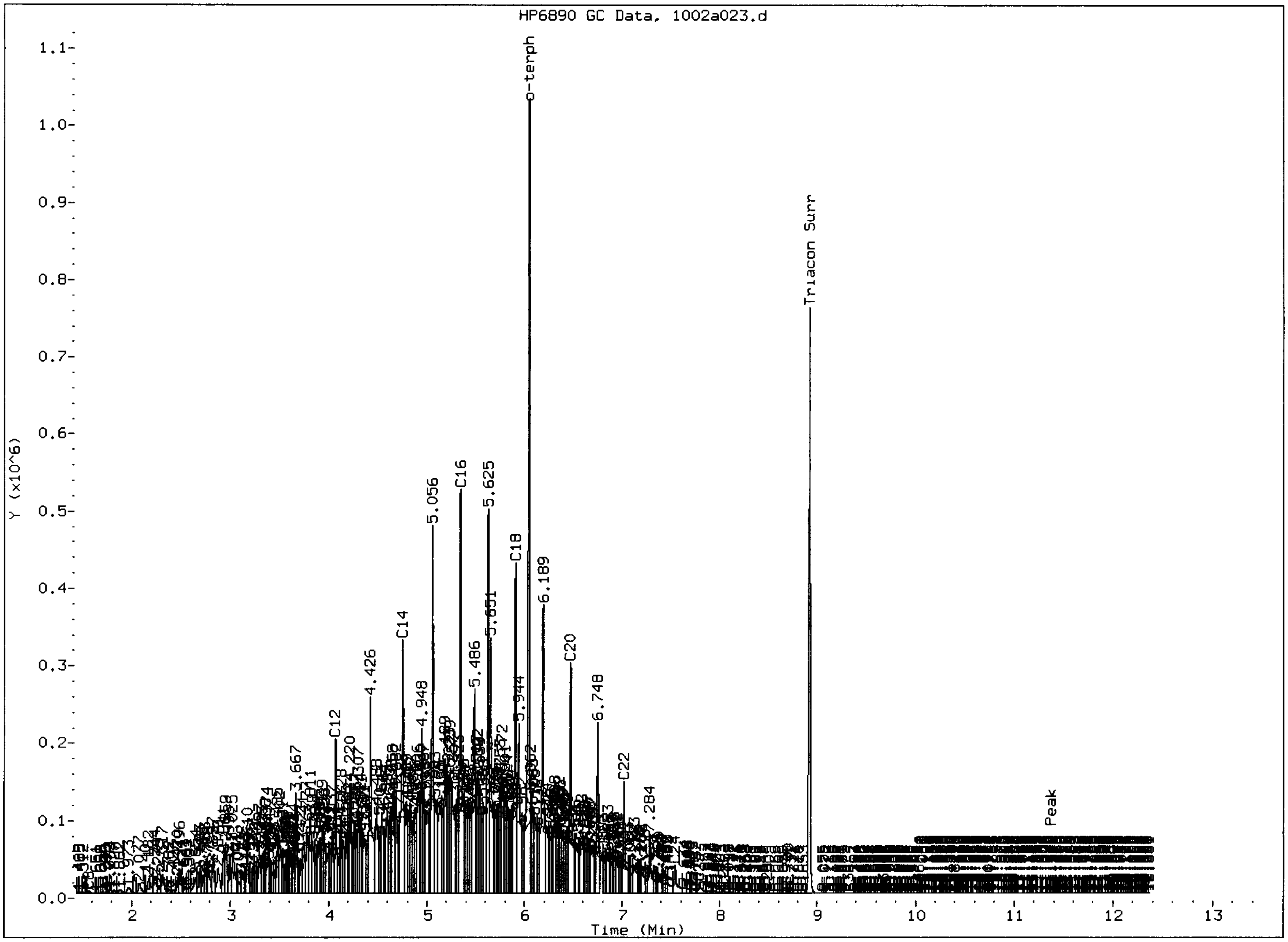


PL 10/3/12

Data File: /chem3/fid4a.i/20121002.b/1002a023.d
Injection Date: 02-OCT-2012 14:13
Instrument: fid4a.i
Client Sample ID:



FID:4A-2C/RTX-1 VL48LCSW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: fl

Date: 10/3/12

RC
10/3/12

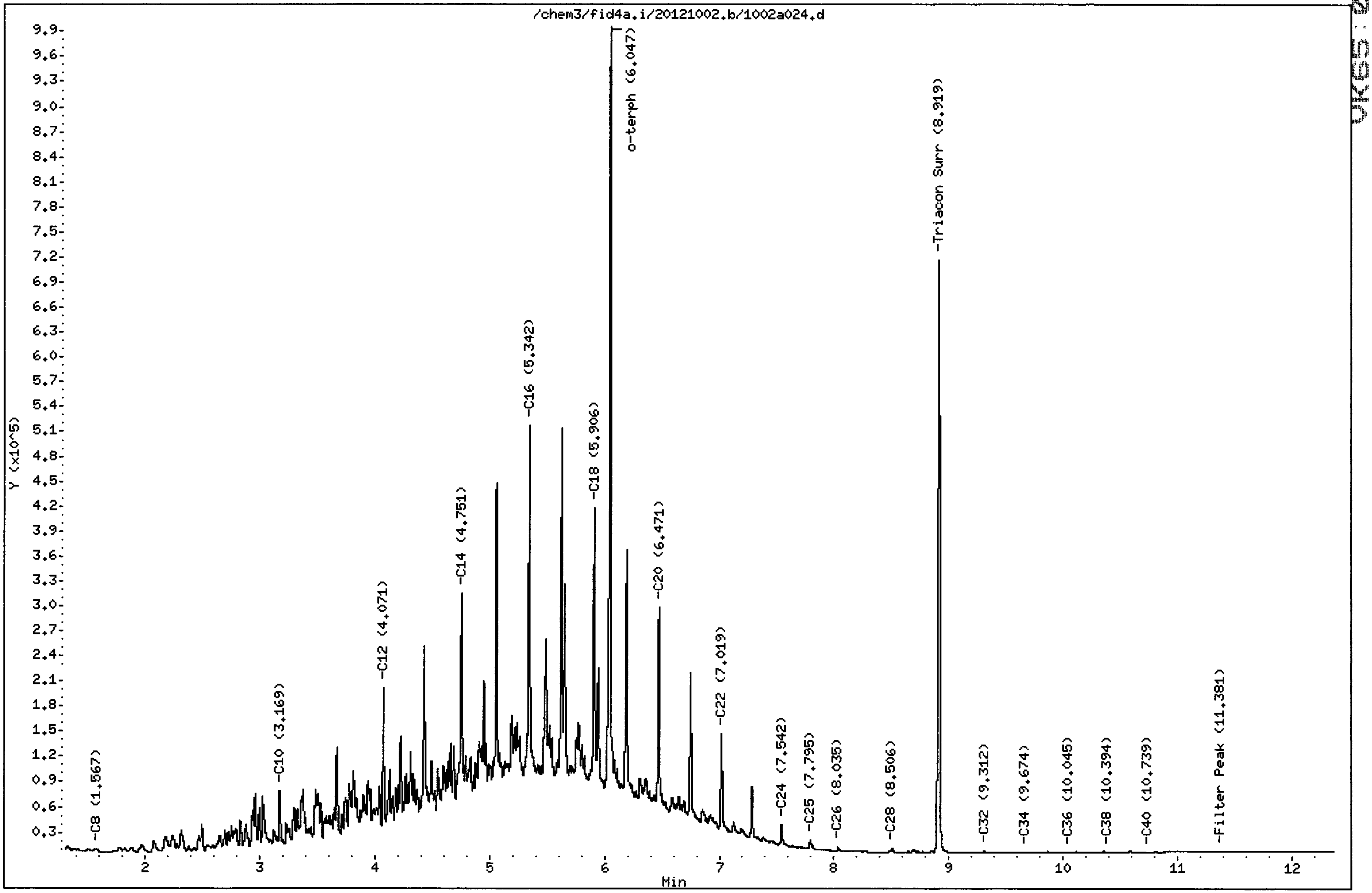
```
                         Analytical Resources Inc.
                          TPH Quantitation Report

Data file: /chem3/fid4a.i/20121002.b/1002a024.d      ARI ID: VL48LCSDW1
Method: /chem3/fid4a.i/20121002.b/ftphfid4a.m        Client ID:
Instrument: fid4a.i                                   Injection: 02-OCT-2012 14:34
Operator: JR
Report Date: 10/03/2012                              Dilution Factor:   1
Macro: 24-AUG-2012
Calibration Dates: Gas:28-SEP-2012  Diesel:25-SEP-2012  M.Oil:25-SEP-2012

                                   FID:4A RESULTS
Compound        RT     Shift    Height      Area    Method    Range          Total Area   Conc
=======================================================================================
Toluene       1.313    0.021      5159      3412 | WATPHG  (Tol-C12)         3781550    204.21
C8            1.567    0.017      3730      8460 | WATPHD  (C12-C24)        17431816   1088.51
C10           3.169    0.003     72837     79564 | WATPHM  (C24-C38)          191418     14.46
C12           4.071   -0.003    196606    187826 |  AK102  (C10-C25)        20208433   1067.56
C14           4.751   -0.004    308974    483203 |  AK103  (C25-C36)          119070     12.94
C16           5.342    0.000    511785    753844 |
C18           5.906    0.003    410991    501488 |
C20           6.471    0.002    292770    456658 |  JET-A  (C10-C18)        14966556   2763.15
C22           7.019    0.000    140286    204657 |MIN.OIL  (C24-C38)          191418     14.24
C24           7.542   -0.001     34009     67561 |
C25           7.795    0.001     14515     26743 |
C26           8.035   -0.001      6065     11307 |
C28           8.506    0.016      5382      7993 |
C32           9.312    0.011       940      1432 |
C34           9.674   -0.003       170       187 |
Filter Peak  11.381    0.012       988       919 |BUNKERC  (C10-C38)        20336372   2221.07
C36          10.045    0.007       338       349 |
C38          10.394    0.002       419       180 |
C40          10.739    0.002       682       489 |
o-terph       6.047    0.004    898613    779286 |
Triacon Surr  8.919    0.003    710880    741292 |NAS DIES (C10-C24)        20144954   1099.38
=======================================================================================
Range Times:  NW Diesel(4.074 - 7.543)    AK102(3.17 - 7.79)    Jet A(3.17 - 5.90)
               NW M.Oil(7.54 - 10.39)     AK103(7.79 - 10.04)   OR Diesel(3.17 - 8.49)


    Surrogate        Area     Amount    %Rec
  ------------------------------------------
    o-Terphenyl     779286     36.0      79.9 M
    Triacontane     741292     39.9      88.6

M  Indicates the peak was manually integrated


       Analyte          RF      Curve Date
     ---------------------------------------
      o-Terph Surr    21670.6   25-SEP-2012
      Triacon Surr    18590.6   25-SEP-2012
      Gas             18517.9   28-SEP-2012
      Diesel          16014.3   25-SEP-2012
      Motor Oil       13234.2   25-SEP-2012
      AK102           18929.5   25-SEP-2012
      AK103            9202.1   25-SEP-2012
      JetA             5416.5   11-AUG-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       18324.0   24-AUG-2012
      Bunker C         9156.1   24-AUG-2012
```

Data File: /chem3/fid4a.i/20121002.b/1002a024.d
Date : 02-OCT-2012 14:34
Client ID:
Sample Info: VL48LCSDW1

Column phase: RTX-1

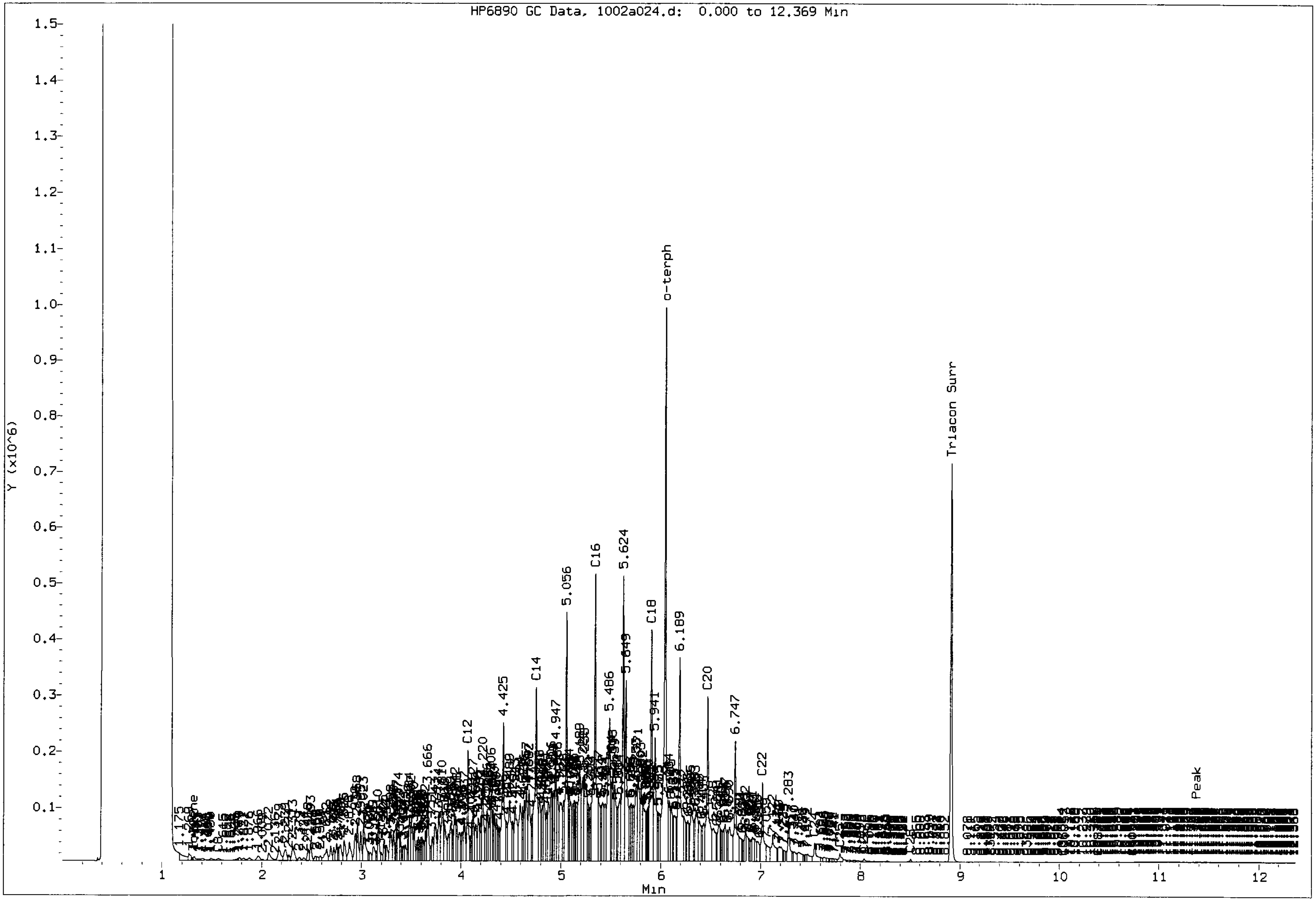
Instrument: fid4a.i

Operator: JR
Column diameter: 0.25

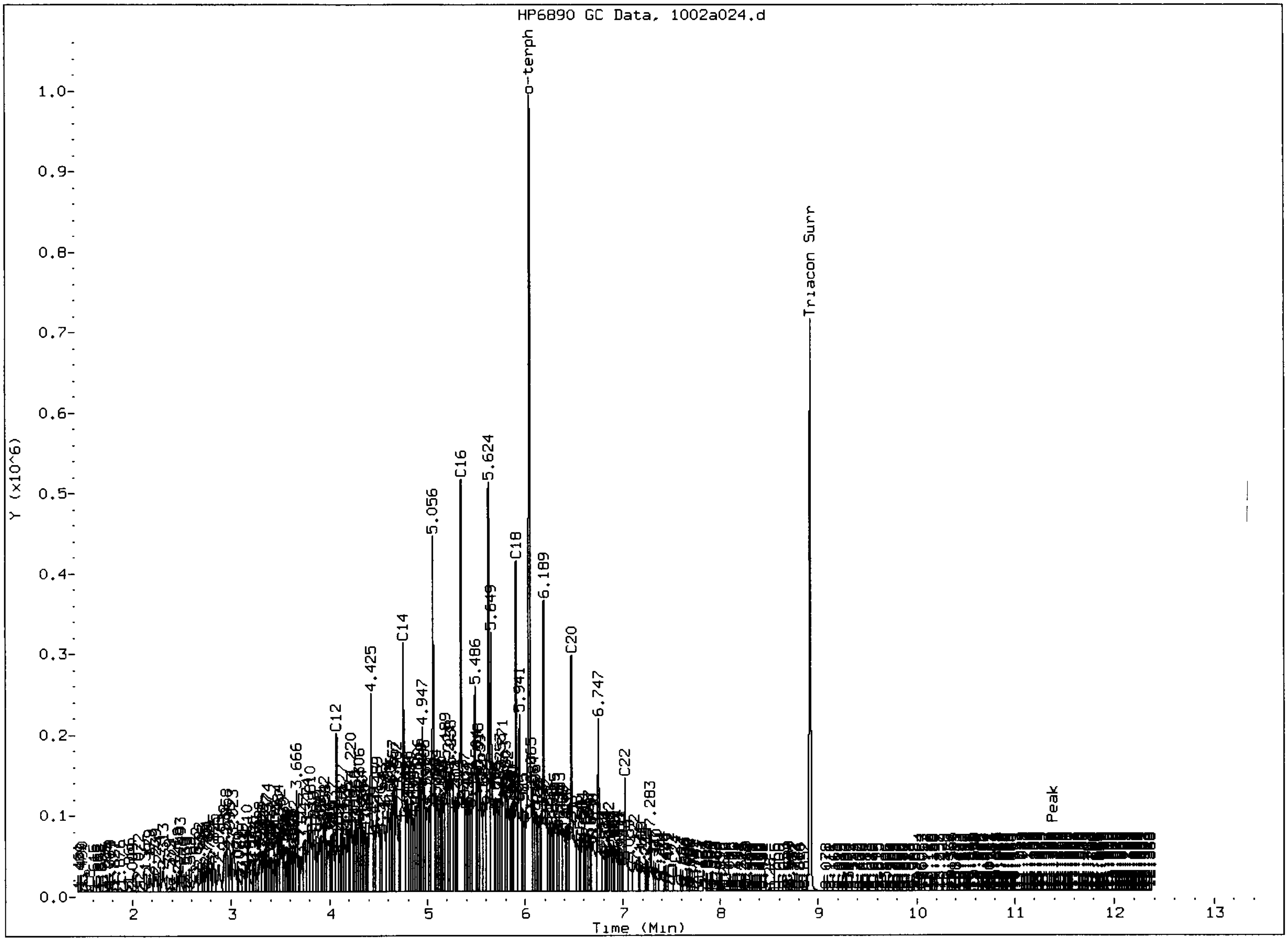


PC 10/3/12

Data File: /chem3/fid4a.i/20121002.b/1002a024.d
Injection Date: 02-OCT-2012 14:34
Instrument: fid4a.i
Client Sample ID:



FID:4A-2C/RTX-1 VL48LCSDW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: PC Date: 10/3/12

TOTAL DIESEL RANGE HYDROCARBONS-EXTRACTION REPORT

ARI Job: VL48
Matrix: Water
Project: Cornwall
0001020.400-510
Date Received: 09/25/12

ARI ID	Client ID	Samp Amt	Final Vol	Prep Date
12-18901-100112MB1	Method Blank	500 mL	1.00 mL	10/01/12
12-18901-100112LCS1	Lab Control	500 mL	1.00 mL	10/01/12
12-18901-100112LCSD1	Lab Control Dup	500 mL	1.00 mL	10/01/12
12-18901-VL48A	MW-15D-092412	500 mL	1.00 mL	10/01/12
12-18902-VL48B	MW-16D-092412	500 mL	1.00 mL	10/01/12
12-18903-VL48C	MW-14D-092412	500 mL	1.00 mL	10/01/12
12-18904-VL48D	MW-15S-092412	500 mL	1.00 mL	10/01/12
12-18905-VL48E	MW-16S-092412	500 mL	1.00 mL	10/01/12
12-18906-VL48F	MW-14S-092412	500 mL	1.00 mL	10/01/12
12-18907-VL48G	MW-13D-092412	500 mL	1.00 mL	10/01/12
12-18908-VL48H	MW-DUP-092412	500 mL	1.00 mL	10/01/12

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG
Matrix: Water

Data Release Authorized:
Reported: 10/02/12

QC Report No: VL48-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

ARI ID	Client ID	Analysis Date	DL	Range	Result
MB-100112	Method Blank	10/01/12	1.0	Gasoline	< 0.25 U
12-18907		PID2		HC ID	---
				Trifluorotoluene	101%
				Bromobenzene	98.4%
VL48G	MW-13D-092412	10/01/12	1.0	**Gasoline**	**0.33**
12-18907		PID2		HC ID	GRO
				Trifluorotoluene	107%
				Bromobenzene	101%

Gasoline values reported in mg/L (ppm)

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

```
                              Analytical Resources Inc.
                             BETX/Gas Quantitation Report


Data file 1: /chem3/pid2.i/100112-1.b/1001a009.d       ARI ID: MB1001
Data file 2: /chem3/pid2.i/100112-2.b/1001a009.d       Client ID:
Method: /chem3/pid2.i/100112-2.b/PIDB.m                Injection Date: 01-OCT-2012 13:47
Instrument: pid2.i                                     Matrix: WATER
Gas Ical Date: 24-SEP-2012                             Dilution Factor:  1.000
BETX Ical Date: 24-SEP-2012
==========================================================================

                           FID Surrogates

        RT       Shift      Height      Area      %Rec      Compound
        --       -----      ------      ----      ----      --------
      7.171     -0.010       3485       45074     101.1     TFT(Surr)
     14.780     -0.011       1920       19562      98.4     BB(Surr)


                    PETROLEUM HYDROCARBONS (FID)
                    ----------------------------

  Method      Range                         RF         Total Area*      Amount
  -----------------------------------------------------------------------------
  WATPHG    Tol-C12   ( 9.05 to 17.57)    356871             1          0.000
  8015C     2MP-TMB   ( 3.70 to 15.72)    745375             1          0.000
  AK101     nC6-nC10  ( 4.16 to 14.45)    595259             0          0.000
  NWTPHG    Tol-Nap   ( 9.05 to 18.58)    373460             1          0.000

M  Indicates manual integration within range

*  Surrogate areas are subtracted from Total Area
   Range marker RT's are set by daily RT standard
==========================================================================


                          PID Surrogates
        RT       Shift      Response     %Rec      Compound
        --       -----      --------     ----      --------
      7.196     -0.010       14236       105.2     TFT(Surr)
     14.798     -0.012       20548       108.6     BB(Surr)


                           SW8021B (PID)
                           -------------

        RT       Shift      Response     Amount     Compound
        --       -----      --------     ------     --------
        ND        ---         ---         ---       Benzene
        ND        ---         ---         ---       Toluene
        ND        ---         ---         ---       Ethylbenzene
        ND        ---         ---         ---       M/P-Xylene
        ND        ---         ---         ---       O-Xylene
        ND        ---         ---         ---       MTBE

  Indicates Peak Area was used for quantitation instead of Height
  Indicates peak was manually integrated
```

NR

JW
10/2/12

Data File: /chem3/pid2.i/100112-1.b/1001a009.d
Date : 01-OCT-2012 13:47
Client ID:
Sample Info: MB1001

Column phase: RTX 502-2 FID

Instrument: pid2.i

Operator: JW
Column diameter: 0.18

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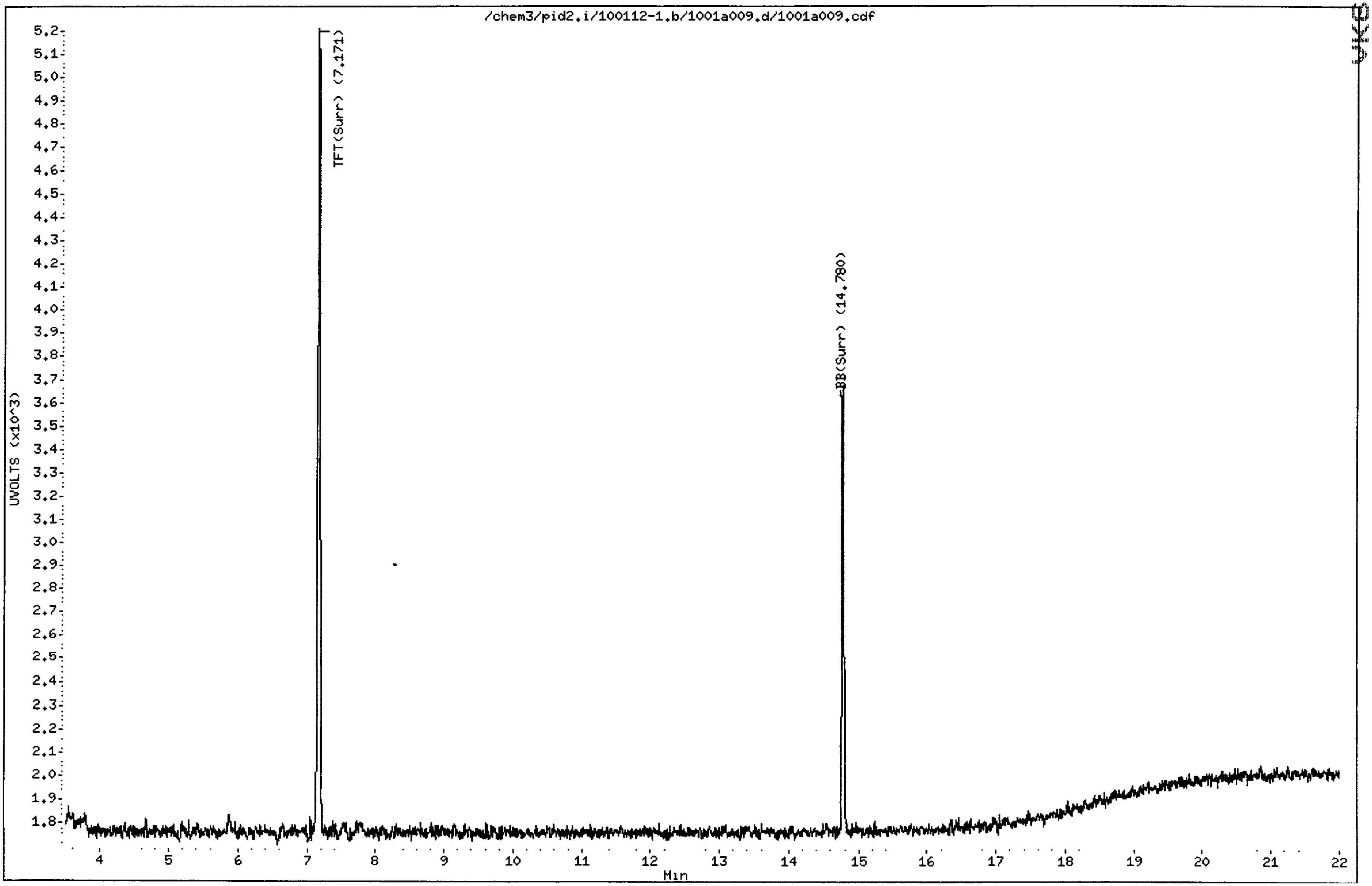

Data File: /chem3/pid2.i/100112-2.b/1001a009.d
Date : 01-OCT-2012 13:47
Client ID:
Sample Info: MB1001

Column phase: RTX 502-2 PID

Instrument: pid2.i

Operator: JW
Column diameter: 0.18

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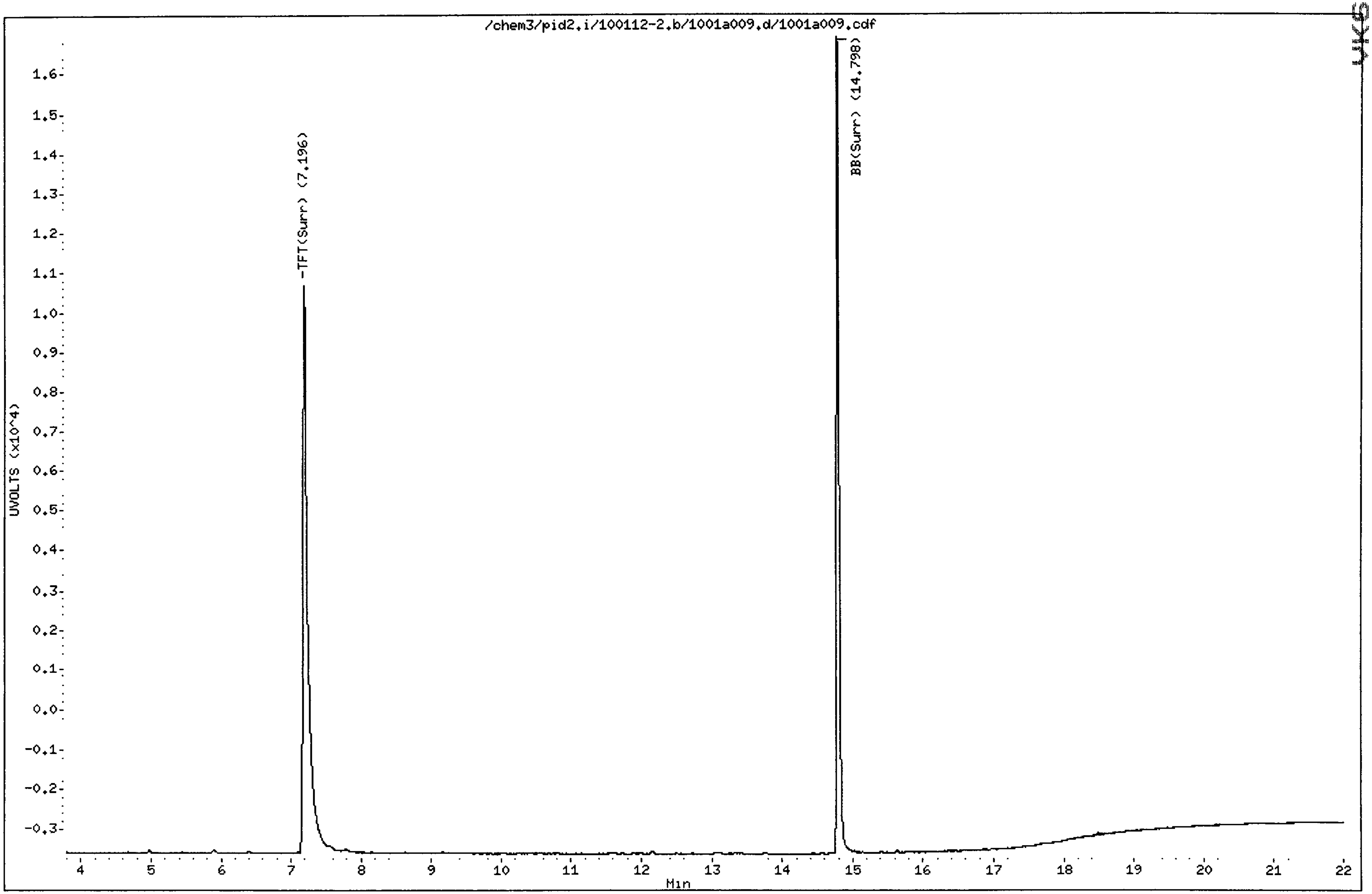


Analytical Resources Inc.
BETX/Gas Quantitation Report

```
Data file 1: /chem3/pid2.i/100112-1.b/1001a013.d      ARI ID: VL48G
Data file 2: /chem3/pid2.i/100112-2.b/1001a013.d      Client ID: MW-13D-092412
Method: /chem3/pid2.i/100112-2.b/PIDB.m               Injection Date: 01-OCT-2012 15:58
Instrument: pid2.i                                    Matrix: WATER
Gas Ical Date: 24-SEP-2012                            Dilution Factor:  1.000
BETX Ical Date: 24-SEP-2012
========================================================================

                        FID Surrogates

          RT       Shift      Height      Area       %Rec      Compound
          --       -----      ------      ----       ----      --------
        7.177     -0.004       3679      45996      106.7      TFT(Surr)   ✓
       14.783     -0.008       1971      20071      101.0      BB(Surr)


                 PETROLEUM HYDROCARBONS (FID)
                 ---------------------------

   Method     Range                          RF        Total Area*       Amount
   -------------------------------------------------------------------------
   WATPHG    Tol-C12   ( 9.05 to 17.57)    356871         94508         0.265 M
   8015C     2MP-TMB   ( 3.70 to 15.72)    745375         12210         0.016 M
   AK101     nC6-nC10  ( 4.16 to 14.45)    595259          6028         0.010 M
   NWTPHG    Tol-Nap   ( 9.05 to 18.58)    373460        121792         0.326 M   ✓
                                                                                    JW
M  Indicates manual integration within range                                       10/2/12

*  Surrogate areas are subtracted from Total Area
   Range marker RT's are set by daily RT standard
========================================================================


                       PID Surrogates
          RT       Shift      Response      %Rec       Compound
          --       -----      --------      ----       --------
         7.201    -0.004       14981        110.7      TFT(Surr)
        14.802    -0.007       20509        108.4      BB(Surr)


                        SW8021B (PID)
                       -------------
                                                                       NR
          RT       Shift      Response     Amount       Compound
          --       -----      --------     ------       --------
         6.402    -0.005         152         0.15      Benzene
          ND        ---          ---         ---       Toluene
          ND        ---          ---         ---       Ethylbenzene
          ND        ---          ---         ---       M/P-Xylene
          ND        ---          ---         ---       O-Xylene
          ND        ---          ---         ---       MTBE


A  Indicates Peak Area was used for quantitation instead of Height
N  Indicates peak was manually integrated
```

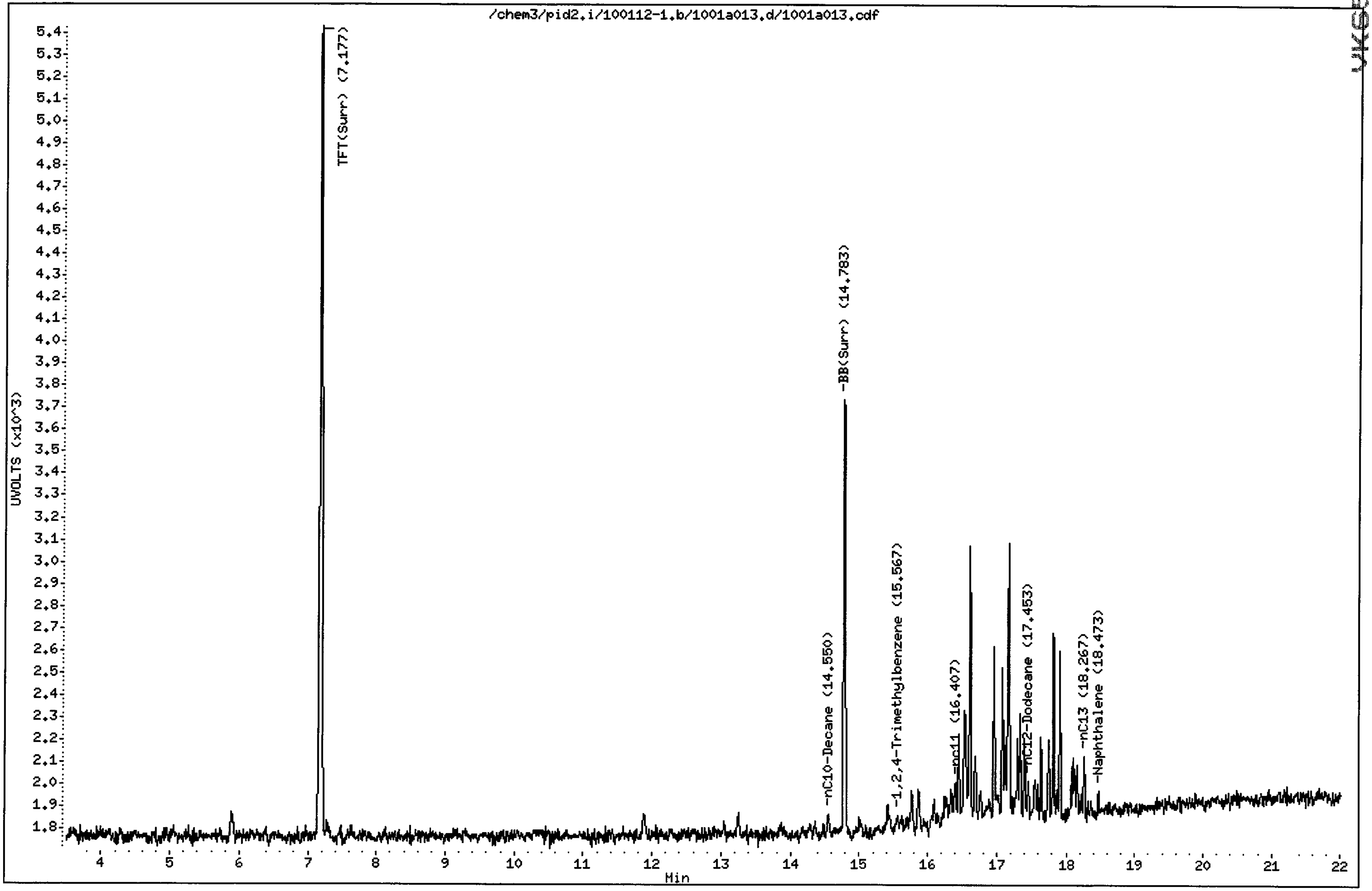
Data File: /chem3/pid2.i/100112-1.b/1001a013.d
Date : 01-OCT-2012 15:58
Client ID: MW-13D-092412
Sample Info: VL48G

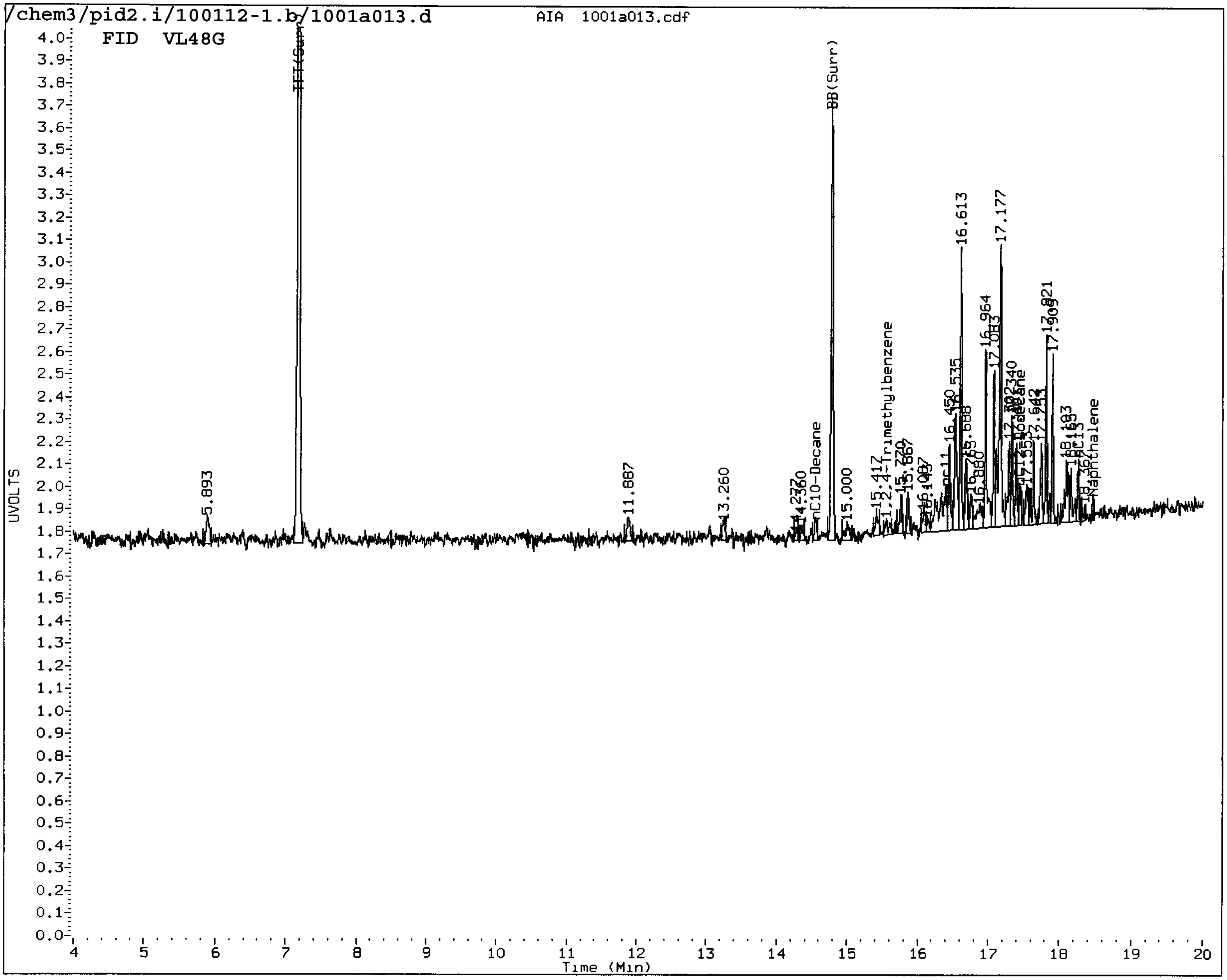
Column phase: RTX 502-2 FID

Page 1

Instrument: pid2.i

Operator: JW
Column diameter: 0.18





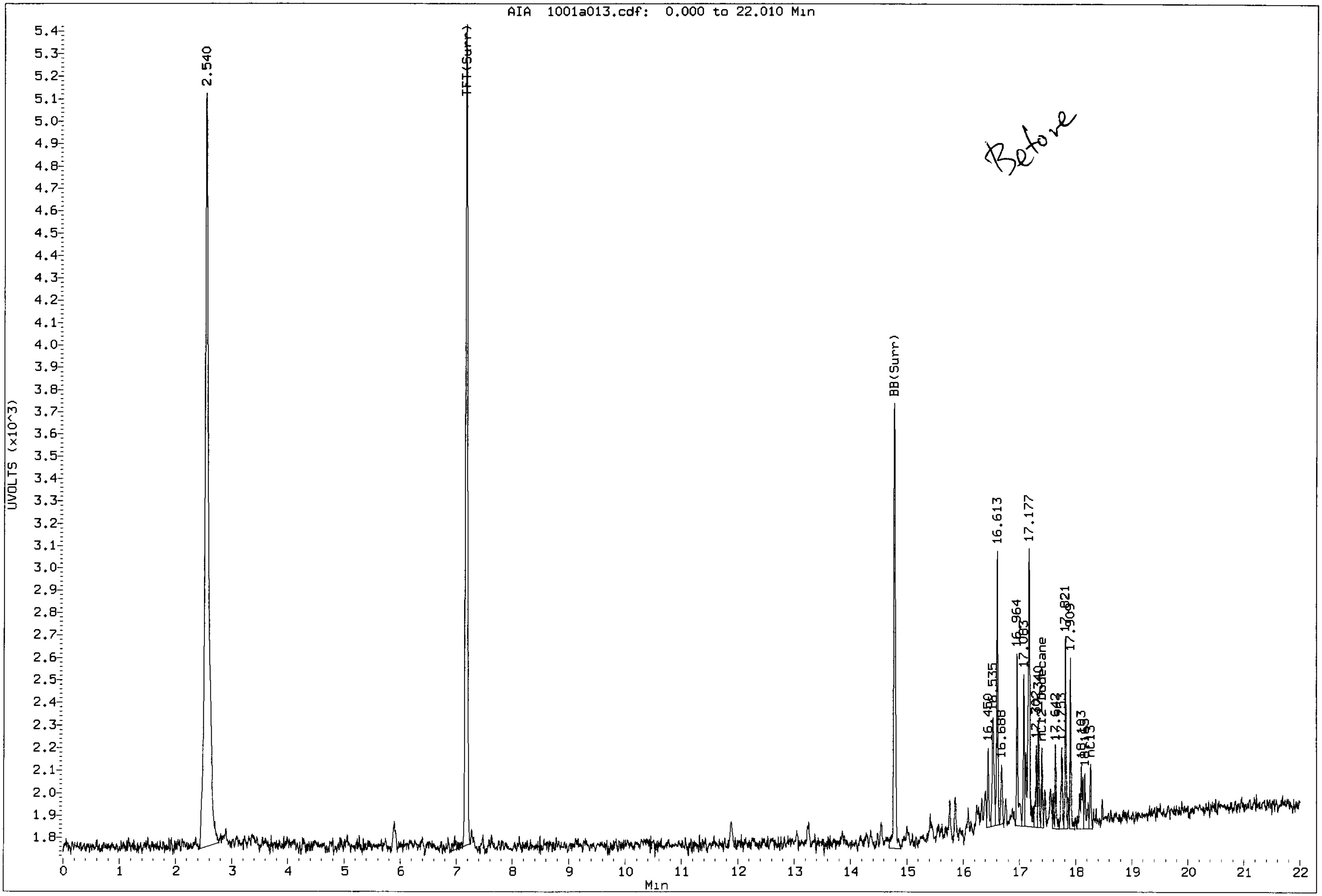
MANUAL INTEGRATION

[✓ 1.] Baseline correction
[✓ 2.] Poor chromatography
[✓ 3.] Peak not found
4. Totals calculation

5. Other ____________________________

Analyst: JW Date: ~~10/12~~ 10/2/12

Data File: /chem3/pid2.i/100112-1.b/1001a013.d/1001a013.cdf
Injection Date: 01-OCT-2012 15:58
Instrument: pid2.i
Client Sample ID: MW-13D-092412



Before

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: VL48
Matrix: Water

QC Report No: VL48-Landau Associates
Project: Cornwall
Event: 0001020.400-510

Client ID	TFT	BBZ	TOT OUT
MB-100112	101%	98.4%	0
LCS-100112	104%	98.8%	0
LCSD-100112	103%	98.5%	0
MW-13D-092412	107%	101%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 12-18907 to 12-18907

ANALYTICAL
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TPHG by Method NWTPHG
Page 1 of 1

Sample ID: LCS-100112
LAB CONTROL SAMPLE

Lab Sample ID: LCS-100112
LIMS ID: 12-18907
Matrix: Water
Data Release Authorized:
Reported: 10/02/12

QC Report No: VL48-Landau Associates
Project: Cornwall
Event: 0001020.400-510
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 10/01/12 12:50
LCSD: 10/01/12 13:19
Instrument/Analyst LCS: PID2/JLW
LCSD: PID2/JLW

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Gasoline Range Hydrocarbons	1.14	1.00	114%	1.11	1.00	111%	2.7%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	**LCSD**
Trifluorotoluene	104%	103%
Bromobenzene	98.8%	98.5%

FORM III

```
                        Analytical Resources Inc.
                      BETX/Gas Quantitation Report


Data file 1: /chem3/pid2.i/100112-1.b/1001a007.d       ARI ID: LCS1001
Data file 2: /chem3/pid2.i/100112-2.b/1001a007.d       Client ID:
Method: /chem3/pid2.i/100112-2.b/PIDB.m                Injection Date: 01-OCT-2012 12:50
Instrument: pid2.i                                     Matrix: WATER
Gas Ical Date: 24-SEP-2012                             Dilution Factor:  1.000
BETX Ical Date: 24-SEP-2012
==========================================================================

                           FID Surrogates

          RT      Shift     Height     Area      %Rec     Compound
          --      -----     ------     ----      ----     --------
        7.175    -0.006      3600     52196     104.4     TFT(Surr)
       14.784    -0.007      1928     20344      98.8     BB(Surr)


                    PETROLEUM HYDROCARBONS (FID)
                    ----------------------------

  Method     Range                        RF       Total Area*     Amount
  -----------------------------------------------------------------------
  WATPHG   Tol-C12   ( 9.05 to 17.57)   356871       405365        1.136 M
  8015C    2MP-TMB   ( 3.70 to 15.72)   745375       882966        1.185 M
  AK101    nC6-nC10  ( 4.16 to 14.45)   595259       713286        1.198 M
  NWTPHG   Tol-Nap   ( 9.05 to 18.58)   373460       426392        1.142 M

M  Indicates manual integration within range

*  Surrogate areas are subtracted from Total Area
   Range marker RT's are set by daily RT standard
==========================================================================


                          PID Surrogates
         RT      Shift     Response      %Rec      Compound
         --      -----     --------      ----      --------
        7.200   -0.005      15350       113.5      TFT(Surr)
       14.802   -0.007      21076       111.3      BB(Surr)


                           SW8021B (PID)
                           -------------

         RT      Shift     Response     Amount      Compound
         --      -----     --------     ------      --------
        6.400   -0.007       4162        4.19N      Benzene
        9.161   -0.006      29060       46.84      Toluene
       12.001   -0.009       6719       12.54      Ethylbenzene
       12.161   -0.006      25525       47.44      M/P-Xylene
       13.064   -0.009       9743       21.98      O-Xylene
        4.055   -0.012       1112        2.86      MTBE


A  Indicates Peak Area was used for quantitation instead of Height
N  Indicates peak was manually integrated
```

NR

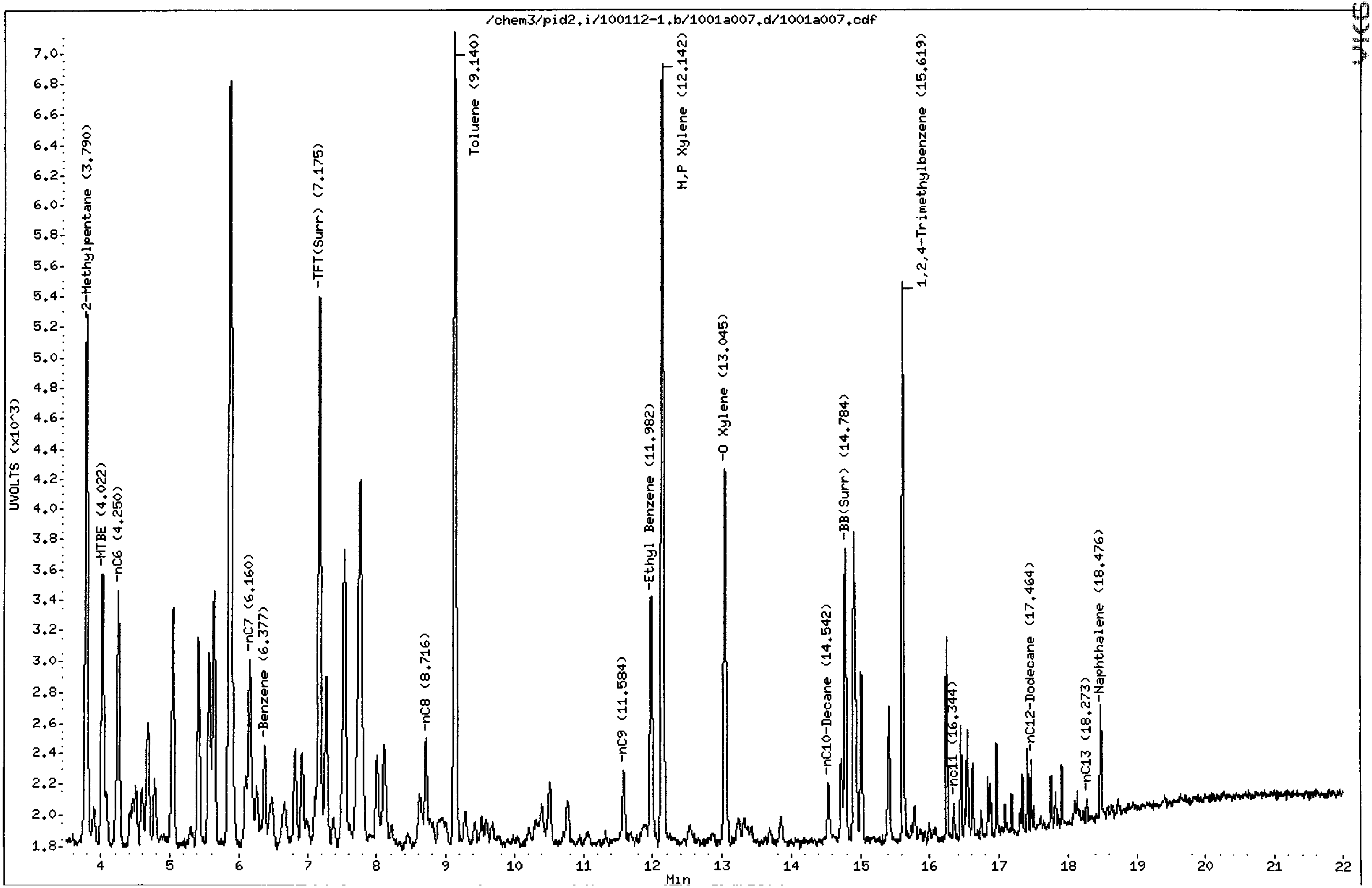
JW
10/2/12

Data File: /chem3/pid2.i/100112-1.b/1001a007.d
Date : 01-OCT-2012 12:50
Client ID:
Sample Info: LCS1001

Instrument: pid2.i

Operator: JW

Column phase: RTX 502-2 FID
Column diameter: 0.18

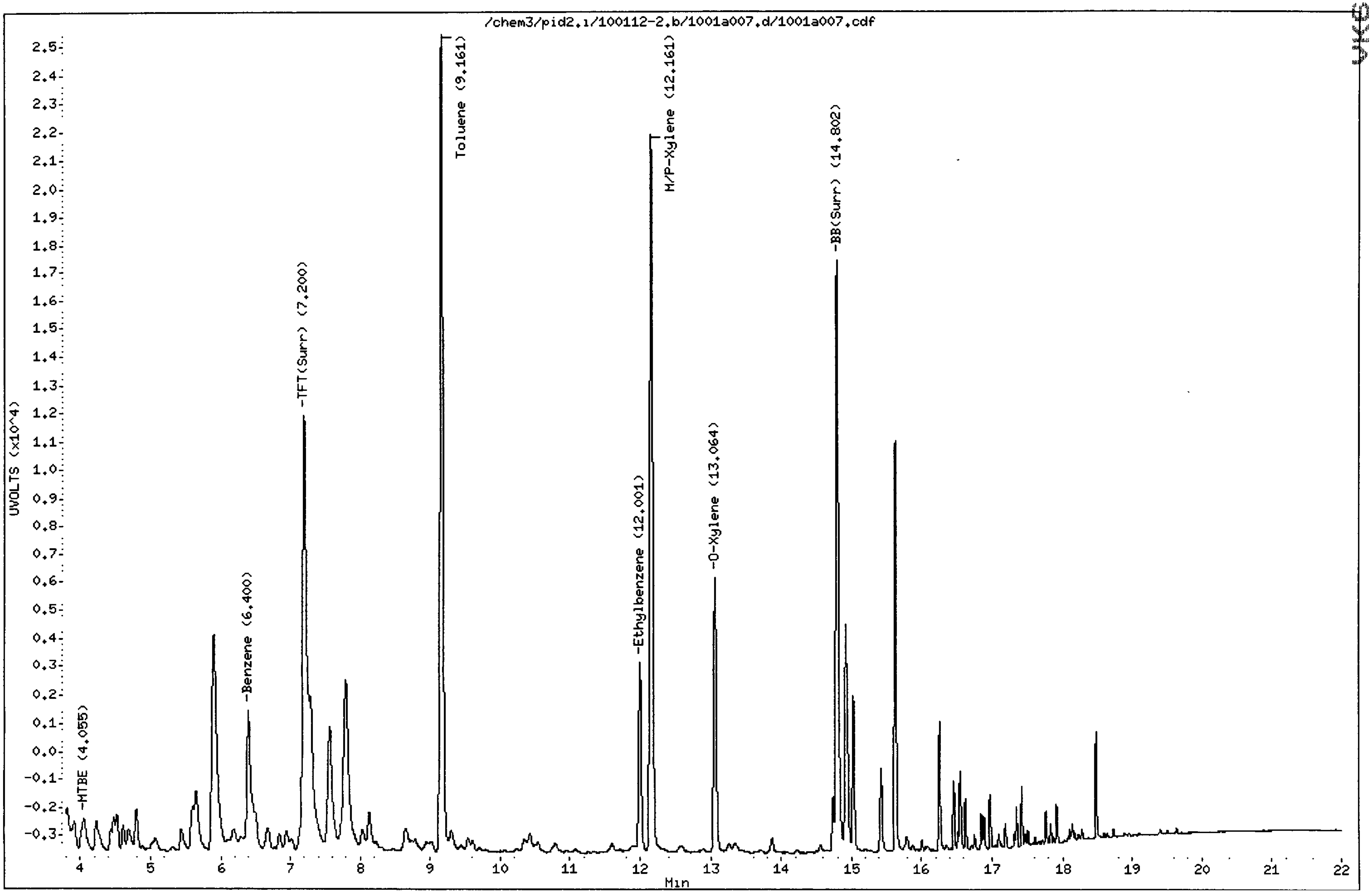


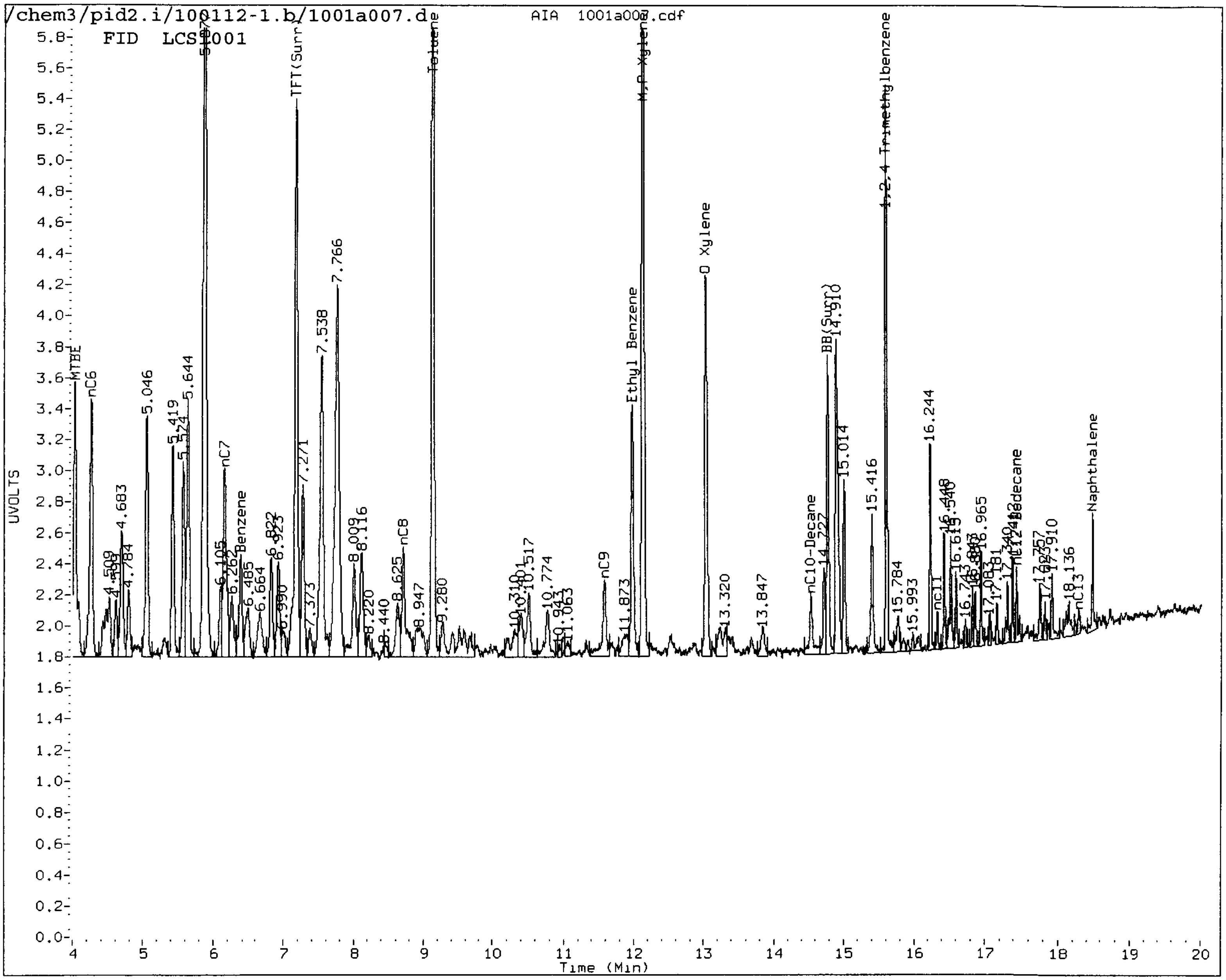
Data File: /chem3/pid2.i/100112-2.b/1001a007.d
Date : 01-OCT-2012 12:50
Client ID:
Sample Info: LCS1001

Column phase: RTX 502-2 PID

Instrument: pid2.i

Operator: JW
Column diameter: 0.18





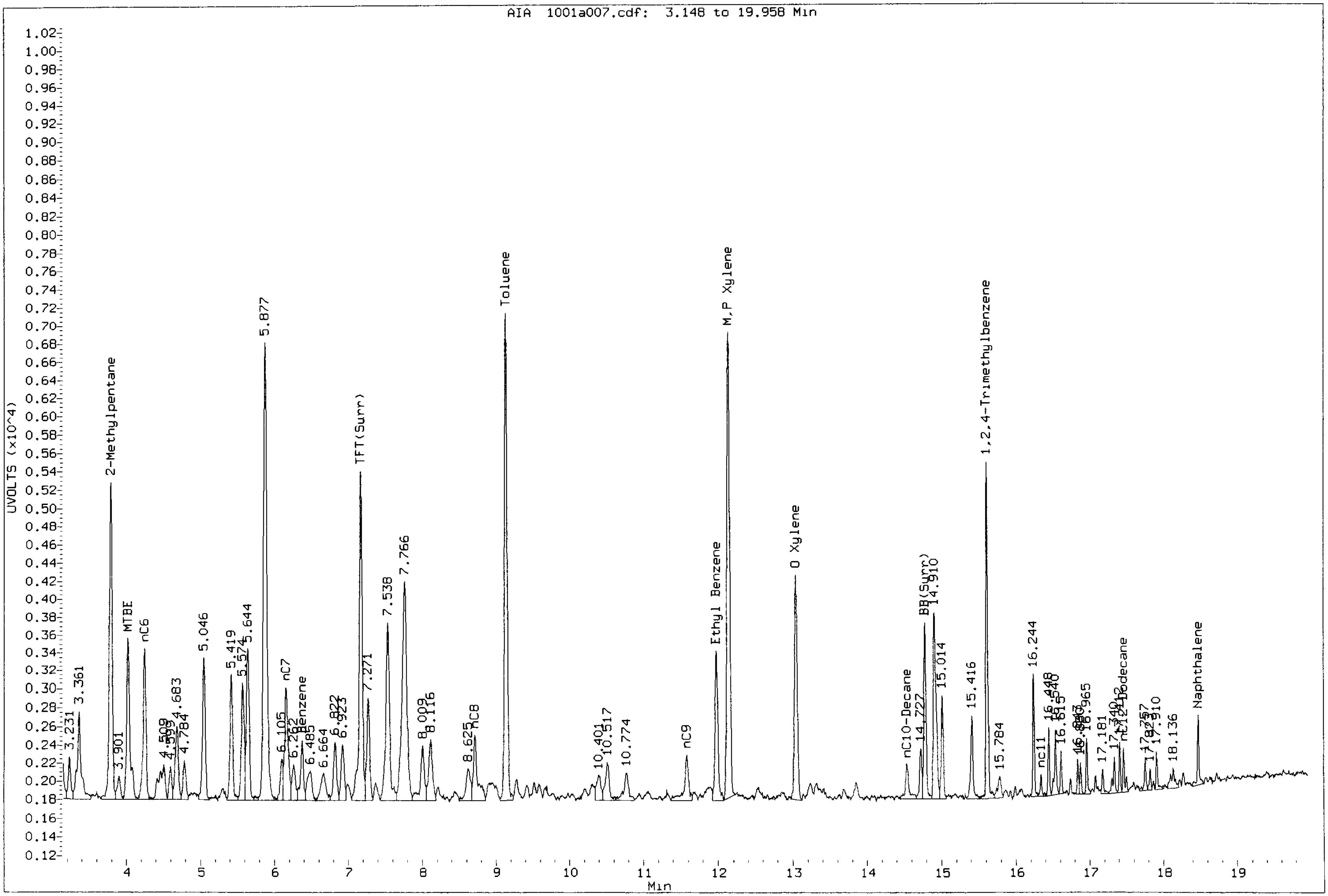
MANUAL INTEGRATION

[✓ 1.] Baseline correction
[✓ 2.] Poor chromatography
[✓ 3] Peak not found
4. Totals calculation

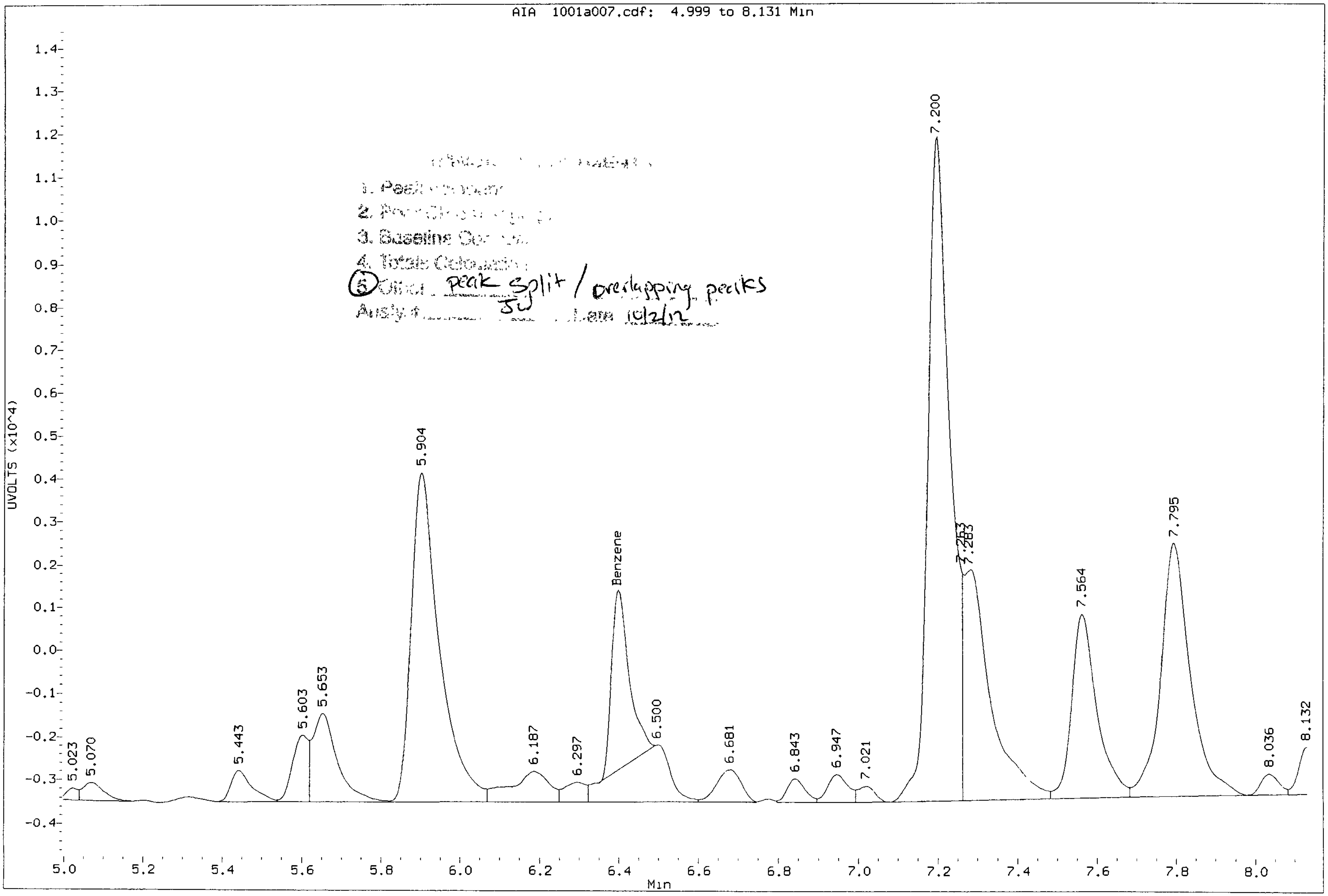
5. Other ____________________

Analyst: Jw   Date: 10/2/12

Data File: /chem3/pid2.i/100112-1.b/1001a007.d/1001a007.cdf
Injection Date: 01-OCT-2012 12:50
Instrument: pid2.i
Client Sample ID:



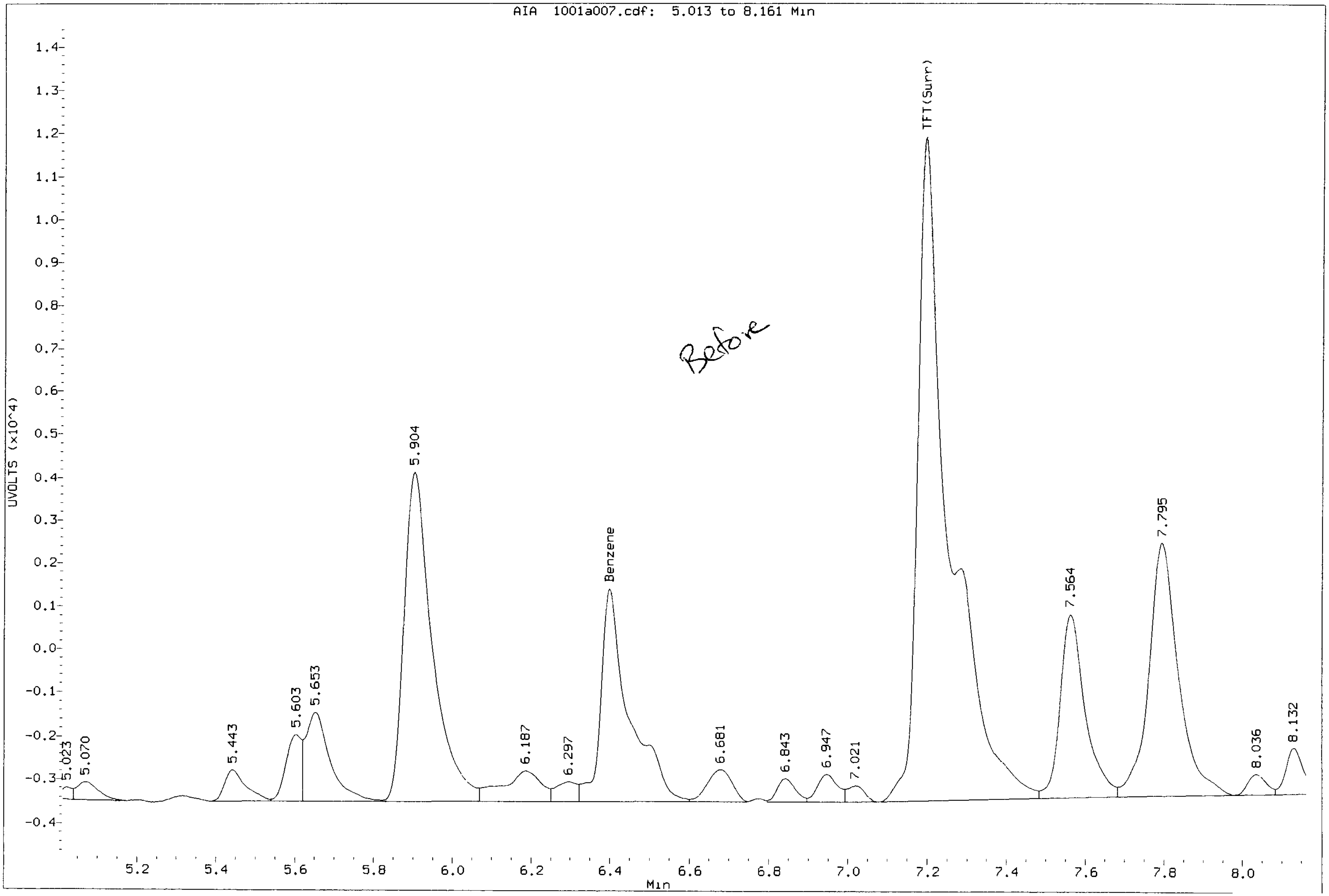
Data File: /chem3/pid2.i/100112-2.b/1001a007.d/1001a007.cdf
Injection Date: 01-OCT-2012 12:50
Instrument: pid2.i
Client Sample ID:



AIA 1001a007.cdf: 4.999 to 8.131 Min

[illegible]
1. Peak [illegible]
2. Poor Chromatography
3. Baseline Correction
4. Totals Calculation
⑤ Other peak split / overlapping peaks
Analyst JW Date 10/2/12

Data File: /chem3/pid2.i/100112-2.b/1001a007.d/1001a007.cdf
Injection Date: 01-OCT-2012 12:50
Instrument: pid2.i
Client Sample ID:



Before

```
                         Analytical Resources Inc.
                       BETX/Gas Quantitation Report


Data file 1: /chem3/pid2.i/100112-1.b/1001a008.d      ARI ID: LCSD1001
Data file 2: /chem3/pid2.i/100112-2.b/1001a008.d      Client ID:
Method: /chem3/pid2.i/100112-2.b/PIDB.m               Injection Date: 01-OCT-2012 13:19
Instrument: pid2.i                                    Matrix: WATER
Gas Ical Date: 24-SEP-2012                            Dilution Factor:  1.000
BETX Ical Date: 24-SEP-2012
==========================================================================

                          FID Surrogates

         RT       Shift      Height      Area       %Rec      Compound
         --       -----      ------      ----       ----      --------
        7.174    -0.007       3548      51128      102.9      TFT(Surr)
       14.782    -0.009       1922      20421       98.5      BB(Surr)


                   PETROLEUM HYDROCARBONS (FID)
                   ----------------------------

  Method     Range                          RF        Total Area*      Amount
  -----------------------------------------------------------------------------
  WATPHG    Tol-C12   ( 9.05 to 17.57)    356871        395082         1.107 M
  8015C     2MP-TMB   ( 3.70 to 15.72)    745375        846832         1.136 M
  AK101    nC6-nC10   ( 4.16 to 14.45)    595259        686581         1.153 M
  NWTPHG    Tol-Nap   ( 9.05 to 18.58)    373460        413474         1.107 M

M  Indicates manual integration within range

*  Surrogate areas are subtracted from Total Area
   Range marker RT's are set by daily RT standard
==========================================================================


                          PID Surrogates
         RT       Shift     Response      %Rec      Compound
         --       -----     --------      ----      --------
        7.197    -0.009       14714      108.8      TFT(Surr)
       14.800    -0.009       20764      109.7      BB(Surr)


                           SW8021B (PID)
                           -------------

         RT       Shift     Response      Amount      Compound
         --       -----     --------      ------      --------
        6.400    -0.007        3194        3.22N      Benzene
        9.160    -0.007       28130       45.34      Toluene
       11.999    -0.011        5934       11.07      Ethylbenzene
       12.160    -0.008       23778       44.19      M/P-Xylene
       13.062    -0.011        8960       20.22      O-Xylene
         ND        ---          ---         ---      MTBE


A  Indicates Peak Area was used for quantitation instead of Height
N  Indicates peak was manually integrated
```

NR

JW
10/2/12

Data File: /chem3/pid2.i/100112-1.b/1001a008.d

Date : 01-OCT-2012 13:19

Client ID:

Sample Info: LCSD1001

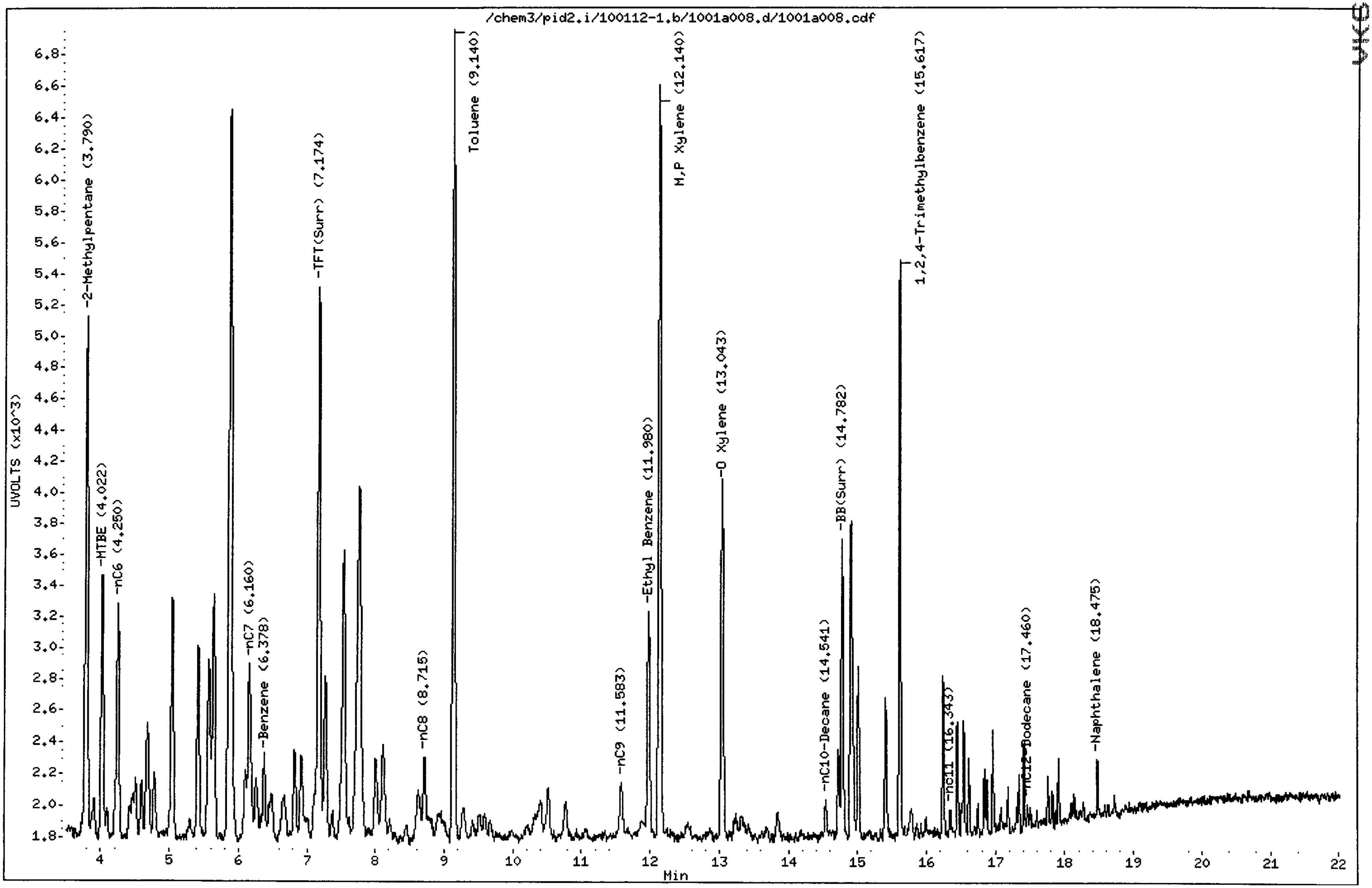
Column phase: RTX 502-2 FID

Page 1

Instrument: pid2.i

Operator: JW

Column diameter: 0.18



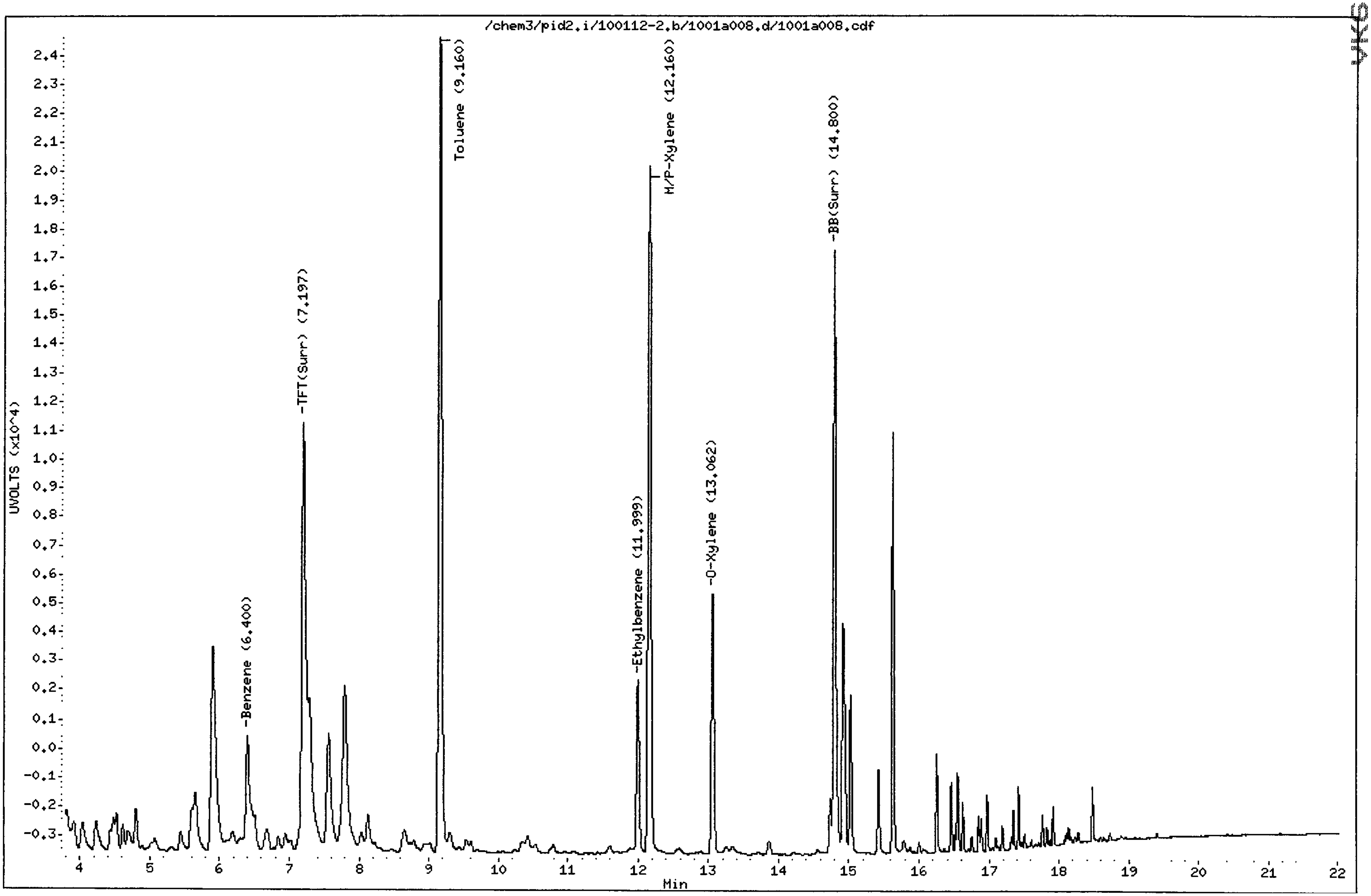
Data File: /chem3/pid2.i/100112-2.b/1001a008.d
Date : 01-OCT-2012 13:19
Client ID:
Sample Info: LCSD1001

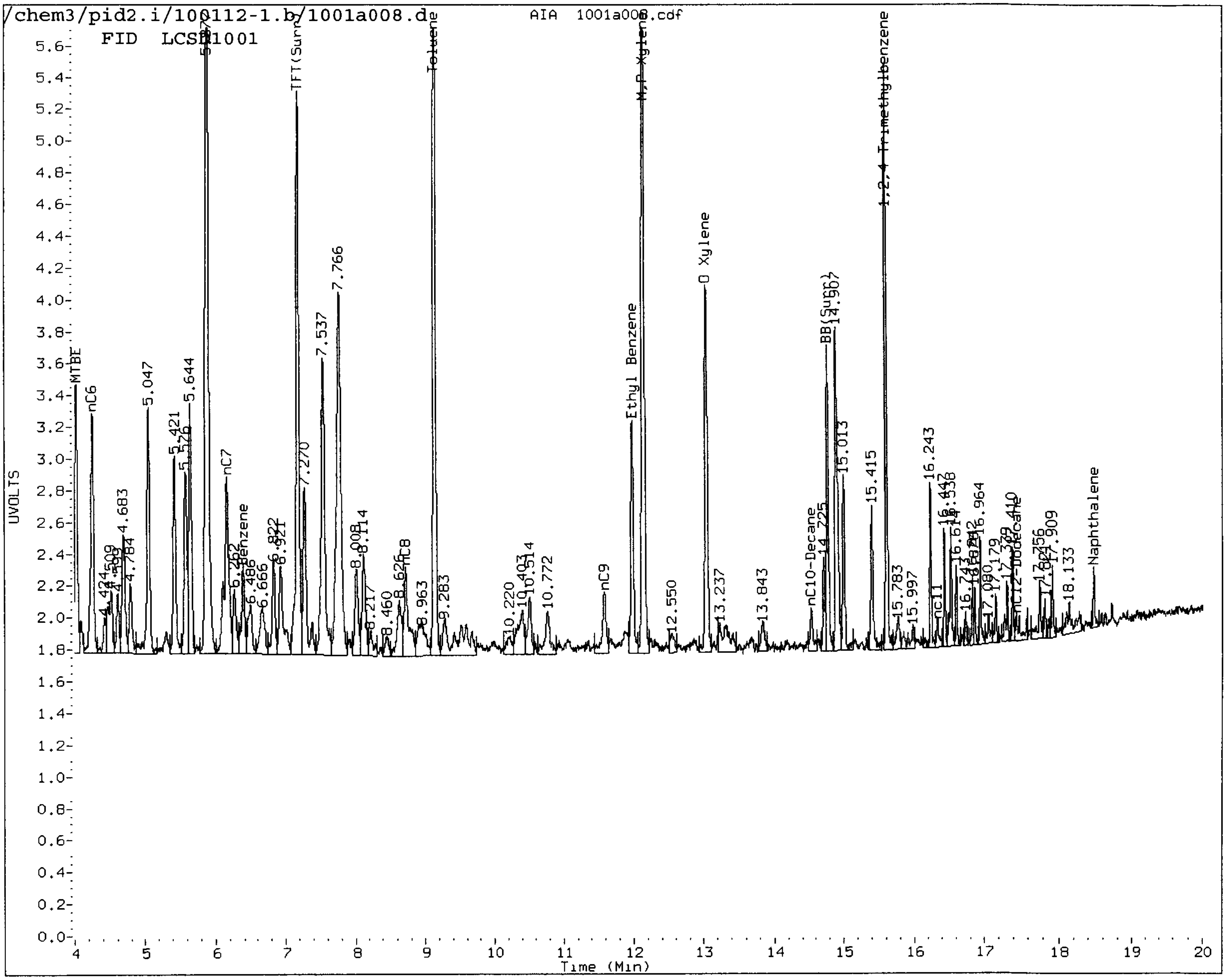
Column phase: RTX 502-2 PID

Instrument: pid2.i

Operator: JW
Column diameter: 0.18

/chem3/pid2.i/100112-2.b/1001a008.d/1001a008.cdf





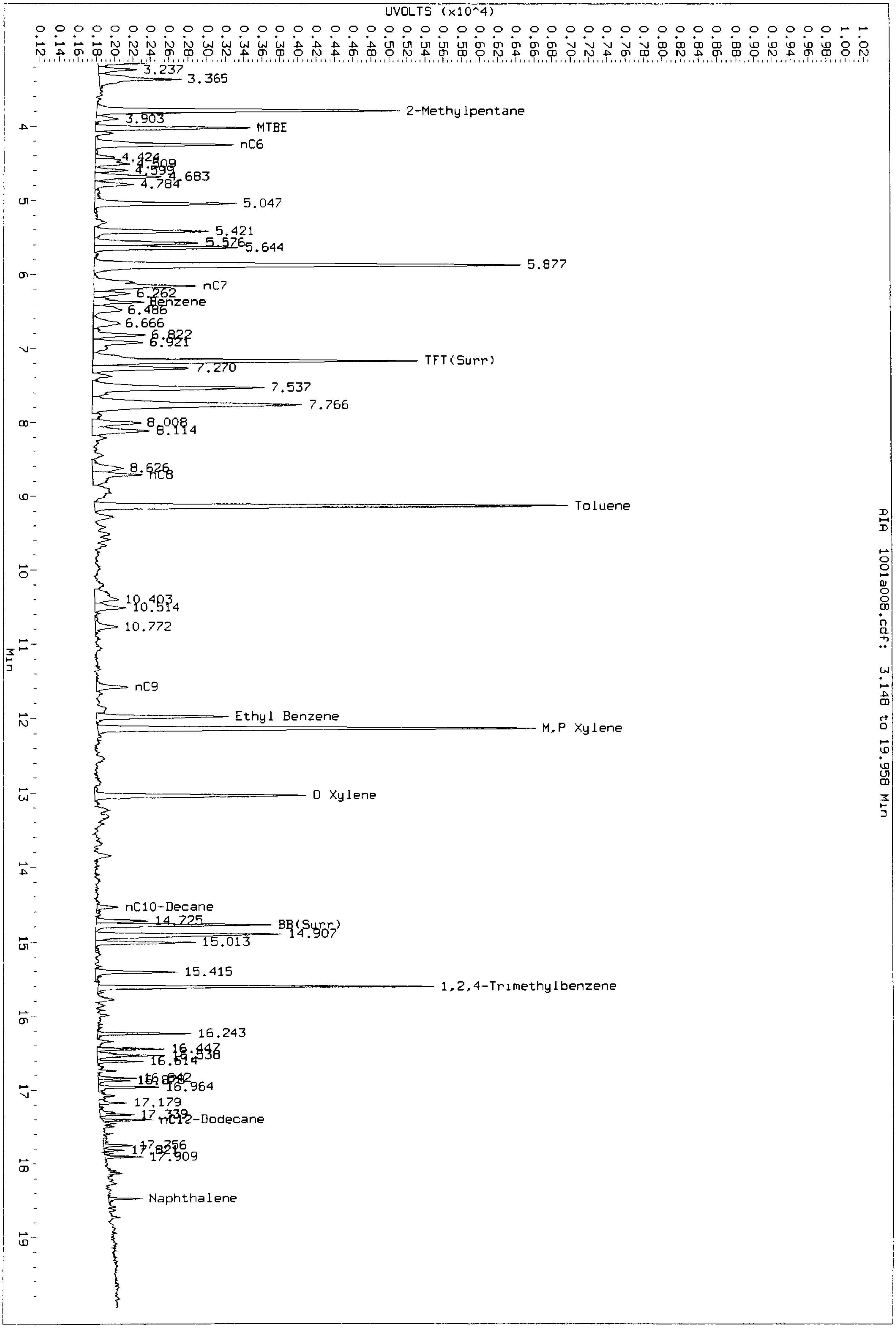
MANUAL INTEGRATION

[✓ 1]. Baseline correction
[✓ 2]. Poor chromatography
[✓ 3]. Peak not found
4. Totals calculation

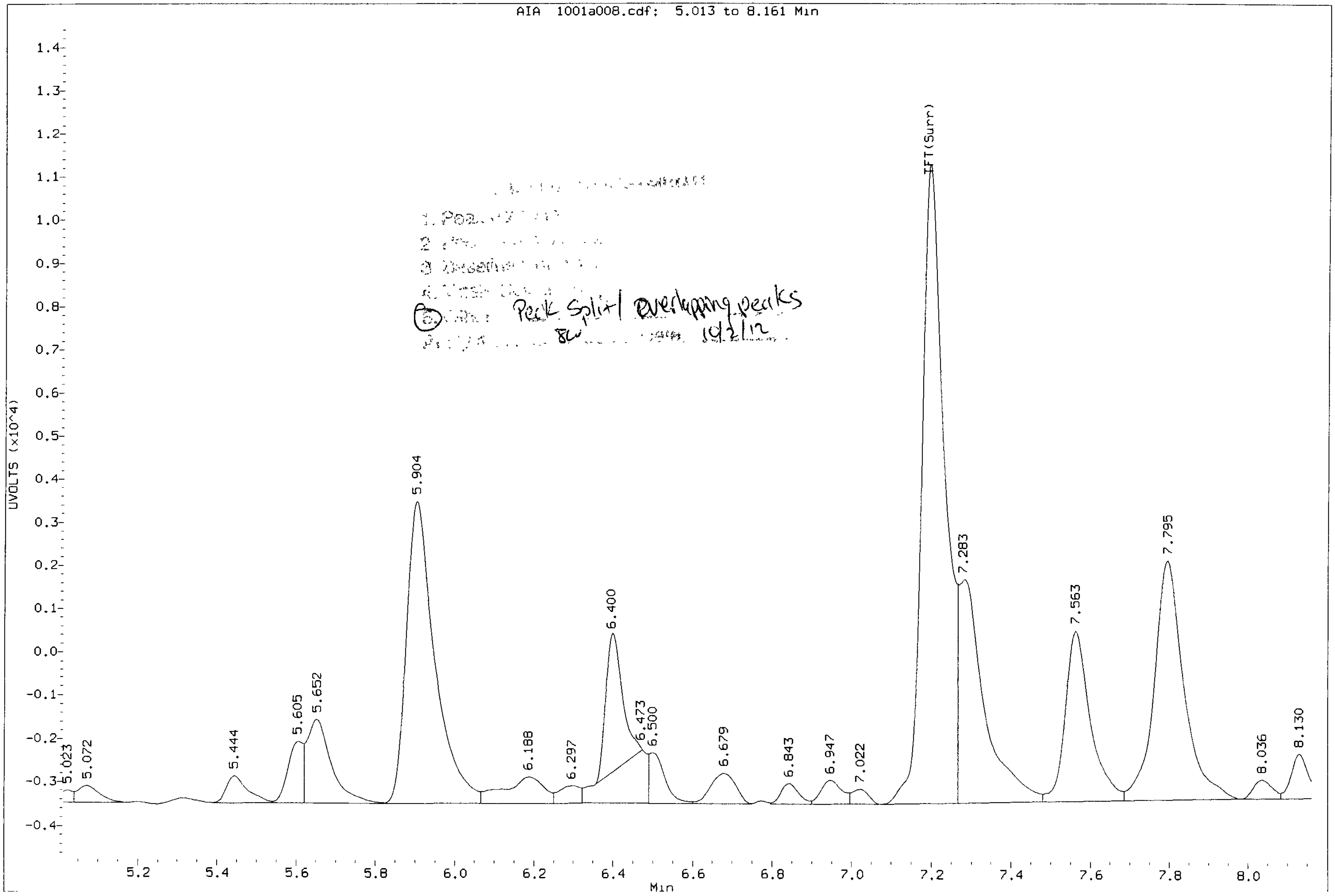
5. Other ______________________

Analyst: JW Date: 10/2/12

Data File: /chem3/pid2.i/100112-1.b/1001a008.d/1001a008.cdf
Injection Date: 01-OCT-2012 13:19
Instrument: pid2.i
Client Sample ID:

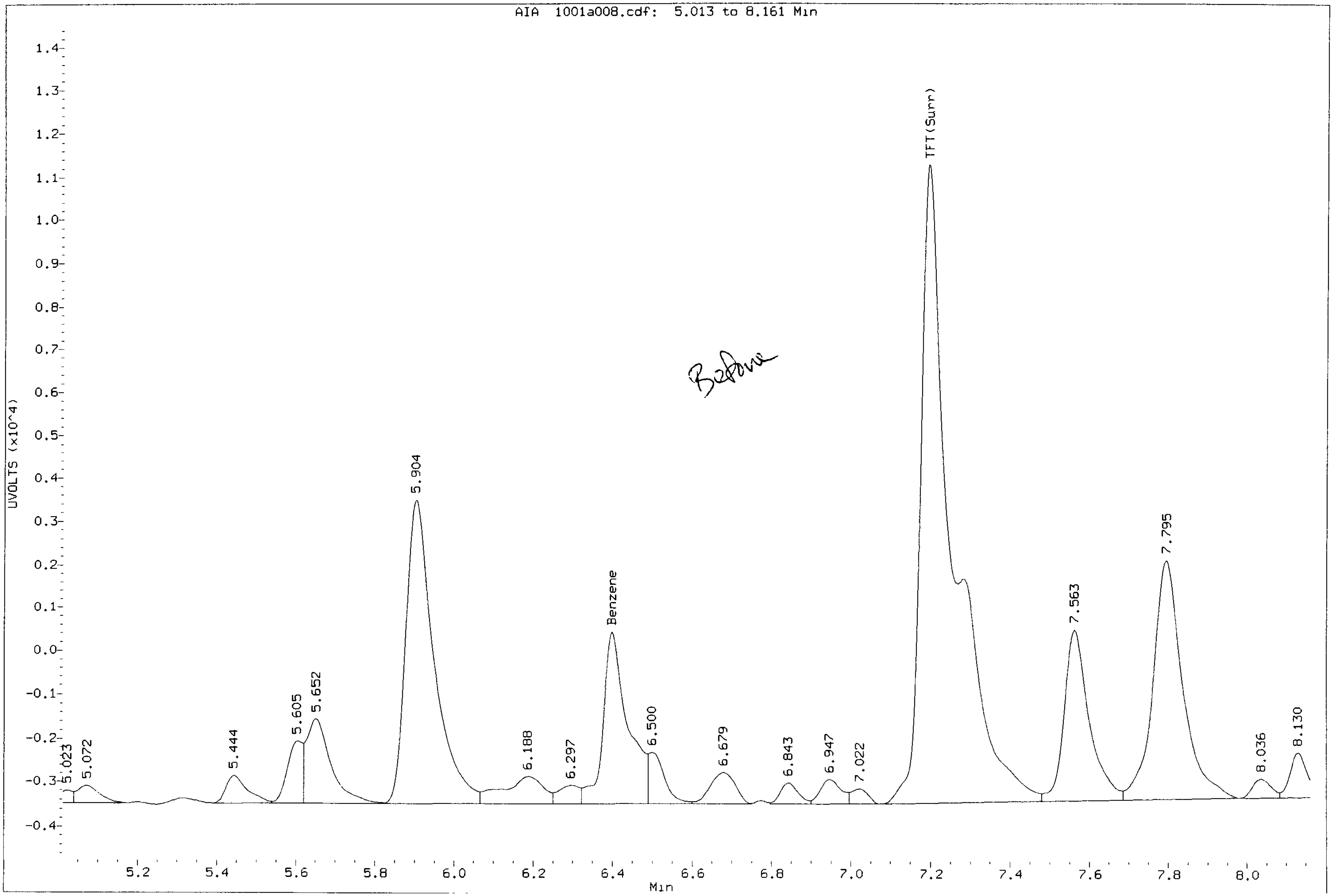


Data File: /chem3/pid2.i/100112-2.b/1001a008.d/1001a008.cdf
Injection Date: 01-OCT-2012 13:19
Instrument: pid2.i
Client Sample ID:



[illegible]
1. Poor [illegible]
2 [illegible]
3 [illegible]
4 [illegible]
⑤ [illegible] Peak Split / overlapping peaks
[illegible] BW [illegible] 10/2/12

Data File: /chem3/pid2.i/100112-2.b/1001a008.d/1001a008.cdf
Injection Date: 01-OCT-2012 13:19
Instrument: pid2.i
Client Sample ID:



Before

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-092412
SAMPLE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/02/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/05/12	**7439-96-5**	**Manganese**	5	**189**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
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Sample ID: MW-16D-092412
SAMPLE

Lab Sample ID: VK65B
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/02/12	**7440-38-2**	**Arsenic**	0.5	**0.7**	
200.8	09/27/12	200.8	10/01/12	**7440-50-8**	**Copper**	0.5	**0.5**	
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/05/12	**7439-96-5**	**Manganese**	5	**391**	
200.8	09/27/12	200.8	10/01/12	**7440-66-6**	**Zinc**	4	**50**	

U-Analyte undetected at given RL
RL-Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-14D-092412
SAMPLE

Lab Sample ID: VK65C
LIMS ID: 12-18407
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/02/12	**7440-38-2**	**Arsenic**	1	**2**	
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	2	**1,340**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
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Sample ID: MW-15S-092412
SAMPLE

Lab Sample ID: VK65D
LIMS ID: 12-18408
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	**Prep Date**	**Analysis Method**	**Analysis Date**	**CAS Number**	**Analyte**	**RL**	**µg/L**	**Q**
200.8	09/27/12	200.8	10/02/12	**7440-38-2**	**Arsenic**	0.5	**0.9**	
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	1	**375**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
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Sample ID: MW-16S-092412
SAMPLE

Lab Sample ID: VK65E
LIMS ID: 12-18409
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/02/12	**7440-38-2**	**Arsenic**	0.5	**0.5**	
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	1	**328**	
200.8	09/27/12	200.8	10/01/12	**7440-66-6**	**Zinc**	4	**27**	

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
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Sample ID: MW-14S-092412
SAMPLE

Lab Sample ID: VK65F
LIMS ID: 12-18410
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/02/12	**7440-38-2**	**Arsenic**	0.5	**0.8**	
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	1	**498**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

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Sample ID: MW-13S-092412
SAMPLE

Lab Sample ID: VK65G
LIMS ID: 12-18411
Matrix: Water
Data Release Authorized
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	2	**724**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-12S-092412
SAMPLE

Lab Sample ID: VK65H
LIMS ID: 12-18412
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	2	**600**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-11S-092412
SAMPLE

Lab Sample ID: VK65I
LIMS ID: 12-18413
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	**7440-50-8**	**Copper**	0.5	**0.9**	
200.8	09/27/12	200.8	10/01/12	**7439-92-1**	**Lead**	0.1	**0.2**	
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	2	**858**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-12D-092412
SAMPLE

Lab Sample ID: VK65J
LIMS ID: 12-18414
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	2	**205**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-11D-092412
SAMPLE

Lab Sample ID: VK65K
LIMS ID: 12-18415
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	**7440-50-8**	**Copper**	0.5	**0.5**	
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	1	**72**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-13D-092412
SAMPLE

Lab Sample ID: VK65L
LIMS ID: 12-18416
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	1	**244**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-DUP-092412
SAMPLE

Lab Sample ID: VK65M
LIMS ID: 12-18417
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/02/12	**7439-96-5**	**Manganese**	1	**172**	
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-092412
MATRIX SPIKE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Arsenic	200.8	0.5 U	24.0	25.0	96.0%	
Copper	200.8	0.5 U	24.3	25.0	97.2%	
Lead	200.8	0.1 U	23.6	25.0	94.4%	
Manganese	200.8	189	209	25	80.0%	H
Zinc	200.8	4 U	71	80	88.8%	

Reported in µg/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

FORM-V

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-092412
DUPLICATE

Lab Sample ID: VK65A
LIMS ID: 12-18405
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Arsenic	200.8	0.5 U	0.5 U	0.0%	+/- 0.5	L
Copper	200.8	0.5 U	0.5 U	0.0%	+/- 0.5	L
Lead	200.8	0.1 U	0.1 U	0.0%	+/- 0.1	L
Manganese	200.8	189	188	0.5%	+/- 20%	
Zinc	200.8	4 U	4 U	0.0%	+/- 4	L

Reported in µg/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS **Sample ID: LAB CONTROL**
Page 1 of 1

Lab Sample ID: VK65LCS
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Arsenic	200.8	26.0	25.0	104%	
Copper	200.8	25.8	25.0	103%	
Lead	200.8	25.5	25.0	102%	
Manganese	200.8	25.7	25.0	103%	
Zinc	200.8	79	80	98.8%	

Reported in µg/L

N-Control limit not met
Control Limits: 80-120%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: VK65MB
LIMS ID: 12-18406
Matrix: Water
Data Release Authorized:
Reported: 10/08/12

QC Report No: VK65-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	09/27/12	200.8	10/01/12	7440-38-2	Arsenic	0.2	0.2	U
200.8	09/27/12	200.8	10/01/12	7440-50-8	Copper	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7439-92-1	Lead	0.1	0.1	U
200.8	09/27/12	200.8	10/01/12	7439-96-5	Manganese	0.5	0.5	U
200.8	09/27/12	200.8	10/01/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

FORM-I

INORGANICS ANALYSIS DATA SHEET
Dissolved Mercury by Method SW7470A

Data Release Authorized:
Reported: 10/01/12
Date Received: 09/25/12
Page 1 of 1

QC Report No238: VK75-Landau Associates
Project: Cornwall
0001020.400-510

Client/ ARI ID	**Date Sampled**	**Matrix**	**Prep Date Anal Date**	**RL**	**Result**
MW-15D-092412 VK75A 12-18431	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-16D-092412 VK75B 12-18432	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-14D-092412 VK75C 12-18433	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-15S-092412 VK75D 12-18434	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-16S-092412 VK75E 12-18435	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-14S-092412 VK75F 12-18436	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-13S-092412 VK75G 12-18437	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-12S-092412 VK75H 12-18438	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-11S-092412 VK75I 12-18439	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-12D-092412 VK75J 12-18440	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-11D-092412 VK75K 12-18441	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-13D-092412 VK75L 12-18442	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MW-DUP-092412 VK75M 12-18443	09/24/12	Water	09/26/12 09/28/12	20.0	20.0 U
MB-092612 Method Blank	NA	Water	09/26/12 09/28/12	20.0	20.0 U

Reported in ng/L

RL-Analytical reporting limit
U-Undetected at reported detection limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-092412
MATRIX SPIKE

Lab Sample ID: VK75A
LIMS ID: 12-18431
Matrix: Water
Data Release Authorized:
Reported: 10/01/12

QC Report No: VK75-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Mercury	7470A	20.0 U	116	100	116%	

Reported in ng/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-092412
DUPLICATE

Lab Sample ID: VK75A
LIMS ID: 12-18431
Matrix: Water
Data Release Authorized:
Reported: 10/01/12

QC Report No: VK75-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Mercury	7470A	20.0 U	20.0 U	0.0%	+/- 20.0	L

Reported in ng/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: VK75LCS
LIMS ID: 12-18432
Matrix: Water
Data Release Authorized:
Reported: 10/01/12

QC Report No: VK75-Landau Associates
Project: Cornwall
0001020.400-510
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Mercury	7470A	234	200	117%	

Reported in ng/L

N-Control limit not met
Control Limits: 80-120%

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 10/31/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-15D-092412
ARI ID: 12-18405 VK65A

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/27/12 092712#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	29.2
Sulfate	10/24/12 102412#1	EPA 300.0	mg/L	0.1	1.8
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	44.5
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	15.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	14.9

RL	Analytical reporting limit
U	Undetected at reported detection limit

VK65:281 B 11/2/12 Kelly

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-16D-092412
ARI ID: 12-18406 VK65B

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/27/12 092712#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	19.2
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	1.4
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	60.8
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	20.0	< 20.0 U
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	19.3

RL Analytical reporting limit
U Undetected at reported detection limit

VK65: 282R BA 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-14D-092412
ARI ID: 12-18407 VK65C

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/27/12 092712#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	14.1
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	1.5
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	0.447
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	63.6
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	24.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	15.8

RL	Analytical reporting limit
U	Undetected at reported detection limit

VK65: 283R 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL
RESOURCES
INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-15S-092412
ARI ID: 12-18408 VK65D

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/27/12 092712#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	28.7
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	0.9
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	0.054
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	53.7
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	20.0	< 20.0 U
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	17.0

RL	Analytical reporting limit
U	Undetected at reported detection limit

VK65: 284R 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-16S-092412
ARI ID: 12-18409 VK65E

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/27/12 092712#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	18.8
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	3.2
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	53.1
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	< 12.0 U
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	18.2

RL = Analytical reporting limit
U = Undetected at reported detection limit

VK65: 285R 10/24/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-14S-092412
ARI ID: 12-18410 VK65F

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/27/12 092712#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/27/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	21.9
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	3.0
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	46.7
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	17.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	14.7

RL Analytical reporting limit
U Undetected at reported detection limit

VK65: 286R 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-13S-092412
ARI ID: 12-18411 VK65G

Analyte	**Date** **Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	15.8
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	2.5
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	37.8
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	< 12.0 U
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	11.7

RL Analytical reporting limit
U Undetected at reported detection limit

VK65: 287R 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL
RESOURCES
INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-12S-092412
ARI ID: 12-18412 VK65H

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	17.7
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	0.1
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	46.4
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	< 12.0 U
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	14.7

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-11S-092412
ARI ID: 12-18413 VK65I

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.200	4.79
Sulfate	09/25/12 092512#1	EPA 300.0	mg/L	0.1	2.8
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	0.059
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	57.9
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	16.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	20.3

RL	Analytical reporting limit
U	Undetected at reported detection limit

VK65: 2892 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-12D-092412
ARI ID: 12-18414 VK65J

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	12.4
Sulfate	10/04/12 100412#1	EPA 300.0	mg/L	1.0	37.6
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.500	5.97
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	101
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	27.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	25.1

RL Analytical reporting limit
U Undetected at reported detection limit

VK65: 290p BC 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-11D-092412
ARI ID: 12-18415 VK65K

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.200	4.19
Sulfate	10/04/12 100412#1	EPA 300.0	mg/L	0.2	9.6
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	10.0	105
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	25.0	277
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	25.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	6.00	33.8

RL	Analytical reporting limit
U	Undetected at reported detection limit

VK65: 291R BL 10/26/12

SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-13D-092412
ARI ID: 12-18416 VK65L

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	0.5
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	22.5
Sulfate	10/04/12 100412#1	EPA 300.0	mg/L	1.0	34.8
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	0.902
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	50.9
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	24.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	13.7

RL Analytical reporting limit
U Undetected at reported detection limit

VK65: 292R QL 10/24/12

ANALYTICAL
RESOURCES
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SAMPLE RESULTS-CONVENTIONALS
VK65-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 10/31/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Client ID: MW-DUP-092412
ARI ID: 12-18417 VK65M

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	09/25/12 092512#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	09/28/12 092812#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	09/28/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	09/28/12 092812#1	EPA 350.1M	mg-N/L	0.500	29.2
Sulfate	10/24/12 102412#1	EPA 300.0	mg/L	0.1	1.9
Sulfide	09/27/12 092712#1	EPA 376.2	mg/L	0.050	< 0.050 U
Chemical Oxygen Demand	10/02/12 100212#1	EPA 410.4	mg/L	5.00	49.3
Biological Oxygen Demand	09/26/12 092612#1	EPA 405.1	mg/L	12.0	21.0
Total Organic Carbon	10/03/12 100312#1	EPA 9060	mg/L	1.50	14.9

RL	Analytical reporting limit
U	Undetected at reported detection limit

VK69:293r

11/2/12
Kelly

MS/MSD RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/05/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: VK65A Client ID: MW-15D-092412							
N-Nitrate	EPA 300.0	09/25/12	mg-N/L	< 0.1	1.9	2.0	95.0%
N-Nitrite	EPA 300.0	09/25/12	mg-N/L	< 0.1	2.0	2.0	100.0%
Total Cyanide	EPA 335.4	09/27/12	mg/L	< 0.005	0.161	0.200	80.5%
N-Ammonia	EPA 350.1M	09/28/12	mg-N/L	29.2	81.8	50.0	105.2%
Sulfate	EPA 300.0	09/25/12	mg/L	< 0.1	1.8	2.0	90.0%
Sulfide	EPA 376.2	09/27/12	mg/L	< 0.050	0.554	0.500	110.8%
Chemical Oxygen Demand	EPA 410.4	10/02/12	mg/L	44.5	133	100	88.5%
Total Organic Carbon	EPA 9060	10/03/12	mg/L	14.9	36.5	20.0	108.0%

REPLICATE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL
RESOURCES
INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: 09/24/12
Date Received: 09/25/12

ARI ID: VK65A Client ID: MW-15D-092412

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
N-Nitrate	EPA 300.0	09/25/12	mg-N/L	< 0.1	< 0.1	NA
N-Nitrite	EPA 300.0	09/25/12	mg-N/L	< 0.1	< 0.1	NA
Total Cyanide	EPA 335.4	09/27/12	mg/L	< 0.005	< 0.005	NA
N-Ammonia	EPA 350.1M	09/28/12	mg-N/L	29.2	29.1	0.3%
Sulfate	EPA 300.0	09/25/12	mg/L	< 0.1	< 0.1	NA
Sulfide	EPA 376.2	09/27/12	mg/L	< 0.050	< 0.050	NA
Chemical Oxygen Demand	EPA 410.4	10/02/12	mg/L	44.5	32.7	30.6%
Total Organic Carbon	EPA 9060	10/03/12	mg/L	14.9	16.3	9.0%

LAB CONTROL RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/24/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Sulfide EPA 376.2	ICVL	09/27/12	mg/L	0.460	0.504	91.3%
Biological Oxygen Demand	ICVL	09/26/12	mg/L	155	198	78.3%
EPA 405.1	ICVL	09/26/12		158	198	79.8%

STANDARD REFERENCE RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL
RESOURCES
INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/31/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
N-Nitrate ERA #230511	EPA 300.0	09/25/12	mg-N/L	3.0	3.0	100.0%
N-Nitrite ERA #401010	EPA 300.0	09/25/12	mg-N/L	3.0	3.0	100.0%
Total Cyanide ERA 220811	EPA 335.4	09/27/12	mg/L	0.394	0.400	98.5%
		09/28/12		0.377	0.400	94.2%
N-Ammonia ERA #15125	EPA 350.1M	09/28/12	mg-N/L	0.506	0.500	101.2%
Sulfate ERA #070811	EPA 300.0	09/25/12	mg/L	3.0	3.0	100.0%
		10/04/12		2.9	3.0	96.7%
		10/24/12		3.0	3.0	100.0%
Chemical Oxygen Demand Thermo Orion #I01	EPA 410.4	10/02/12	mg/L	84.6	90.0	94.0%
Total Organic Carbon ERA 0409-12-01	EPA 9060	10/03/12	mg/L	18.9	20.0	94.5%

Kelly
11/2/12

METHOD BLANK RESULTS-CONVENTIONALS
VK65-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 10/31/12

Project: Cornwall
Event: 0001020.400-510
Date Sampled: NA
Date Received: NA

Analyte	**Method**	**Date**	**Units**	**Blank**	**ID**
N-Nitrate	EPA 300.0	09/25/12	mg-N/L	< 0.1 U	
N-Nitrite	EPA 300.0	09/25/12	mg-N/L	< 0.1 U	
Total Cyanide	EPA 335.4	09/27/12 09/28/12	mg/L	< 0.005 U < 0.005 U	
N-Ammonia	EPA 350.1M	09/28/12	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	09/25/12 10/04/12 10/24/12	mg/L	< 0.1 U < 0.1 U < 0.1 U	
Sulfide	EPA 376.2	09/27/12	mg/L	< 0.050 U	
Chemical Oxygen Demand	EPA 410.4	10/02/12	mg/L	< 5.00 U	
Biological Oxygen Demand	EPA 405.1	09/26/12 09/26/12	mg/L	< 1.0 U < 1.0 U	
Total Organic Carbon	EPA 9060	10/03/12	mg/L	< 1.50 U	

FB Filtration Blank

VK65: 0098r

Kelly
11/2/12

AQUATIC RESEARCH INCORPORATED

LABORATORY & CONSULTING SERVICES
3927 AURORA AVENUE NORTH, SEATTLE, WA 98103
PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: ARI098-49 **PAGE 1**
REPORT DATE: 10/05/12
DATE SAMPLED: 09/24/12 **DATE RECEIVED:** 09/26/12
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM ANALYTICAL RESOURCES INC. / VK65

CASE NARRATIVE

Thirteen water samples were received by the laboratory in good condition Analysis was performed according to the chain of custody received with the samples No difficulties were encountered in the preparation or analysis of these samples Sample data follows while QA/QC data is contained on the following page

SAMPLE DATA

SAMPLE ID	LAB ID	TANNIN/LIGNIN (mg/L)
12-18405-VK65A	MW-15D-092412	1.35
12-18406-VK65B	MW-16D-092412	1.31
12-18407-VK65C	MW-14D-092412	3.83
12-18408-VK65D	MW-15S-092412	1.54
12-18409-VK65E	MW-16S-092412	1.31
12-18105-VK65F	MW-14S-092412	3.14
12-18411-VK65G	MW-13S-092412	0.953
12-18412-VK65H	MW-12S-092412	1.01
12-18413-VK65I	MW-11S-092412	1.58
12-18414-VK65J	MW-12D-092412	12.2
12-18415-VK65K	MW-11D-092412	37.9
12-18416-VK65L	MW-13D-092412	6.45
12-18417-VK65M	MW-DUP-092412	1.38

CASE FILE NUMBER:	**ARI098-49**	**PAGE 2**	
REPORT DATE:	**10/05/12**		
DATE SAMPLED:	**09/24/12**	**DATE RECEIVED:**	**09/26/12**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM ANALYTICAL RESOURCES INC. / VK65

QA/QC DATA

QC PARAMETER	TANNIN/LIGNIN (mg/L)
METHOD	SM5550
DATE ANALYZED	10/05/12
DETECTION LIMIT	0.010
DUPLICATE	
SAMPLE ID	MW-15D-092412
ORIGINAL	1.35
DUPLICATE	1.34
RPD	0.91%
SPIKE SAMPLE	
SAMPLE ID	MW-15D-092412
ORIGINAL	1.35
SPIKED SAMPLE	2.29
SPIKE ADDED	1.00
% RECOVERY	94.55%
QC CHECK	
FOUND	1.07
TRUE	1.00
% RECOVERY	106.95%
BLANK	<0.010

RPD = RELATIVE PERCENT DIFFERENCE
NA = NOT APPLICABLE OR NOT AVAILABLE
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TOO SAMPLE CONCENTRATION

SUBMITTED BY:

Damien Gadomski

Damien Gadomski
Project Manager

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 09/25/12

ANALYTICAL RESOURCES INCORPORATED

ARI Project: VK65

VAR1098·49

Laboratory: Aquatic Research, Inc
Lab Contact: Steve Lazoff
Lab Address: 3927 Aurora Ave N.
Seattle, WA 98103
Phone: 206-632-2715
Fax: 206-632-2417

ARI Client: Landau Associates
Project ID: Cornwall
ARI PM: Kelly Bottem
Phone: 206-695-6211
Fax: 206-695-6201
Email: subdata@arilabs.com

Analytical Protocol: In-house
Special Instructions:

Requested Turn Around:
Email Results (Y/N): **email**

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses
12-18405-VK65A	MW-15D-092412	09/24/12 08:26	Water	1	Tannins & Lignins
Special Instructions: None					
12-18406-VK65B	MW-16D-092412	09/24/12 08:30	Water	1	Tannins & Lignins
Special Instructions: None					
12-18407-VK65C	MW-14D-092412	09/24/12 10:00	Water	1	Tannins & Lignins
Special Instructions: None					
12-18408-VK65D	MW-15S-092412	09/24/12 10:50	Water	1	Tannins & Lignins
Special Instructions: None					
12-18409-VK65E	MW-16S-092412	09/24/12 11:30	Water	1	Tannins & Lignins
Special Instructions: None					
12-18410-VK65F	MW-14S-092412	09/24/12 12:50	Water	1	Tannins & Lignins
Special Instructions: None					
12-18411-VK65G	MW-13S-092412	09/24/12 13:00	Water	1	Tannins & Lignins
Special Instructions: None					

Carrier	Airbill	Date	
Relinquished by	Company ARI	Date 9/26/12	Time 0850
Received by	Company AR	Date 9/26/12	Time 0850

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 09/25/12

ANALYTICAL RESOURCES INCORPORATED

ARI Project: VK65

Laboratory: Aquatic Research, Inc
Lab Contact: Steve Lazoff

ARI Client: Landau Associates
Project ID: 0001020.400-510

ARI Sample ID	Client Sample ID/ Add'l Sample ID	Sampled	Matrix	Bottles	Analyses
12-18412-VK65H	MW-12S-092412	09/24/12 14:00	Water	1	Tannins & Lignins
Special Instructions: None					
12-18413-VK65I	MW-11S-092412	09/24/12 14:25	Water	1	Tannins & Lignins
Special Instructions: None					
12-18414-VK65J	MW-12D-092412	09/24/12 15:10	Water	1	Tannins & Lignins
Special Instructions: None					
12-18415-VK65K	MW-11D-092412	09/24/12 15:35	Water	1	Tannins & Lignins
Special Instructions: None					
12-18416-VK65L	MW-13D-092412	09/24/12 17:00	Water	1	Tannins & Lignins
Special Instructions: None					
12-18417-VK65M	MW-DUP-092412	09/24/12	Water	1	Tannins & Lignins
Special Instructions: None					

Carrier	Airbill	Date	
Relinquished by	Company ARI	Date 9/26/12	Time 0850
Received by	Company ARI	Date 9/26/12	Time 0850

Analytical Resources, Incorporated
Analytical Chemists and Consultants

August 16, 2012

Mr. Larry Beard
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall 001020.400.500
ARI Job No: VE38, VE43, VE90

Dear Larry,

Please find enclosed analytical results for the conventionals analyses of samples received for the project referenced above. Analytical Resources, Inc. (ARI) accepted five water samples and a trip blank on August 1, 2012. The samples were received in good condition and there were no discrepancies between the COC and containers' labels.

The samples were analyzed for SVOCs, SIM PAHs, HCID, VOCs, Pesticides, Herbicides, Dissolved Metals, Anions, Sulfide, COD, BOD, Ammonia, TOC, Cyanide and NWTPH-Dx follow ups as requested on the COC. The Tannins and Lignins were subcontracted to Aquatic Research, Inc.

The VOCs 8/7/12 CCAL is out of control low for acrolein. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The SVOCs 8/8/12 CCAL is out of control high for 2,4,6-Tribromophenol and Pentachlorophenol. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The dissolved metals matrix spike in association with sample MW-16D-073112 is out of control low for zinc with a sample duplicate RPD for zinc outside of control limits. All other QC is in control.

The dissolved mercury LCS is out of control high. All associated samples were non-detect and no further corrective action was taken.

The sulfate matrix spike is out of control, low in association with sample MW-16D-073112. All other QC is in control and no further corrective action was taken.

The herbicide LCS and LCSD are out of control low for 2,4,5-T with a RPD for Dalapon outside of the +/-40% control limits. All other spike recoveries are in control and no further corrective action was taken.

The herbicide sample MW-11D-073112 was analyzed twice due to matrix effects. Both sets of data have been reported.

The pesticides LCS and/or LCSD are out of control high for several analytes. The associated samples are non-detect and no further corrective action was taken.

Quality control analyses are included for your review. No other analytical complications were noted.

A copy of these reports and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
206-695-6211
kellyb@arilabs.com

KFB/kfb
Enclosure
cc: File VE38, VE43, VE90

LANDAU ASSOCIATES

☒ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ____________

VE38

Date 073112
Page 1 of 2

Chain-of-Custody Record

Project Name Cornwall
Project No. 0001020.400.500
Project Location/Event Bellingham, WA /Additional GW Investigation
Sampler's Name Christophe Venot
Project Contact " /Jeremy Davis / Larry Beard
Send Results To Anne Halvorsen / " / "

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____________

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	SVOCs	SIM PAHs	HCID *	VOCs	Pesticides	Herbicides	Dissolved Metals **	Anions (SO4, NO2, NO3) **	Sulfide	NH3	Tot + Free Cyanide	Tannins + Lignins
MW-16D-073112	073112	0830	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-12D-073112	073112	1040	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-11D-073112	073112	1230	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-12S-073112	073112	1300	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-11S-073112 ***	073112	1415	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
TBS	072512	—	AQ	2				X								

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash/silica gel cleanup

___ run samples standardized to ____________ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt

X Dissolved metal water samples field filtered

Other * LAI TO follow up with Gx/Dx Based on results
** NOTE 48hr hold time
*** As, Cu, Pb, Mn, Zn, Hg
**** METALS NOT PRESERVED BUT WERE FILTERED

Special Shipment/Handling or Storage Requirements ON ICE

Method of Shipment PICK-UP

Relinquished by	Received by	Relinquished by	Received by
Signature Christophe V	Signature A. Volgardsen	Signature	Signature
Printed Name Christophe Venot	Printed Name	Printed Name	Printed Name
Company LAI	Company ARI	Company	Company
Date 080112 Time 0800	Date 8/1/12 Time 1245	Date Time	Date Time

NOTE: Centrifuge SVOCs, CPAH, Pesticides & herbicides

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

LANDAU ASSOCIATES

☒ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ______

Chain-of-Custody Record

Date 073112
Page 2 of 2

Project Name Cornwall
Project No. ______
Project Location/Event Bellingham, WA / Additional GW Investigation
Sampler's Name Christophe Venot
Project Contact " / Jeremy Davis /
Send Results To Anne Halvorsen / " / Larry Beard

Turnaround Time
☒ Standard
☐ Accelerated
☐ ______

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	TOC, COD	BOD*	NWTPH-DX**	NWTPH-GX**
MW-16D-073112	073112	0830	AQ	6	X	X		
MW-12D-073112	073112	1040	AQ	6	X	X		
MW-11D-073112	073112	1230	AQ	6	X	X		
MW-12S-073112	073112	1700	AQ	6	X	X		
MW-11S-073112	073112	1415	AQ	6	X	X		
T95	072512	—	AQ	2				

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash/silica gel cleanup

___ run samples standardized to ______ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt

X Dissolved metal water samples field filtered

Other * Note 48-hr hold time
** LAI to follow up with Dx/Gx based on HCID Results

Special Shipment/Handling or Storage Requirements ON ICE

Method of Shipment Pick-up

Relinquished by	Received by	Relinquished by	Received by
Signature Christophe	Signature A. Volgardsen	Signature	Signature
Printed Name Christophe Venot	Printed Name	Printed Name	Printed Name
Company LAI	Company ARI	Company	Company
Date 080112 Time 0900	Date 8/1/12 Time 1245	Date Time	Date Time

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau

COC No(s): [✓ NA]

Assigned ARI Job No: VE38

Project Name: Cornwall

Delivered by: Fed-Ex UPS [✓ Courier] Hand Delivered Other:

Tracking No: NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? [✓ YES] NO

Were custody papers included with the cooler? .... [✓ YES] NO

Were custody papers properly filled out (ink, signed, etc.) .... [✓ YES] NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)........ 4.8 1.9 5.4 4.9 2.1

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90877952

Cooler Accepted by: AV Date: 8/1/12 Time: 1245

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? .... YES [✓ NO]

What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies [✓ Foam Block] Paper Other: BOX

Was sufficient ice used (if appropriate)? .... NA [✓ YES] NO

Were all bottles sealed in individual plastic bags? .... YES [✓ NO]

Did all bottles arrive in good condition (unbroken)? .... [✓ YES] NO

Were all bottle labels complete and legible? .... [✓ YES] NO

Did the number of containers listed on COC match with the number of containers received? .... [✓ YES] NO

Did all bottle labels and tags agree with custody papers? .... [✓ YES] NO

Were all bottles used correct for the requested analyses? .... [✓ YES] NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA [✓ YES] NO

Were all VOC vials free of air bubbles? .... NA YES [✓ NO]

Was sufficient amount of sample sent in each bottle? .... [✓ YES] NO

Date VOC Trip Blank was made at ARI.. NA 7/25/12

Was Sample Split by ARI : [✓ NA] YES Date/Time: Equipment: Split by:

Samples Logged by: AV Date: 8/1/12 Time: 1537

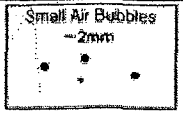
***** Notify Project Manager of discrepancies or concerns *****

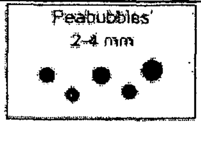
Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

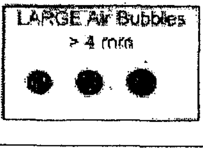
Additional Notes, Discrepancies, & Resolutions:

16D= 2pp 12D=5pp 11D=5pb 12S= 3pb, 11S=5pb
TB=1HS, 3pb

By: AV Date: 8/1/12







Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

PRESERVATION VERIFICATION 08/01/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VE38**

PC: Kelly
VTSR: 08/01/12

Inquiry Number: NONE
Analysis Requested: 08/01/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: AV
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0001020.400.500
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-14610 **VE38A**	MW-16D-073112	F		P	P		DIS P					P	F			Y						
12-14611 **VE38B**	MW-12D-073112	F		P	P		DIS P					P	F			Y						
12-14612 **VE38C**	MW-11D-073112	F		P	P		DIS P					P	F			Y						
12-14613 **VE38D**	MW-12S-073112	F		P	P		DIS P					P	F			Y						
12-14614 **VE38E**	MW-11S-073112	F		P	P		*DIS F					P	F			Y			<2	MP2276	2ml	8/2/12 CB

E = Filtered/unpreserved P=Pass F=Fail
Sulfide preserved with ZnOAC lab to adjust pH
Cyanide = unpreserved

preserved Sample E in
lab CB 8/2/12

Checked By AV Date 8/1/12

Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau

COC No(s): ____ [✓ NA]

Assigned ARI Job No: VE43

Project Name: Cornwall

Delivered by: Fed-Ex UPS [✓ Courier] Hand Delivered Other: ____

Tracking No: ____ [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? [✓ YES] NO

Were custody papers included with the cooler? .... [✓ YES] NO

Were custody papers properly filled out (ink, signed, etc.) .... [✓ YES] NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)........ 4.8 1.9 5.4 4.9 2.1

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90877952

Cooler Accepted by: AV Date: 8/1/12 Time: 1245

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? .... YES [✓ NO]

What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: Box

Was sufficient ice used (if appropriate)? .... NA [✓ YES] NO

Were all bottles sealed in individual plastic bags? .... YES [✓ NO]

Did all bottles arrive in good condition (unbroken)? .... [✓ YES] NO

Were all bottle labels complete and legible? .... [✓ YES] NO

Did the number of containers listed on COC match with the number of containers received? .... [✓ YES] NO

Did all bottle labels and tags agree with custody papers? .... [✓ YES] NO

Were all bottles used correct for the requested analyses? .... [✓ YES] NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA [✓ YES] NO

Were all VOC vials free of air bubbles? .... [✓ NA] YES NO

Was sufficient amount of sample sent in each bottle? .... [✓ YES] NO

Date VOC Trip Blank was made at ARI........ [✓ NA] ____

Was Sample Split by ARI : [✓ NA] YES Date/Time: ____ Equipment: ____ Split by: ____

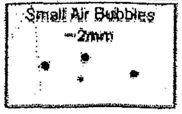
Samples Logged by: AV Date: 8/2/12 Time: 1300

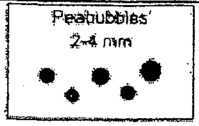
***** Notify Project Manager of discrepancies or concerns *****

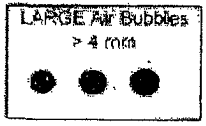
Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:


Small Air Bubbles ~2mm


Peabubbles 2-4 mm


LARGE Air Bubbles > 4 mm

Small → "sm"

Peabubbles → "pb"

Large → "lg"

Headspace → "hs"

PRESERVATION VERIFICATION 08/01/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VE43**

PC: Kelly
VTSR: 08/01/12

Inquiry Number: NONE
Analysis Requested: 08/01/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: AV
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0001020.400.500
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-14616 **VE43A**	MW-16D-073112						DIS P									Y						
12-14617 **VE43B**	MW-12D-073112						DIS P									Y						
12-14618 **VE43C**	MW-11D-073112						DIS P									Y						
12-14619 **VE43D**	MW-12S-073112						DIS P									Y						
12-14620 **VE43E**	MW-11S-073112						DIS E*									Y			<2	MP2276	2ml	8/2/12 CB

*E=Filtered/unpreserved

P=Pass F=Fail

Preserved ~~samples~~ Sample CB 8/2/12 E in lab

– CB 8/2/12

Checked By AV Date 8/1/12

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VE38
Client: Landau Associates
Project Event: 0001020.400.500
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-16D-073112	VE38A	12-14610	Water	07/31/12 08:30	08/01/12 12:45
2.	MW-12D-073112	VE38B	12-14611	Water	07/31/12 10:40	08/01/12 12:45
3.	MW-11D-073112	VE38C	12-14612	Water	07/31/12 12:30	08/01/12 12:45
4.	MW-12S-073112	VE38D	12-14613	Water	07/31/12 13:00	08/01/12 12:45
5.	MW-11S-073112	VE38E	12-14614	Water	07/31/12 14:15	08/01/12 12:45
6.	Trip Blanks	VE38F	12-14615	Water	07/31/12	08/01/12 12:45

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VE43
Client: Landau Associates
Project Event: 0001020.400.500
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-16D-073112	VE43A	12-14616	Water	07/31/12 08:30	08/01/12 12:45
2.	MW-12D-073112	VE43B	12-14617	Water	07/31/12 10:40	08/01/12 12:45
3.	MW-11D-073112	VE43C	12-14618	Water	07/31/12 12:30	08/01/12 12:45
4.	MW-12S-073112	VE43D	12-14619	Water	07/31/12 13:00	08/01/12 12:45
5.	MW-11S-073112	VE43E	12-14620	Water	07/31/12 14:15	08/01/12 12:45

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VE90
Client: Landau Associates
Project Event: 0001020.400.500
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-16D-073112	VE90A	12-14876	Water	07/31/12 08:30	08/01/12 12:45

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Data Reporting Qualifiers

Effective 2/14/2011

Inorganic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Duplicate RPD is not within established control limits
B	Reported value is less than the CRDL but ≥ the Reporting Limit
N	Matrix Spike recovery not within established control limits
NA	Not Applicable, analyte not spiked
H	The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
L	Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Flagged value is not within established control limits
B	Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J	Estimated concentration when the value is less than ARI's established reporting limits
D	The spiked compound was not detected due to sample extract dilution
E	Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

S	Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte
NA	The flagged analyte was not analyzed for
NR	Spiked compound recovery is not reported due to chromatographic interference
NS	The flagged analyte was not spiked into the sample
M	Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
M2	The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
Y	The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
EMPC	Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria" **(Dioxin/Furan analysis only)**
C	The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
P	The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference
X	Analyte signal includes interference from polychlorinated diphenyl ethers. **(Dioxin/Furan analysis only)**
Z	Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**

Geotechnical Data

A	The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
F	Samples were frozen prior to particle size determination
SM	Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
SS	Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
W	Weight of sample in some pipette aliquots was below the level required for accurate weighting

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Landau Associates
ARI Job No.: VE38
Client Project: Cornwall
Client Project No.: 0001020.400.500

Case Narrative

1. Five samples were submitted for preparation on August 1, 2012, and were in good condition. Each sample was received in eight 500 milliliters amber glass bottles, with a total of 20 liters for the entire job.
2. The samples were submitted for removal of solid particulate by means of centrifuging according to modified Corp of Engineers draft interim guide lines.
3. The samples were centrifuged in decontaminated 500mL glass bottles, in a pre-cooled centrifuge (4°C) at 1,000 x g for 30 minutes.
4. The supernatant water was decanted back into the original sample bottles and delivered to sample receiving for distribution.
5. There were no other anomalies in the sample or methods on this project.

Released by: ______________ Date: 8/3/12
Geotechnical Laboratory Manager

Reviewed by: ______________ Date: 8-3-2012
Lead Technician

AQUATIC RESEARCH INCORPORATED
LABORATORY & CONSULTING SERVICES
3927 AURORA AVENUE NORTH, SEATTLE, WA 98103
PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: **ARI098-44** **PAGE 1**
REPORT DATE: **08/16/12**
DATE SAMPLED: **07/31/12** **DATE RECEIVED:** **08/02/12**
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM ANALYTICAL RESOURCES INC. / VE38

CASE NARRATIVE

Five water samples were received by the laboratory in good condition. Analysis was performed according to the chain of custody received with the samples. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on the following page.

SAMPLE DATA

SAMPLE ID	LAB ID	TANNIN/LIGNIN (mg/L)
12-14610-VE38A	MW-16D-073112	1.22
12-14611-VE38B	MW-12D-073112	9.54
12-14612-VE38C	MW-11D-073112	29.9
12-14613-VE38D	MW-12S-073112	7.83
12-14614-VE38E	MW-11S-073112	1.90

CASE FILE NUMBER:	**ARI098-44**		**PAGE 2**
REPORT DATE:	**08/16/12**		
DATE SAMPLED:	**07/31/12**	**DATE RECEIVED:**	**08/02/12**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM ANALYTICAL RESOURCES INC. / VE38

QA/QC DATA

QC PARAMETER	TANNIN/LIGNIN (mg/L)
METHOD	SM5550
DATE ANALYZED	08/16/12
DETECTION LIMIT	0.010
DUPLICATE	
SAMPLE ID	BATCH
ORIGINAL	1.22
DUPLICATE	1.22
RPD	0.00%
SPIKE SAMPLE	
SAMPLE ID	BATCH
ORIGINAL	1.22
SPIKED SAMPLE	2.16
SPIKE ADDED	1.00
% RECOVERY	94.85%
QC CHECK	
FOUND	1.04
TRUE	1.00
% RECOVERY	103.58%
BLANK	<0.010

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TOO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski
Project Manager

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 08/01/12

ANALYTICAL RESOURCES INCORPORATED

ARI Project: VE38

AR1098.44

Laboratory: Aquatic Research, Inc
Lab Contact: Steve Lazoff
Lab Address: 3927 Aurora Ave N.
Seattle, WA 98103
Phone: 206-632-2715
Fax: 206-632-2417

ARI Client: Landau Associates
Project ID: Cornwall
ARI PM: Kelly Bottem
Phone: 206-695-6211
Fax: 206-695-6201
Email: subdata@arilabs.com

Analytical Protocol: In-house
Special Instructions:

Requested Turn Around:
Email Results (Y/N): **email**

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses
12-14610-VE38A	MW-16D-073112	07/31/12 08:30	Water	1	Tannins & Lignins
Special Instructions: None					
12-14611-VE38B	MW-12D-073112	07/31/12 10:40	Water	1	Tannins & Lignins
Special Instructions: None					
12-14612-VE38C	MW-11D-073112	07/31/12 12:30	Water	1	Tannins & Lignins
Special Instructions: None					
12-14613-VE38D	MW-12S-073112	07/31/12 13:00	Water	1	Tannins & Lignins
Special Instructions: None					
12-14614-VE38E	MW-11S-073112	07/31/12 14:15	Water	1	Tannins & Lignins
Special Instructions: None					

Carrier	Airbill	Date	
Relinquished by	Company ARI	Date 8/02/12	Time 1051
Received by	Company ARE	Date 8/2/12	Time 1051

Subcontractor Custody Form - **VE38**

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 22:32
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	82.0%
Tetrachlorometaxylene	57.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 22:50
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	52.5%
Tetrachlorometaxylene	55.0%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 23:08
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	74.0%
Tetrachlorometaxylene	63.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12S-073112
SAMPLE

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 23:26
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	64.2%
Tetrachlorometaxylene	63.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11S-073112
SAMPLE

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 23:43
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	78.0%
Tetrachlorometaxylene	60.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-080612
METHOD BLANK

Lab Sample ID: MB-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 21:21
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane	0.050	< 0.050 U
5103-71-9	cis-Chlordane	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	67.0%
Tetrachlorometaxylene	62.2%

SW8081/PESTICIDE WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Client ID	DCBP	TCMX	TOT OUT
MB-080612	67.0%	62.2%	0
LCS-080612	70.5%	60.5%	0
LCSD-080612	73.8%	59.5%	0
MW-16D-073112	82.0%	57.8%	0
MW-12D-073112	52.5%	55.0%	0
MW-11D-073112	74.0%	63.2%	0
MW-12S-073112	64.2%	63.2%	0
MW-11S-073112	78.0%	60.2%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(54-100)	(32-116)
(TCMX) = Tetrachlorometaxylene	(52-100)	(43-106)

Prep Method: SW3510C
Log Number Range: 12-14610 to 12-14614

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081B
Page 1 of 1

Sample ID: LCS-080612
LCS/LCSD

Lab Sample ID: LCS-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted LCS/LCSD: 08/06/12

Date Analyzed LCS: 08/15/12 21:39
LCSD: 08/15/12 21:57
Instrument/Analyst LCS: ECD6/AAR
LCSD: ECD6/AAR
GPC Cleanup: No
Florisil Cleanup: No

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 5.0 mL
LCSD: 5.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00
Sulfur Cleanup: Yes
Silica Gel: Yes

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
alpha-BHC	0.196	0.200	98.0%	0.199	0.200	99.5%	1.5%
beta-BHC	0.175	0.200	87.5%	0.179	0.200	89.5%	2.3%
delta-BHC	0.183	0.200	91.5%	0.182	0.200	91.0%	0.5%
gamma-BHC (Lindane)	0.232	0.200	116%	0.236	0.200	118%	1.7%
Heptachlor	0.176	0.200	88.0%	0.182	0.200	91.0%	3.4%
Aldrin	0.175	0.200	87.5%	0.170	0.200	85.0%	2.9%
Heptachlor Epoxide	0.223	0.200	112%	0.235	0.200	118%	5.2%
Endosulfan I	0.210	0.200	105%	0.215	0.200	108%	2.4%
Dieldrin	0.423	0.400	106%	0.435	0.400	109%	2.8%
4,4'-DDE	0.412	0.400	103%	0.418	0.400	104%	1.4%
Endrin	0.478	0.400	120%	0.473	0.400	118%	1.1%
Endosulfan II	0.407	0.400	102%	0.417	0.400	104%	2.4%
4,4'-DDD	0.383	0.400	95.8%	0.393	0.400	98.2%	2.6%
Endosulfan Sulfate	0.372	0.400	93.0%	0.378	0.400	94.5%	1.6%
4,4'-DDT	0.405	0.400	101%	0.413	0.400	103%	2.0%
Methoxychlor	1.91	2.00	95.5%	1.96	2.00	98.0%	2.6%
Endrin Ketone	0.390	0.400	97.5%	0.408	0.400	102%	4.5%
Endrin Aldehyde	0.304	0.400	76.0%	0.317	0.400	79.2%	4.2%
trans-Chlordane	0.217	0.200	108%	0.219	0.200	110%	0.9%
cis-Chlordane	0.220	0.200	110%	0.224	0.200	112%	1.8%

Pest/PCB Surrogate Recovery

	LCS	**LCSD**
Decachlorobiphenyl	70.5%	73.8%
Tetrachlorometaxylene	60.5%	59.5%

Results reported in µg/L (ppb)
RPD calculated using sample concentrations per SW846.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16D-073112**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 16:29

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Date Analyzed: 08/07/12 16:29

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	99.6%
d8-Toluene	97.8%
Bromofluorobenzene	95.9%
d4-1,2-Dichlorobenzene	100%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12D-073112**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 16:56

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**0.44**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Date Analyzed: 08/07/12 16:56

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	102%
d8-Toluene	97.7%
Bromofluorobenzene	99.2%
d4-1,2-Dichlorobenzene	105%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11D-073112**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 17:22

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Date Analyzed: 08/07/12 17:22

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	103%
d8-Toluene	97.6%
Bromofluorobenzene	97.1%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12S-073112**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 17:49

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	**Acetone**	**5.0**	**5.0**	
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**2.6**	
100-41-4	**Ethylbenzene**	**0.20**	**0.46**	
100-42-5	**Styrene**	**0.20**	**0.82**	
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	**m,p-Xylene**	**0.40**	**0.42**	
95-47-6	**o-Xylene**	**0.20**	**0.31**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.86**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-12S-073112**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Date Analyzed: 08/07/12 17:49

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.25**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	99.0%
d8-Toluene	97.8%
Bromofluorobenzene	97.4%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11S-073112**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 18:15

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-11S-073112**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Date Analyzed: 08/07/12 18:15

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	**4-Isopropyltoluene**	**0.20**	**0.86**	
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	100%
d8-Toluene	97.8%
Bromofluorobenzene	99.0%
d4-1,2-Dichlorobenzene	104%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET

Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: Trip Blanks**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE38F
LIMS ID: 12-14615
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 12:24

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: Trip Blanks**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE38F
LIMS ID: 12-14615
Matrix: Water
Date Analyzed: 08/07/12 12:24

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	99.3%
d8-Toluene	96.5%
Bromofluorobenzene	96.7%
d4-1,2-Dichlorobenzene	100%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-080712A**
Page 1 of 2 **METHOD BLANK**

Lab Sample ID: MB-080712A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 11:56

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MB-080712A
METHOD BLANK

Lab Sample ID: MB-080712A
LIMS ID: 12-14610
Matrix: Water
Date Analyzed: 08/07/12 11:56

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	98.7%
d8-Toluene	96.7%
Bromofluorobenzene	97.7%
d4-1,2-Dichlorobenzene	100%

VOA SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
MB-080712A	Method Blank	10	98.7%	96.7%	97.7%	100%	0
LCS-080712A	Lab Control	10	99.9%	99.2%	98.6%	99.9%	0
LCSD-080712A	Lab Control Dup	10	101%	99.8%	99.0%	102%	0
VE38A	MW-16D-073112	10	99.6%	97.8%	95.9%	100%	0
VE38B	MW-12D-073112	10	102%	97.7%	99.2%	105%	0
VE38C	MW-11D-073112	10	103%	97.6%	97.1%	102%	0
VE38D	MW-12S-073112	10	99.0%	97.8%	97.4%	102%	0
VE38E	MW-11S-073112	10	100%	97.8%	99.0%	104%	0
VE38F	Trip Blanks	10	99.3%	96.5%	96.7%	100%	0

SW8260C	LCS/MB LIMITS	QC LIMITS
(DCE) = d4-1,2-Dichloroethane	(80-120)	(80-130)
(TOL) = d8-Toluene	(80-120)	(80-120)
(BFB) = Bromofluorobenzene	(80-120)	(80-120)
(DCB) = d4-1,2-Dichlorobenzene	(80-120)	(80-120)

Prep Method: SW5030B
Log Number Range: 12-14610 to 12-14615

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: LCS-080712A**
Page 1 of 2 **LAB CONTROL SAMPLE**

Lab Sample ID: LCS-080712A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/08/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT2/PKC
LCSD: NT2/PKC
Date Analyzed LCS: 08/07/12 10:25
LCSD: 08/07/12 10:52

Sample Amount LCS: 10.0 mL
LCSD: 10.0 mL
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Chloromethane	8.72	10.0	87.2%	8.42	10.0	84.2%	3.5%
Bromomethane	8.94	10.0	89.4%	8.87	10.0	88.7%	0.8%
Vinyl Chloride	8.94	10.0	89.4%	8.67	10.0	86.7%	3.1%
Chloroethane	9.00	10.0	90.0%	8.75	10.0	87.5%	2.8%
Methylene Chloride	8.84	10.0	88.4%	8.50	10.0	85.0%	3.9%
Acetone	45.5	50.0	91.0%	45.6	50.0	91.2%	0.2%
Carbon Disulfide	9.30	10.0	93.0%	8.96	10.0	89.6%	3.7%
1,1-Dichloroethene	9.33	10.0	93.3%	9.12	10.0	91.2%	2.3%
1,1-Dichloroethane	9.29	10.0	92.9%	8.95	10.0	89.5%	3.7%
trans-1,2-Dichloroethene	8.73	10.0	87.3%	8.56	10.0	85.6%	2.0%
cis-1,2-Dichloroethene	8.99	10.0	89.9%	8.73	10.0	87.3%	2.9%
Chloroform	9.43	10.0	94.3%	9.11	10.0	91.1%	3.5%
1,2-Dichloroethane	9.63	10.0	96.3%	9.54	10.0	95.4%	0.9%
2-Butanone	45.3	50.0	90.6%	44.7	50.0	89.4%	1.3%
1,1,1-Trichloroethane	9.65	10.0	96.5%	9.25	10.0	92.5%	4.2%
Carbon Tetrachloride	9.88	10.0	98.8%	9.75	10.0	97.5%	1.3%
Vinyl Acetate	8.80	10.0	88.0%	8.56	10.0	85.6%	2.8%
Bromodichloromethane	9.79	10.0	97.9%	9.54	10.0	95.4%	2.6%
1,2-Dichloropropane	9.24	10.0	92.4%	9.14	10.0	91.4%	1.1%
cis-1,3-Dichloropropene	9.61	10.0	96.1%	9.35	10.0	93.5%	2.7%
Trichloroethene	9.58	10.0	95.8%	9.43	10.0	94.3%	1.6%
Dibromochloromethane	10.3	10.0	103%	9.84	10.0	98.4%	4.6%
1,1,2-Trichloroethane	9.59	10.0	95.9%	9.35	10.0	93.5%	2.5%
Benzene	9.31	10.0	93.1%	9.20	10.0	92.0%	1.2%
trans-1,3-Dichloropropene	9.74	10.0	97.4%	9.52	10.0	95.2%	2.3%
2-Chloroethylvinylether	9.04	10.0	90.4%	8.77	10.0	87.7%	3.0%
Bromoform	10.4	10.0	104%	9.85	10.0	98.5%	5.4%
4-Methyl-2-Pentanone (MIBK)	46.5	50.0	93.0%	45.8	50.0	91.6%	1.5%
2-Hexanone	47.9	50.0	95.8%	46.1	50.0	92.2%	3.8%
Tetrachloroethene	10.0	10.0	100%	9.56	10.0	95.6%	4.5%
1,1,2,2-Tetrachloroethane	9.47	10.0	94.7%	9.28	10.0	92.8%	2.0%
Toluene	9.57	10.0	95.7%	9.36	10.0	93.6%	2.2%
Chlorobenzene	10.1	10.0	101%	9.72	10.0	97.2%	3.8%
Ethylbenzene	9.91	10.0	99.1%	9.56	10.0	95.6%	3.6%
Styrene	10.0	10.0	100%	9.42	10.0	94.2%	6.0%
Trichlorofluoromethane	9.90	10.0	99.0%	9.50	10.0	95.0%	4.1%
1,1,2-Trichloro-1,2,2-trifluoroetha	9.56	10.0	95.6%	9.14	10.0	91.4%	4.5%
m,p-Xylene	20.3	20.0	102%	19.6	20.0	98.0%	3.5%
o-Xylene	10.1	10.0	101%	9.86	10.0	98.6%	2.4%
1,2-Dichlorobenzene	9.91	10.0	99.1%	9.90	10.0	99.0%	0.1%
1,3-Dichlorobenzene	9.91	10.0	99.1%	9.74	10.0	97.4%	1.7%
1,4-Dichlorobenzene	9.96	10.0	99.6%	9.71	10.0	97.1%	2.5%
Acrolein	42.0 Q	50.0	84.0%	41.4 Q	50.0	82.8%	1.4%
Methyl Iodide	9.58	10.0	95.8%	9.23	10.0	92.3%	3.7%
Bromoethane	9.56	10.0	95.6%	9.20	10.0	92.0%	3.8%
Acrylonitrile	8.43	10.0	84.3%	8.34	10.0	83.4%	1.1%
1,1-Dichloropropene	9.48	10.0	94.8%	9.31	10.0	93.1%	1.8%
Dibromomethane	9.72	10.0	97.2%	9.65	10.0	96.5%	0.7%

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: LCS-080712A**
Page 2 of 2 **LAB CONTROL SAMPLE**

Lab Sample ID: LCS-080712A
LIMS ID: 12-14610
Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
1,1,1,2-Tetrachloroethane	10.3	10.0	103%	10.1	10.0	101%	2.0%
1,2-Dibromo-3-chloropropane	8.63	10.0	86.3%	8.75	10.0	87.5%	1.4%
1,2,3-Trichloropropane	9.89	10.0	98.9%	9.54	10.0	95.4%	3.6%
trans-1,4-Dichloro-2-butene	9.35	10.0	93.5%	8.77	10.0	87.7%	6.4%
1,3,5-Trimethylbenzene	9.97	10.0	99.7%	9.81	10.0	98.1%	1.6%
1,2,4-Trimethylbenzene	10.0	10.0	100%	9.84	10.0	98.4%	1.6%
Hexachlorobutadiene	8.87	10.0	88.7%	9.25	10.0	92.5%	4.2%
Ethylene Dibromide	9.76	10.0	97.6%	9.46	10.0	94.6%	3.1%
Bromochloromethane	9.39	10.0	93.9%	8.96	10.0	89.6%	4.7%
2,2-Dichloropropane	9.42	10.0	94.2%	9.03	10.0	90.3%	4.2%
1,3-Dichloropropane	9.78	10.0	97.8%	9.32	10.0	93.2%	4.8%
Isopropylbenzene	9.85	10.0	98.5%	9.53	10.0	95.3%	3.3%
n-Propylbenzene	9.91	10.0	99.1%	9.61	10.0	96.1%	3.1%
Bromobenzene	9.79	10.0	97.9%	9.39	10.0	93.9%	4.2%
2-Chlorotoluene	9.88	10.0	98.8%	9.57	10.0	95.7%	3.2%
4-Chlorotoluene	9.82	10.0	98.2%	9.58	10.0	95.8%	2.5%
tert-Butylbenzene	10.2	10.0	102%	10.0	10.0	100%	2.0%
sec-Butylbenzene	9.96	10.0	99.6%	9.87	10.0	98.7%	0.9%
4-Isopropyltoluene	9.95	10.0	99.5%	9.92	10.0	99.2%	0.3%
n-Butylbenzene	9.49	10.0	94.9%	9.41	10.0	94.1%	0.8%
1,2,4-Trichlorobenzene	8.82	10.0	88.2%	9.25	10.0	92.5%	4.8%
Naphthalene	8.53	10.0	85.3%	8.95	10.0	89.5%	4.8%
1,2,3-Trichlorobenzene	8.28	10.0	82.8%	8.90	10.0	89.0%	7.2%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	LCSD
d4-1,2-Dichloroethane	99.9%	101%
d8-Toluene	99.2%	99.8%
Bromofluorobenzene	98.6%	99.0%
d4-1,2-Dichlorobenzene	99.9%	102%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 17:53
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Date Analyzed: 08/08/12 17:53

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.3**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	57.6%	2-Fluorobiphenyl	59.6%
d14-p-Terphenyl	76.0%	d4-1,2-Dichlorobenzene	46.0%
d5-Phenol	63.5%	2-Fluorophenol	56.0%
2,4,6-Tribromophenol	94.9%	d4-2-Chlorophenol	62.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 18:27
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Date Analyzed: 08/08/12 18:27

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.4**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	58.0%	2-Fluorobiphenyl	54.4%
d14-p-Terphenyl	53.2%	d4-1,2-Dichlorobenzene	47.2%
d5-Phenol	60.5%	2-Fluorophenol	56.3%
2,4,6-Tribromophenol	90.1%	d4-2-Chlorophenol	61.3%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 19:01
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

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ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Date Analyzed: 08/08/12 19:01

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.7**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	56.8%	2-Fluorobiphenyl	53.6%
d14-p-Terphenyl	42.0%	d4-1,2-Dichlorobenzene	46.4%
d5-Phenol	57.6%	2-Fluorophenol	55.7%
2,4,6-Tribromophenol	82.7%	d4-2-Chlorophenol	59.5%

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12S-073112
SAMPLE

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 19:35
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

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ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-12S-073112
SAMPLE

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Date Analyzed: 08/08/12 19:35

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.8**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	61.6%	2-Fluorobiphenyl	57.2%
d14-p-Terphenyl	73.6%	d4-1,2-Dichlorobenzene	47.6%
d5-Phenol	64.3%	2-Fluorophenol	60.5%
2,4,6-Tribromophenol	88.3%	d4-2-Chlorophenol	65.6%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11S-073112
SAMPLE

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 20:09
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-11S-073112
SAMPLE

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Date Analyzed: 08/08/12 20:09

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.2**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	59.6%	2-Fluorobiphenyl	57.6%
d14-p-Terphenyl	67.2%	d4-1,2-Dichlorobenzene	49.2%
d5-Phenol	62.1%	2-Fluorophenol	58.9%
2,4,6-Tribromophenol	84.0%	d4-2-Chlorophenol	62.9%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MB-080612
METHOD BLANK

Lab Sample ID: MB-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 14:28
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MB-080612
METHOD BLANK

Lab Sample ID: MB-080612
LIMS ID: 12-14610
Matrix: Water
Date Analyzed: 08/08/12 14:28

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	64.4%	2-Fluorobiphenyl	64.0%
d14-p-Terphenyl	82.4%	d4-1,2-Dichlorobenzene	52.8%
d5-Phenol	66.9%	2-Fluorophenol	64.0%
2,4,6-Tribromophenol	87.5%	d4-2-Chlorophenol	68.5%

SW8270 SEMIVOLATILES WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT OUT
MB-080612	64.4%	64.0%	82.4%	52.8%	66.9%	64.0%	87.5%	68.5%	0
LCS-080612	62.4%	68.0%	79.2%	52.4%	65.6%	61.3%	98.9%	66.4%	0
LCSD-080612	64.0%	65.2%	78.8%	48.0%	66.4%	64.0%	97.9%	67.7%	0
MW-16D-073112	57.6%	59.6%	76.0%	46.0%	63.5%	56.0%	94.9%	62.7%	0
MW-12D-073112	58.0%	54.4%	53.2%	47.2%	60.5%	56.3%	90.1%	61.3%	0
MW-11D-073112	56.8%	53.6%	42.0%	46.4%	57.6%	55.7%	82.7%	59.5%	0
MW-12S-073112	61.6%	57.2%	73.6%	47.6%	64.3%	60.5%	88.3%	65.6%	0
MW-11S-073112	59.6%	57.6%	67.2%	49.2%	62.1%	58.9%	84.0%	62.9%	0

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(50-100)	(34-101)
(FBP) = 2-Fluorobiphenyl	(51-100)	(38-100)
(TPH) = d14-p-Terphenyl	(54-117)	(27-122)
(DCB) = d4-1,2-Dichlorobenzene	(40-100)	(27-100)
(PHL) = d5-Phenol	(15-121)	(16-106)
(2FP) = 2-Fluorophenol	(33-100)	(23-100)
(TBP) = 2,4,6-Tribromophenol	(46-125)	(31-128)
(2CP) = d4-2-Chlorophenol	(46-102)	(33-100)

Prep Method: SW3520C
Log Number Range: 12-14610 to 12-14614

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Page 1 of 2

Sample ID: LCS-080612
LCS/LCSD

Lab Sample ID: LCS-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted LCS/LCSD: 08/06/12

Date Analyzed LCS: 08/08/12 15:02
LCSD: 08/08/12 15:36
Instrument/Analyst LCS: NT6/JZ
LCSD: NT6/JZ
GPC Cleanup: NO

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Phenol	17.0	25.0	68.0%	17.7	25.0	70.8%	4.0%
Bis-(2-Chloroethyl) Ether	15.9	25.0	63.6%	17.1	25.0	68.4%	7.3%
2-Chlorophenol	17.2	25.0	68.8%	18.3	25.0	73.2%	6.2%
1,3-Dichlorobenzene	11.2	25.0	44.8%	11.9	25.0	47.6%	6.1%
1,4-Dichlorobenzene	11.7	25.0	46.8%	12.4	25.0	49.6%	5.8%
Benzyl Alcohol	14.1	25.0	56.4%	14.5	25.0	58.0%	2.8%
1,2-Dichlorobenzene	12.2	25.0	48.8%	13.0	25.0	52.0%	6.3%
2-Methylphenol	16.9	25.0	67.6%	17.5	25.0	70.0%	3.5%
2,2'-Oxybis(1-Chloropropane)	15.2	25.0	60.8%	15.7	25.0	62.8%	3.2%
4-Methylphenol	34.2	50.0	68.4%	34.8	50.0	69.6%	1.7%
N-Nitroso-Di-N-Propylamine	16.1	25.0	64.4%	16.2	25.0	64.8%	0.6%
Hexachloroethane	9.9	25.0	39.6%	10.6	25.0	42.4%	6.8%
Nitrobenzene	16.1	25.0	64.4%	17.1	25.0	68.4%	6.0%
Isophorone	18.3	25.0	73.2%	18.8	25.0	75.2%	2.7%
2-Nitrophenol	18.6	25.0	74.4%	20.1	25.0	80.4%	7.8%
2,4-Dimethylphenol	48.7	75.0	64.9%	49.8	75.0	66.4%	2.2%
Benzoic Acid	107	138	77.5%	110	138	79.7%	2.8%
bis(2-Chloroethoxy) Methane	16.1	25.0	64.4%	16.9	25.0	67.6%	4.8%
2,4-Dichlorophenol	53.5	75.0	71.3%	55.6	75.0	74.1%	3.8%
1,2,4-Trichlorobenzene	13.0	25.0	52.0%	13.9	25.0	55.6%	6.7%
Naphthalene	13.8	25.0	55.2%	14.4	25.0	57.6%	4.3%
4-Chloroaniline	40.2	75.0	53.6%	40.6	75.0	54.1%	1.0%
Hexachlorobutadiene	11.2	25.0	44.8%	12.2	25.0	48.8%	8.5%
4-Chloro-3-methylphenol	54.7	75.0	72.9%	54.8	75.0	73.1%	0.2%
2-Methylnaphthalene	13.3	25.0	53.2%	13.8	25.0	55.2%	3.7%
Hexachlorocyclopentadiene	28.3	75.0	37.7%	28.6	75.0	38.1%	1.1%
2,4,6-Trichlorophenol	59.8	75.0	79.7%	61.9	75.0	82.5%	3.5%
2,4,5-Trichlorophenol	59.9	75.0	79.9%	61.6	75.0	82.1%	2.8%
2-Chloronaphthalene	17.0	25.0	68.0%	17.9	25.0	71.6%	5.2%
2-Nitroaniline	41.8	75.0	55.7%	42.7	75.0	56.9%	2.1%
Dimethylphthalate	19.4	25.0	77.6%	19.8	25.0	79.2%	2.0%
Acenaphthylene	16.3	25.0	65.2%	16.8	25.0	67.2%	3.0%
3-Nitroaniline	47.0	75.0	62.7%	47.5	75.0	63.3%	1.1%
Acenaphthene	15.9	25.0	63.6%	16.6	25.0	66.4%	4.3%
2,4-Dinitrophenol	135 Q	138	97.8%	143 Q	138	104%	5.8%
4-Nitrophenol	68.9	75.0	91.9%	68.2	75.0	90.9%	1.0%
Dibenzofuran	14.8	25.0	59.2%	15.4	25.0	61.6%	4.0%
2,6-Dinitrotoluene	59.4	75.0	79.2%	60.6	75.0	80.8%	2.0%
2,4-Dinitrotoluene	59.3	75.0	79.1%	61.0	75.0	81.3%	2.8%
Diethylphthalate	19.1	25.0	76.4%	19.5	25.0	78.0%	2.1%
4-Chlorophenyl-phenylether	18.2	25.0	72.8%	19.0	25.0	76.0%	4.3%
Fluorene	16.9	25.0	67.6%	17.5	25.0	70.0%	3.5%
4-Nitroaniline	49.1	75.0	65.5%	49.6	75.0	66.1%	1.0%
4,6-Dinitro-2-Methylphenol	120	138	87.0%	124	138	89.9%	3.3%
N-Nitrosodiphenylamine	16.0	25.0	64.0%	16.8	25.0	67.2%	4.9%

FORM III

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Page 2 of 2

Sample ID: LCS-080612
LCS/LCSD

Lab Sample ID: LCS-080612
LIMS ID: 12-14610
Matrix: Water
Date Analyzed LCS: 08/08/12 15:02
LCSD: 08/08/12 15:36

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
4-Bromophenyl-phenylether	19.0	25.0	76.0%	19.7	25.0	78.8%	3.6%
Hexachlorobenzene	19.0	25.0	76.0%	19.8	25.0	79.2%	4.1%
Pentachlorophenol	73.7 Q	75.0	98.3%	75.3 Q	75.0	100%	2.1%
Phenanthrene	17.4	25.0	69.6%	17.6	25.0	70.4%	1.1%
Carbazole	19.1	25.0	76.4%	19.0	25.0	76.0%	0.5%
Anthracene	15.8	25.0	63.2%	15.9	25.0	63.6%	0.6%
Di-n-Butylphthalate	19.9	25.0	79.6%	19.7	25.0	78.8%	1.0%
Fluoranthene	18.0	25.0	72.0%	18.0	25.0	72.0%	0.0%
Pyrene	17.4	25.0	69.6%	17.6	25.0	70.4%	1.1%
Butylbenzylphthalate	18.6	25.0	74.4%	19.0	25.0	76.0%	2.1%
3,3'-Dichlorobenzidine	50.7	75.0	67.6%	50.2	75.0	66.9%	1.0%
Benzo(a)anthracene	17.7	25.0	70.8%	17.8	25.0	71.2%	0.6%
bis(2-Ethylhexyl)phthalate	19.6	25.0	78.4%	20.3	25.0	81.2%	3.5%
Chrysene	16.0	25.0	64.0%	16.3	25.0	65.2%	1.9%
Di-n-Octyl phthalate	19.1	25.0	76.4%	19.2	25.0	76.8%	0.5%
Benzo(a)pyrene	16.3	25.0	65.2%	16.4	25.0	65.6%	0.6%
Indeno(1,2,3-cd)pyrene	16.3	25.0	65.2%	16.4	25.0	65.6%	0.6%
Dibenz(a,h)anthracene	15.4	25.0	61.6%	15.3	25.0	61.2%	0.7%
Benzo(g,h,i)perylene	15.5	25.0	62.0%	15.7	25.0	62.8%	1.3%
1-Methylnaphthalene	19.1	25.0	76.4%	19.9	25.0	79.6%	4.1%
Total Benzofluoranthenes	34.2	50.0	68.4%	34.5	50.0	69.0%	0.9%

Semivolatile Surrogate Recovery

	LCS	LCSD
d5-Nitrobenzene	62.4%	64.0%
2-Fluorobiphenyl	68.0%	65.2%
d14-p-Terphenyl	79.2%	78.8%
d4-1,2-Dichlorobenzene	52.4%	48.0%
d5-Phenol	65.6%	66.4%
2-Fluorophenol	61.3%	64.0%
2,4,6-Tribromophenol	98.9%	97.9%
d4-2-Chlorophenol	66.4%	67.7%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized: MW
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 19:22
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
91-20-3	**Naphthalene**	**0.010**	**0.032**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.026**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.36**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.29**
86-73-7	**Fluorene**	**0.010**	**0.082**
85-01-8	**Phenanthrene**	**0.010**	**0.11**
120-12-7	**Anthracene**	**0.010**	**0.013**
206-44-0	**Fluoranthene**	**0.010**	**0.053**
129-00-0	**Pyrene**	**0.010**	**0.039**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	**Dibenzofuran**	**0.010**	**0.012**
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	63.0%
d14-Dibenzo(a,h)anthracene	65.7%

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/09/12 13:38
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.046**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.034**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.053**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.025**
86-73-7	**Fluorene**	**0.010**	**0.023**
85-01-8	**Phenanthrene**	**0.010**	**0.040**
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	Fluoranthene	0.010	< 0.010 U
129-00-0	Pyrene	0.010	< 0.010 U
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	35.3%
d14-Dibenzo(a,h)anthracene	33.3%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized: MW
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 20:20
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.010	< 0.010 U
91-57-6	2-Methylnaphthalene	0.010	< 0.010 U
90-12-0	1-Methylnaphthalene	0.010	< 0.010 U
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	Acenaphthene	0.010	< 0.010 U
86-73-7	Fluorene	0.010	< 0.010 U
85-01-8	Phenanthrene	0.010	< 0.010 U
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	Fluoranthene	0.010	< 0.010 U
129-00-0	Pyrene	0.010	< 0.010 U
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	49.0%
d14-Dibenzo(a,h)anthracene	54.7%

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12S-073112
SAMPLE

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 20:49
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.062**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.025**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.082**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.078**
86-73-7	**Fluorene**	**0.010**	**0.069**
85-01-8	**Phenanthrene**	**0.010**	**0.062**
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	**Fluoranthene**	**0.010**	**0.029**
129-00-0	**Pyrene**	**0.010**	**0.019**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	67.0%
d14-Dibenzo(a,h)anthracene	64.0%

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11S-073112
SAMPLE

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 21:18
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
91-20-3	**Naphthalene**	**0.010**	**0.027**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.052**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.082**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.042**
86-73-7	**Fluorene**	**0.010**	**0.036**
85-01-8	**Phenanthrene**	**0.010**	**0.065**
120-12-7	**Anthracene**	**0.010**	**0.010**
206-44-0	Fluoranthene	0.010	< 0.010 U
129-00-0	Pyrene	0.010	< 0.010 U
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	60.7%
d14-Dibenzo(a,h)anthracene	58.0%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-080612
METHOD BLANK

Lab Sample ID: MB-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: NA
Date Received: NA

Date Extracted: 08/06/12
Date Analyzed: 08/08/12 17:26
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.010	< 0.010 U
91-57-6	2-Methylnaphthalene	0.010	< 0.010 U
90-12-0	1-Methylnaphthalene	0.010	< 0.010 U
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	Acenaphthene	0.010	< 0.010 U
86-73-7	Fluorene	0.010	< 0.010 U
85-01-8	Phenanthrene	0.010	< 0.010 U
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	Fluoranthene	0.010	< 0.010 U
129-00-0	Pyrene	0.010	< 0.010 U
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	61.7%
d14-Dibenzo(a,h)anthracene	64.3%

SIM SW8270 SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Client ID	MNP	DBA	TOT OUT
MB-080612	61.7%	64.3%	0
LCS-080612	63.0%	66.7%	0
LCSD-080612	59.7%	65.7%	0
MW-16D-073112	63.0%	65.7%	0
MW-12D-073112	35.3%	33.3%	0
MW-11D-073112	49.0%	54.7%	0
MW-12S-073112	67.0%	64.0%	0
MW-11S-073112	60.7%	58.0%	0

	LCS/MB LIMITS	QC LIMITS
(MNP) = d10-2-Methylnaphthalene	(40-93)	(35-94)
(DBA) = d14-Dibenzo(a,h)anthracene	(31-115)	(26-115)

Prep Method: SW3510C
Log Number Range: 12-14610 to 12-14614

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Page 1 of 1

Sample ID: LCS-080612
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE38-Landau Associates
Project: Cornwall
Event: 0001020.400.500
Date Sampled: NA
Date Received: NA

Date Extracted LCS/LCSD: 08/06/12

Date Analyzed LCS: 08/08/12 17:55
LCSD: 08/08/12 18:24
Instrument/Analyst LCS: NT11/VTS
LCSD: NT11/VTS

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Naphthalene	0.172	0.300	57.3%	0.173	0.300	57.7%	0.6%
2-Methylnaphthalene	0.173	0.300	57.7%	0.171	0.300	57.0%	1.2%
1-Methylnaphthalene	0.173	0.300	57.7%	0.170	0.300	56.7%	1.7%
Acenaphthylene	0.203	0.300	67.7%	0.193	0.300	64.3%	5.1%
Acenaphthene	0.186	0.300	62.0%	0.183	0.300	61.0%	1.6%
Fluorene	0.195	0.300	65.0%	0.187	0.300	62.3%	4.2%
Phenanthrene	0.187	0.300	62.3%	0.184	0.300	61.3%	1.6%
Anthracene	0.170	0.300	56.7%	0.152	0.300	50.7%	11.2%
Fluoranthene	0.211	0.300	70.3%	0.200	0.300	66.7%	5.4%
Pyrene	0.209	0.300	69.7%	0.204	0.300	68.0%	2.4%
Benzo(a)anthracene	0.209	0.300	69.7%	0.203	0.300	67.7%	2.9%
Chrysene	0.194	0.300	64.7%	0.192	0.300	64.0%	1.0%
Benzo(a)pyrene	0.173	0.300	57.7%	0.148	0.300	49.3%	15.6%
Indeno(1,2,3-cd)pyrene	0.188	0.300	62.7%	0.179	0.300	59.7%	4.9%
Dibenz(a,h)anthracene	0.185	0.300	61.7%	0.182	0.300	60.7%	1.6%
Benzo(g,h,i)perylene	0.193	0.300	64.3%	0.190	0.300	63.3%	1.6%
Dibenzofuran	0.172	0.300	57.3%	0.166	0.300	55.3%	3.6%
Total Benzofluoranthenes	0.573	0.600	95.5%	0.567	0.600	94.5%	1.1%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

SIM Semivolatile Surrogate Recovery

	LCS	**LCSD**
d10-2-Methylnaphthalene	63.0%	59.7%
d14-Dibenzo(a,h)anthracene	66.7%	65.7%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 19:50
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	91.6%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 20:26
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	81.7%

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/09/12 10:51
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	47	< 47 Y
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	2,000	< 2,000 Y
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	NR

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11D-073112
DILUTION

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 17:25
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 10.0

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	2.5	< 2.5 U
93-76-5	2,4,5-T	2.5	< 2.5 U
88-85-7	Dinoseb	5.0	< 5.0 U
1918-00-9	Dicamba	5.0	< 5.0 U
94-75-7	2,4-D	10	< 10 U
94-82-6	2,4-DB	50	< 50 U
75-99-0	Dalapon	10	< 10 U
94-74-6	MCPA	2,500	< 2,500 U
120-36-5	Dichloroprop	10	< 10 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	NR

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-12S-073112
SAMPLE

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 21:03
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	83.6%

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-11S-073112
SAMPLE

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted: 08/06/12
Date Analyzed: 08/15/12 21:39
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	87.2%

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-080612
METHOD BLANK

Lab Sample ID: MB-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

Date Extracted: 08/06/12
Date Analyzed: 08/09/12 07:15
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	84.2%

SW8151A/HERBICIDE WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Client ID	DCPA	TOT OUT
MB-080612	84.2%	0
LCS-080612	87.8%	0
LCSD-080612	87.7%	0
MW-16D-073112	91.6%	0
MW-12D-073112	81.7%	0
MW-11D-073112	NR	0
MW-11D-073112 DL	NR	0
MW-12S-073112	83.6%	0
MW-11S-073112	87.2%	0

	LCS/MB LIMITS	QC LIMITS
(DCPA) = 2,4-Dichlorophenylacetic Acid	(66-112)	(28-140)

Log Number Range: 12-14610 to 12-14614

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Page 1 of 1

Sample ID: LCS-080612
LCS/LCSD

Lab Sample ID: LCS-080612
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/16/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted LCS/LCSD: 08/06/12

Date Analyzed LCS: 08/09/12 07:51
LCSD: 08/09/12 08:27
Instrument/Analyst LCS: ECD1/AAR
LCSD: ECD1/AAR

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 50 mL
LCSD: 50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
2,4,5-TP (Silvex)	6.67	10.0	66.7%	6.79	10.0	67.9%	1.8%
2,4,5-T	1.13	2.50	45.2%	1.61	2.50	64.4%	35.0%
Dinoseb	2.15	5.00	43.0%	1.94	5.00	38.8%	10.3%
Dicamba	3.33	5.00	66.6%	3.70	5.00	74.0%	10.5%
2,4-D	5.41	10.0	54.1%	7.29	10.0	72.9%	29.6%
2,4-DB	47.5	50.0	95.0%	47.3	50.0	94.6%	0.4%
Dalapon	2.96	10.0	29.6%	4.45	10.0	44.5%	40.2%
Dichloroprop	6.88	10.0	68.8%	6.94	10.0	69.4%	0.9%

Herbicide Surrogate Recovery

	LCS	LCSD
2,4-Dichlorophenylacetic	87.8%	87.7%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Extraction Method: SW3510C
Page 1 of 1

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Matrix: Water

Data Release Authorized:
Reported: 08/06/12

ARI ID	**Sample ID**	**Extraction Date**	**Analysis Date**	**DL**	**Range**	**Result**
MB-080312	Method Blank	08/03/12	08/03/12	1.0	Gas	< 0.25 U
12-14610					Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	84.9%
VE38A	MW-16D-073112	08/03/12	08/03/12	1.0	Gas	< 0.25 U
12-14610	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	108%
VE38B	MW-12D-073112	08/03/12	08/03/12	1.0	Gas	< 0.25 U
12-14611	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	84.8%
VE38C	MW-11D-073112	08/03/12	08/04/12	1.0	Gas	< 0.25 U
12-14612	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	84.0%
VE38D	MW-12S-073112	08/03/12	08/04/12	1.0	Gas	< 0.25 U
12-14613	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	89.1%
VE38E	MW-11S-073112	08/03/12	08/04/12	1.0	Gas	< 0.25 U
12-14614	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	85.8%

Reported in mg/L (ppm)

Gas value based on total peaks in the range from Toluene to C12.
Diesel value based on the total peaks in the range from C12 to C24.
Oil value based on the total peaks in the range from C24 to C38.

YZ 8/6/12

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                       Analytical Resources Inc.
                      407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a028.d       ARI ID: VE38MBW1
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m         Client ID: VE38MBW1
Instrument: fid4a.i                                    Injection: 03-AUG-2012 22:17
Operator: AR
Report Date: 08/06/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound         RT     Shift    Height      Area            Range           Total Area    Conc
=================================================================================================
Toluene        1.398  -0.005      3913       8779 |   GAS (Tol-C12)             54959      3.65
C8             1.718   0.038       779       2283 | DIESEL (C12-C24)            42269      2.89
C10            3.238   0.005       353        689 |  M.OIL (C24-C38)           104348      8.30
C12            4.121  -0.002       324        428 | AK-102 (C10-C25)            63317      3.66
C14            4.801  -0.004       126        112 | AK-103 (C25-C36)            65499      7.67
C16            5.392   0.005       122        182 |
C18            5.946  -0.002        95        138 |
C20            6.521   0.001       335        447 |  JET-A (C10-C18)            33214      2.69
C22            7.074   0.002        70         76 |MIN.OIL (C24-C38)          104348      7.76
C24            7.590  -0.003        68         42 |
C25            7.844   0.000       124        123 |
C26            8.092   0.003       164        295 |
C28            8.540  -0.005       887        819 |
C32            9.379  -0.007       596        350 |
C34            9.778  -0.005       780       1359 |
Filter Peak    9.967   0.013       942        708 |BUNKERC (C10-C38)          167146     21.89
C36           10.169   0.001      1318       3411 |
C38           10.527  -0.015      1874       2084 |
C40           10.923   0.011      2912       6148 |
o-terph        6.090  -0.001    568983     777921 |
Triacon Surr   8.967  -0.018    700998     777928 |NAS DIES (C10-C24)          62798      3.67
=================================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)    Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)    OR Diesel(3.23 - 8.55)


    Surrogate         Area      Amount      %Rec
  ----------------------------------------------
    o-Terphenyl     777921       38.2       84.9
    Triacontane     777928       40.8       90.6

M  Indicates the peak was manually integrated

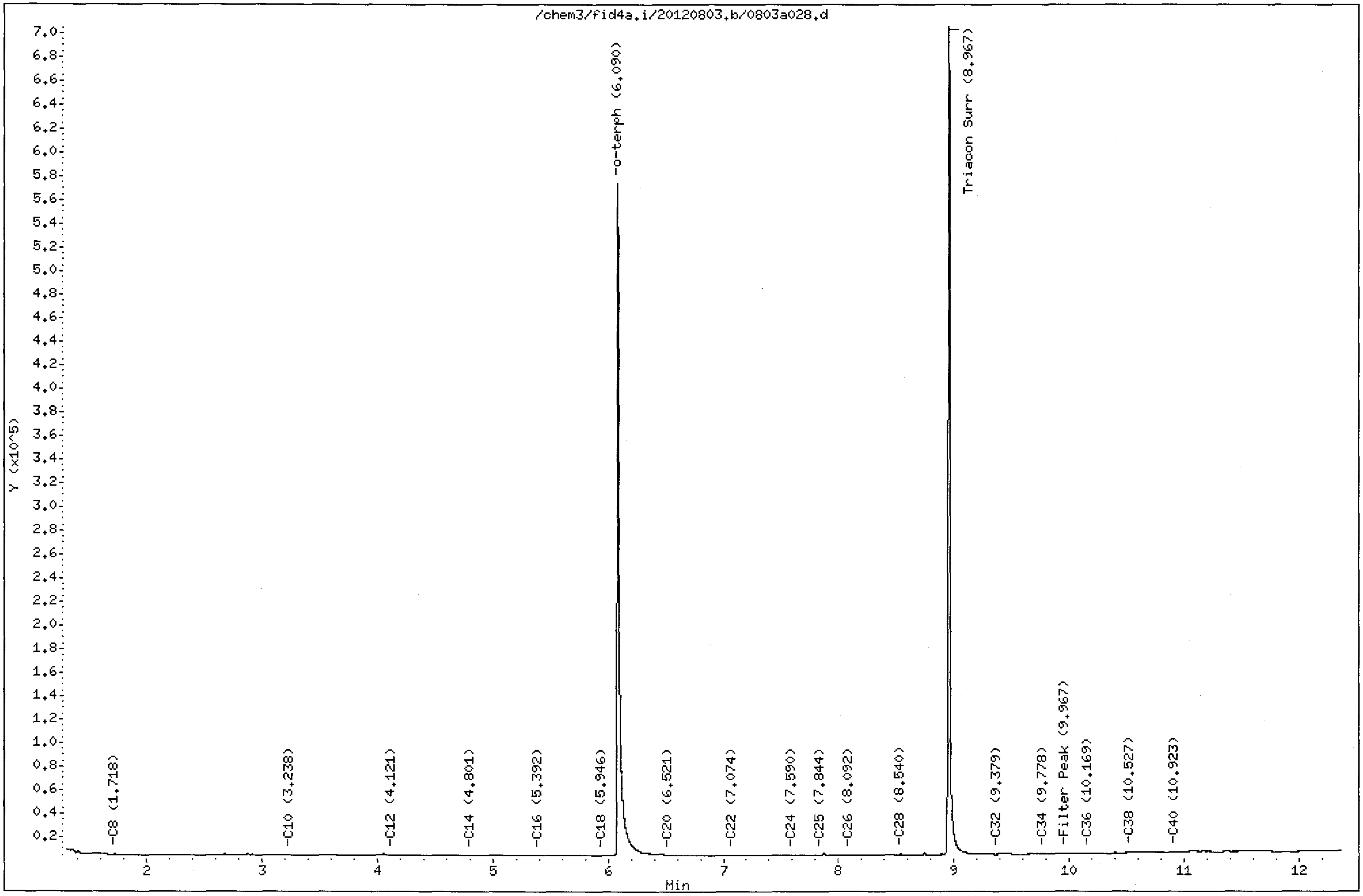

      Analyte            RF      Curve Date
    ------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120803.b/0803a028.d
Date : 03-AUG-2012 22:17
Client ID: VE38MBW1
Sample Info: VE38MBW1

Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



YZ 8/6/12

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                       Analytical Resources Inc.
                      407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a031.d      ARI ID: VE38A
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m        Client ID: MW-16D-073112
Instrument: fid4a.i                                   Injection: 03-AUG-2012 23:21
Operator: AR
Report Date: 08/06/2012                              Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                              FID:4A RESULTS
Compound        RT    Shift   Height     Area          Range          Total Area   Conc
=====================================================================================
Toluene        1.408   0.005    5274     10385 |  GAS (Tol-C12)         329946    21.93
C8             1.729   0.048     937      2424 | DIESEL (C12-C24)      4211008   287.44
C10            3.242   0.009    1989      4312 |  M.OIL (C24-C38)      1255760    99.91
C12            4.141   0.017   10692     32462 | AK-102 (C10-C25)      4593072   265.51
C14            4.806   0.001   17227      8802 | AK-103 (C25-C36)      1053028   123.33
C16            5.405   0.018   30197     11964 |
C18            5.940  -0.008   27552     34413 |
C20            6.526   0.005   24654     12684 |  JET-A (C10-C18)      2591060   209.60
C22            7.081   0.008   19874     32142 |MIN.OIL (C24-C38)      1255760    93.43
C24            7.602   0.009   17208      5133 |
C25            7.832  -0.012   15127     16927 |
C26            8.078  -0.011   12753     18667 |
C28            8.550   0.004   10019     14364 |
C32            9.389   0.003    5483      7710 |
C34            9.793   0.010    3960      2500 |
Filter Peak    9.947  -0.007    3725      5910 |BUNKERC (C10-C38)      5714807   748.60
C36           10.174   0.005    3349      3445 |
C38           10.532  -0.010    3500      5060 |
C40           10.910  -0.002    3858      5896 |
o-terph        6.091   0.000  962389    987052 |
Triacon Surr   8.963  -0.022  794942    788277 |NAS DIES (C10-C24)     4459047   260.25
====================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)   OR Diesel(3.23 - 8.55)


    Surrogate        Area     Amount    %Rec
  ----------------------------------------------
    o-Terphenyl     987052     48.5     107.7
    Triacontane     788277     41.3      91.8

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
      -------------------------------------
       o-Terph Surr    20371.2   10-JUL-2012
       Triacon Surr    19086.0   12-JUN-2012
       Gas             15043.9   10-MAY-2012
       Diesel          14650.0   10-JUL-2012
       Motor Oil       12569.0   12-JUN-2012
       AK102           17299.0   10-JUL-2012
       AK103            8538.0   24-MAY-2012
       JetA            12362.0   31-JUL-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       17134.0   10-JUL-2012
       Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120803.b/0803a031.d

Date : 03-AUG-2012 23:21

Client ID: MW-16D-073112

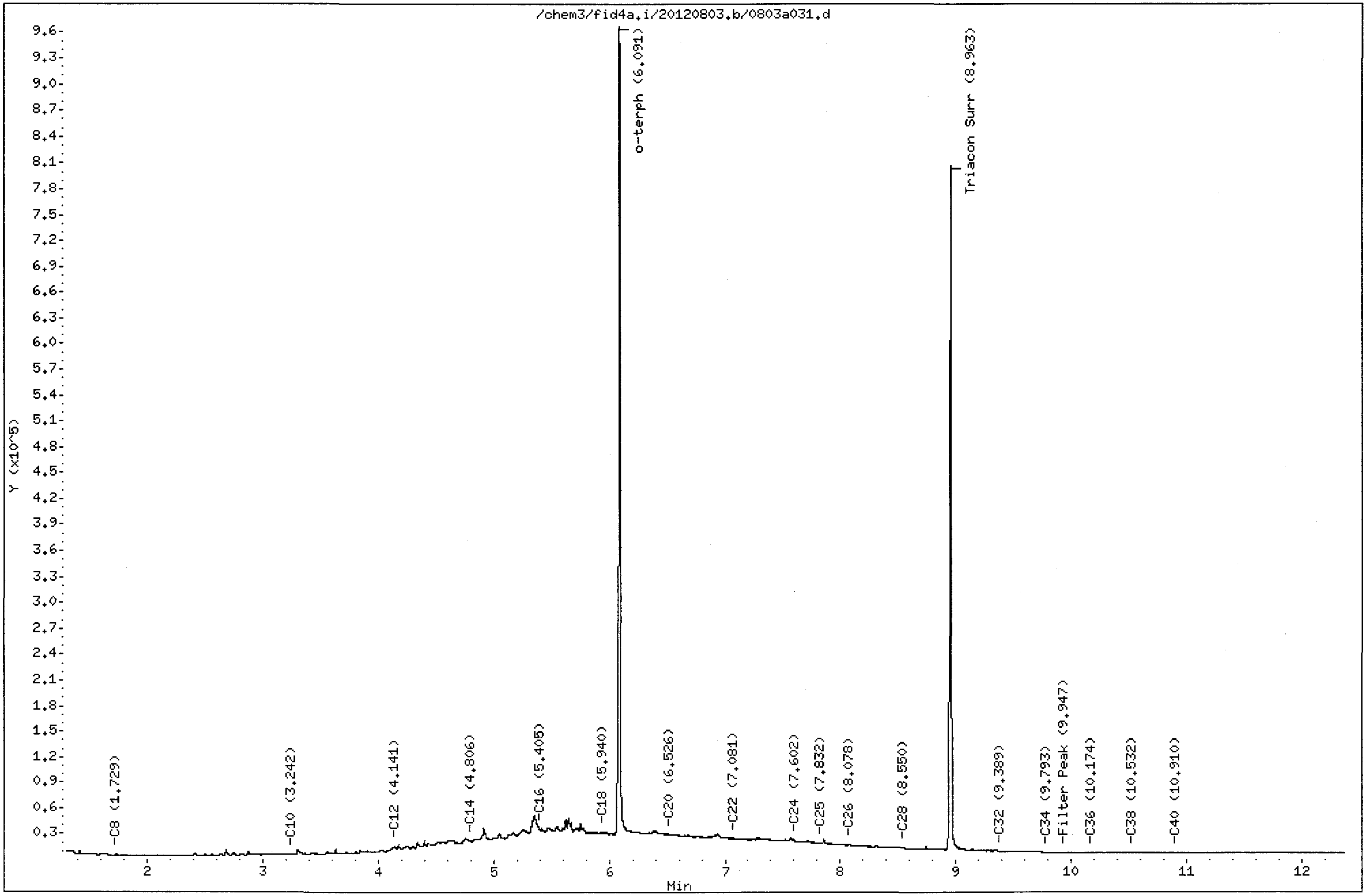
Instrument: fid4a.i

Sample Info: VE38A

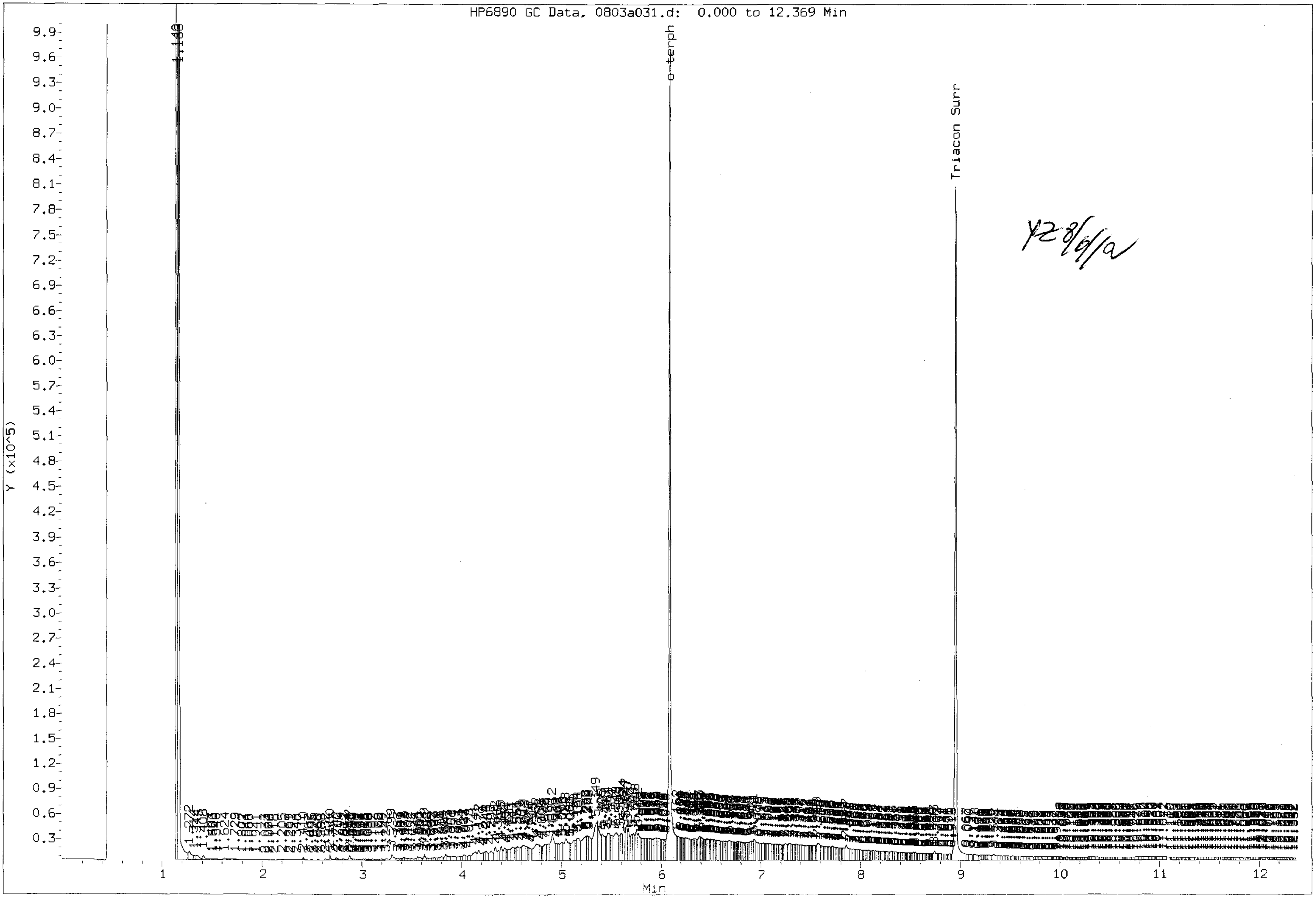
Operator: AR

Column phase: RTX-1

Column diameter: 0.25



Data File: /chem3/fid4a.i/20120803.b/0803a031.d
Injection Date: 03-AUG-2012 23:21
Instrument: fid4a.i
Client Sample ID: MW-16D-073112



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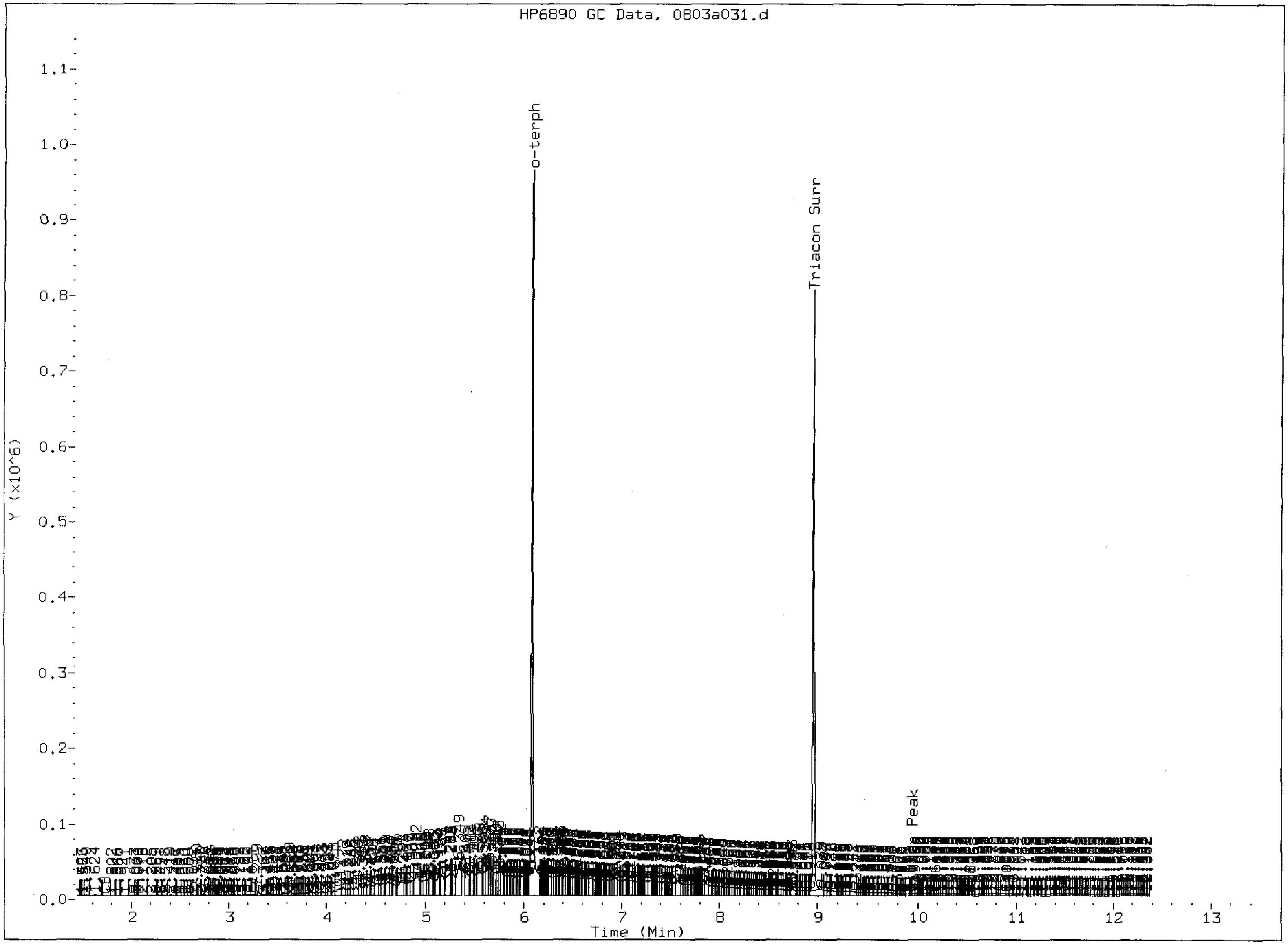
FID:4A-2C/RTX-1 VE38A

FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: YZ

Date: 8/6/12

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                        Analytical Resources Inc.
                       407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a032.d      ARI ID: VE38B
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m        Client ID: MW-12D-073112
Instrument: fid4a.i                                   Injection: 03-AUG-2012 23:43
Operator: AR
Report Date: 08/06/2012                              Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound         RT     Shift    Height     Area           Range            Total Area    Conc
==================================================================================================
Toluene        1.393  -0.010     4491       9955 |   GAS (Tol-C12)          190971       12.69
C8             1.714   0.033      786       2605 | DIESEL (C12-C24)        1503893      102.65
C10            3.240   0.006      919       1147 |  M.OIL (C24-C38)         993244       79.02
C12            4.110  -0.014     3544       2994 | AK-102 (C10-C25)        1712340       98.98
C14            4.806   0.001     5932       8363 | AK-103 (C25-C36)         840738       98.47
C16            5.392   0.005    10270      16077 |
C18            5.943  -0.005     8392      11242 |
C20            6.529   0.008     8745       2405 |  JET-A (C10-C18)         752240       60.85
C22            7.062  -0.010    11533      24951 |MIN.OIL (C24-C38)         993244       73.90
C24            7.586  -0.007    13808      24649 |
C25            7.836  -0.008    12092      22410 |
C26            8.079  -0.010    11171      26034 |
C28            8.532  -0.014     9635      22058 |
C32            9.384  -0.002     5782      13330 |
C34            9.791   0.008     4105       6702 |
Filter Peak    9.949  -0.005     3766       5482 |BUNKERC (C10-C38)        2620512      343.27
C36           10.169   0.001     3344       4122 |
C38           10.542   0.000     3469       1931 |
C40           10.906  -0.006     3913       5546 |
o-terph        6.095   0.003   883908     777243 |
Triacon Surr   8.960  -0.026   807498     756241 |NAS DIES (C10-C24)       1627268       94.97
==================================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)   OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------------
    o-Terphenyl     777243      38.2      84.8
    Triacontane     756241      39.6      88.1

M  Indicates the peak was manually integrated


      Analyte           RF      Curve Date
    -------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

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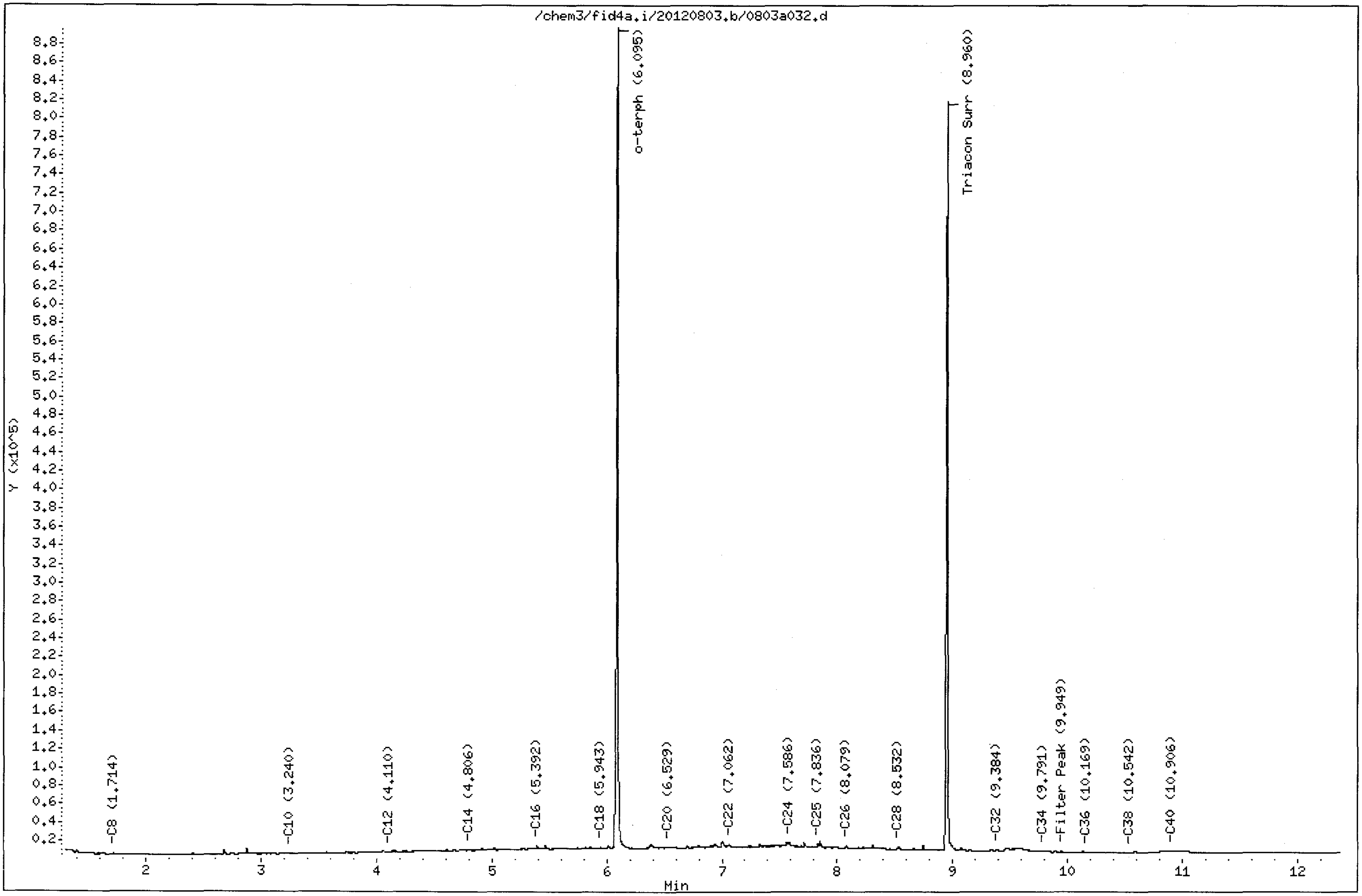
Data File: /chem3/fid4a.i/20120803.b/0803a032.d
Date : 03-AUG-2012 23:43
Client ID: MW-12D-073112
Sample Info: VE38B

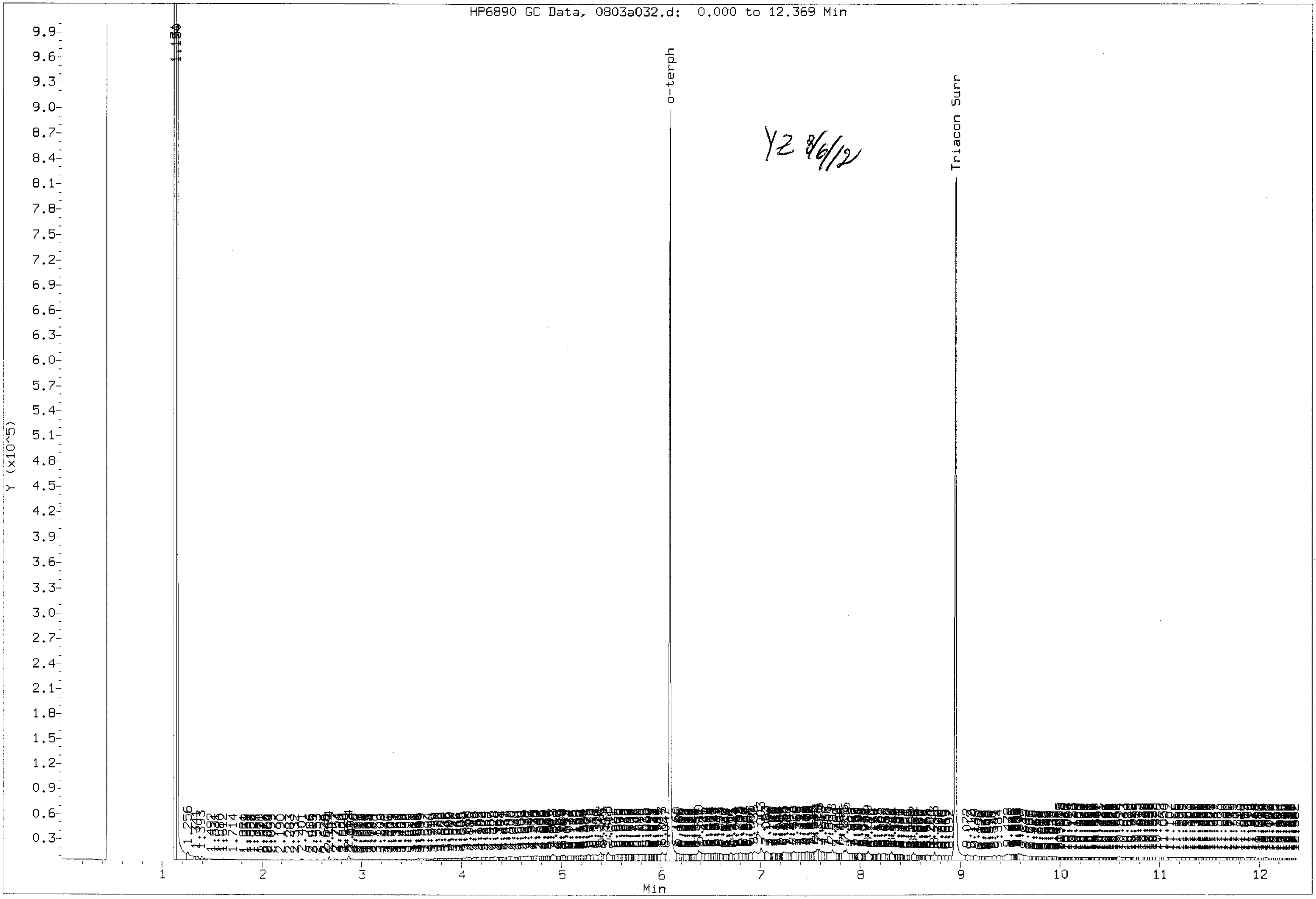
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



Data File: /chem3/fid4a.i/20120803.b/0803a032.d
Injection Date: 03-AUG-2012 23:43
Instrument: fid4a.i
Client Sample ID: MW-12D-073112



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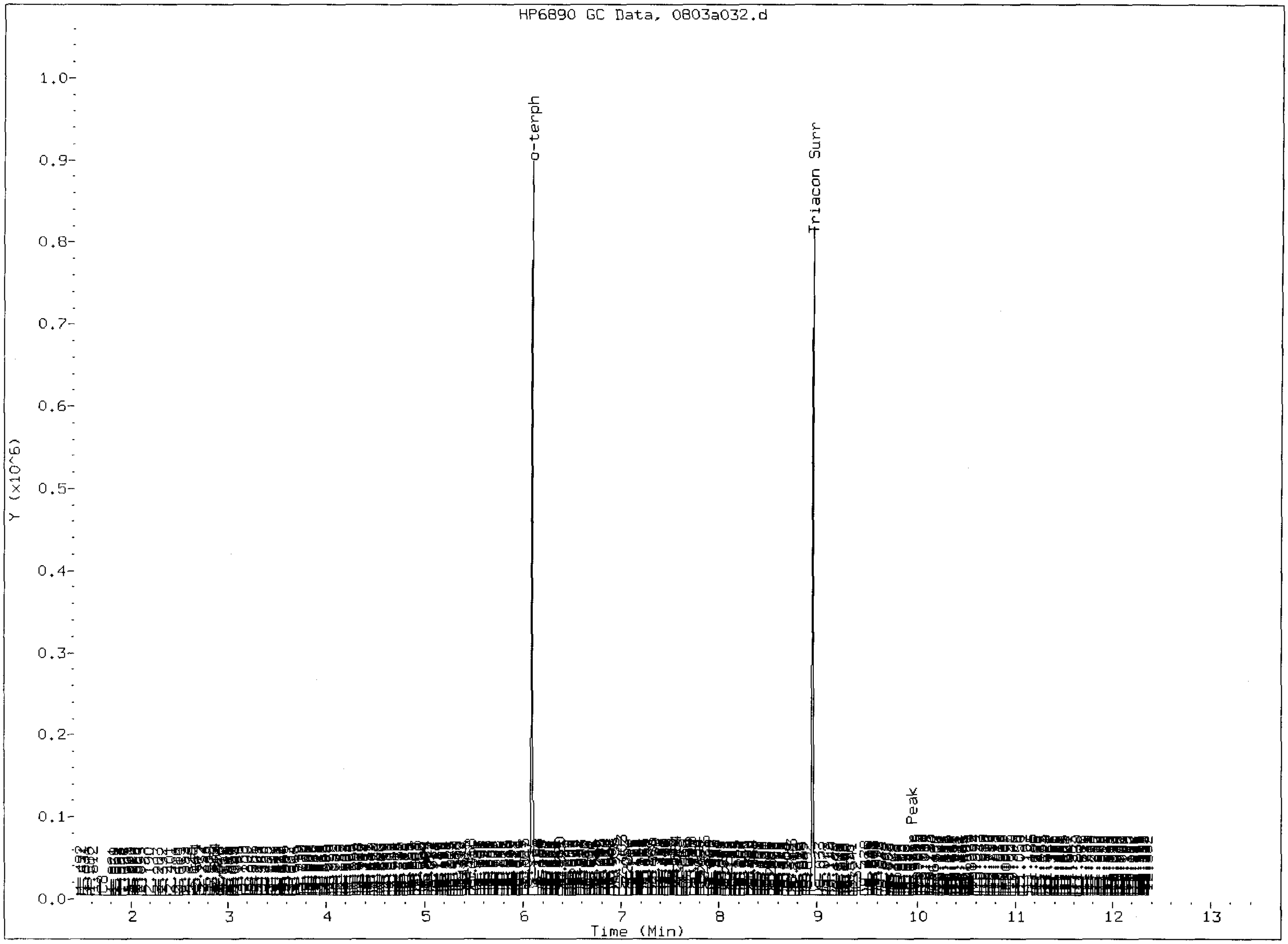
FID:4A-2C/RTX-1 VE38B FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: YB Date: 8/6/12

KZ 8/9/12

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                          Analytical Resources Inc.
                           407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a033.d       ARI ID: VE38C
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m         Client ID: MW-11D-073112
Instrument: fid4a.i                                    Injection: 04-AUG-2012 00:04
Operator: AR
Report Date: 08/06/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                     FID:4A RESULTS
Compound        RT    Shift   Height     Area          Range             Total Area   Conc
=================================================================================================
Toluene        1.405  0.002     5822      8144 |   GAS (Tol-C12)           201490     13.39
C8             1.682  0.001      567      1039 | DIESEL (C12-C24)          828885     56.58
C10            3.224 -0.009      541       106 |  M.OIL (C24-C38)          599916     47.73
C12            4.151  0.027     2306      3512 | AK-102 (C10-C25)         1012998     58.56
C14            4.811  0.006     3432      9141 | AK-103 (C25-C36)          495084     57.99
C16            5.379 -0.008     4179      5347 |
C18            5.942 -0.005     4273      7811 |
C20            6.537  0.017     4790      2555 |  JET-A (C10-C18)          484086     39.16
C22            7.062 -0.011     5034      6198 |MIN.OIL (C24-C38)          599916     44.63
C24            7.609  0.016     5883      3560 |
C25            7.840 -0.005     4987      2826 |
C26            8.081 -0.008     4825      6638 |
C28            8.534 -0.011     5533     12950 |
C32            9.382 -0.004     3445      6275 |
C34            9.780 -0.003     3148      5414 |
Filter Peak    9.941 -0.013     2661      3735 |BUNKERC (C10-C38)        1568481    205.46
C36           10.186  0.018     2477      1378 |
C38           10.535 -0.007     2875      2007 |
C40           10.913  0.001     3321      2249 |
o-terph        6.095  0.004   891251    769814 |
Triacon Surr   8.959 -0.026   781072    727111 |NAS DIES (C10-C24)        968564     56.53
===============================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)   OR Diesel(3.23 - 8.55)


    Surrogate        Area     Amount     %Rec
  --------------------------------------------
    o-Terphenyl     769814      37.8      84.0
    Triacontane     727111      38.1      84.7

M  Indicates the peak was manually integrated


        Analyte          RF       Curve Date
    --------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```
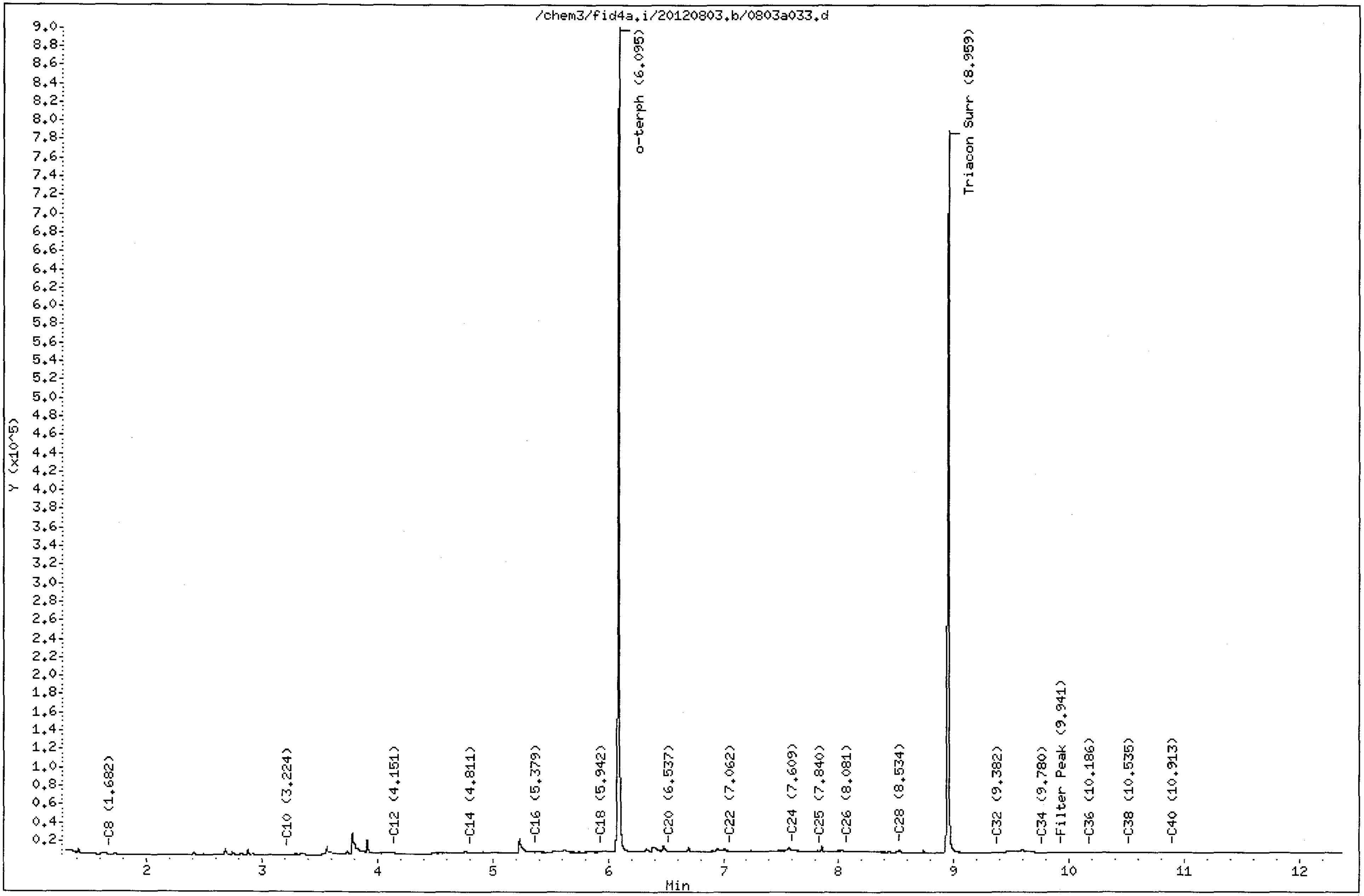

Data File: /chem3/fid4a.i/20120803.b/0803a033.d
Date : 04-AUG-2012 00:04
Client ID: MW-11D-073112
Sample Info: VE38C

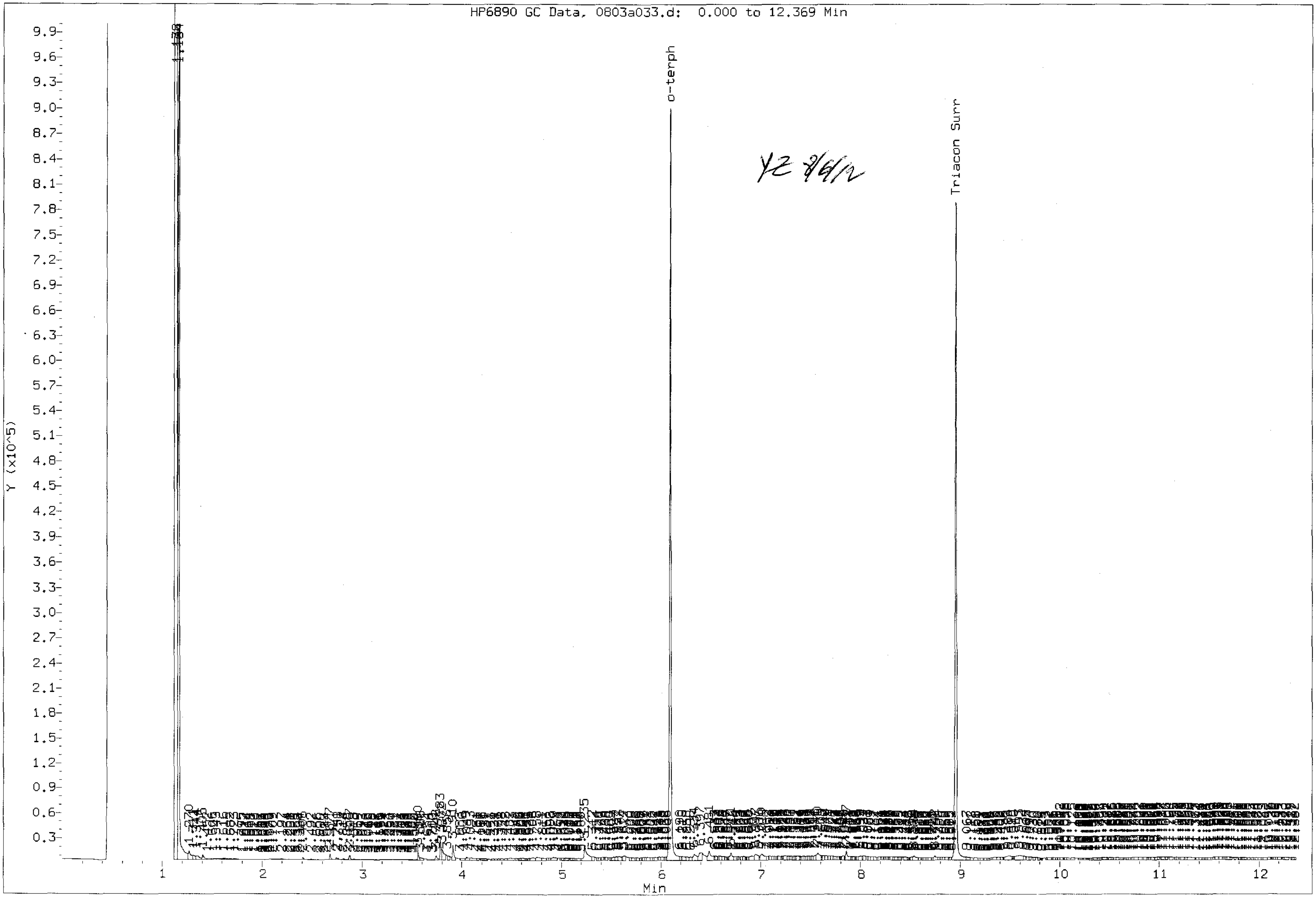
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



Data File: /chem3/fid4a.i/20120803.b/0803a033.d
Injection Date: 04-AUG-2012 00:04
Instrument: fid4a.i
Client Sample ID: MW-11D-073112



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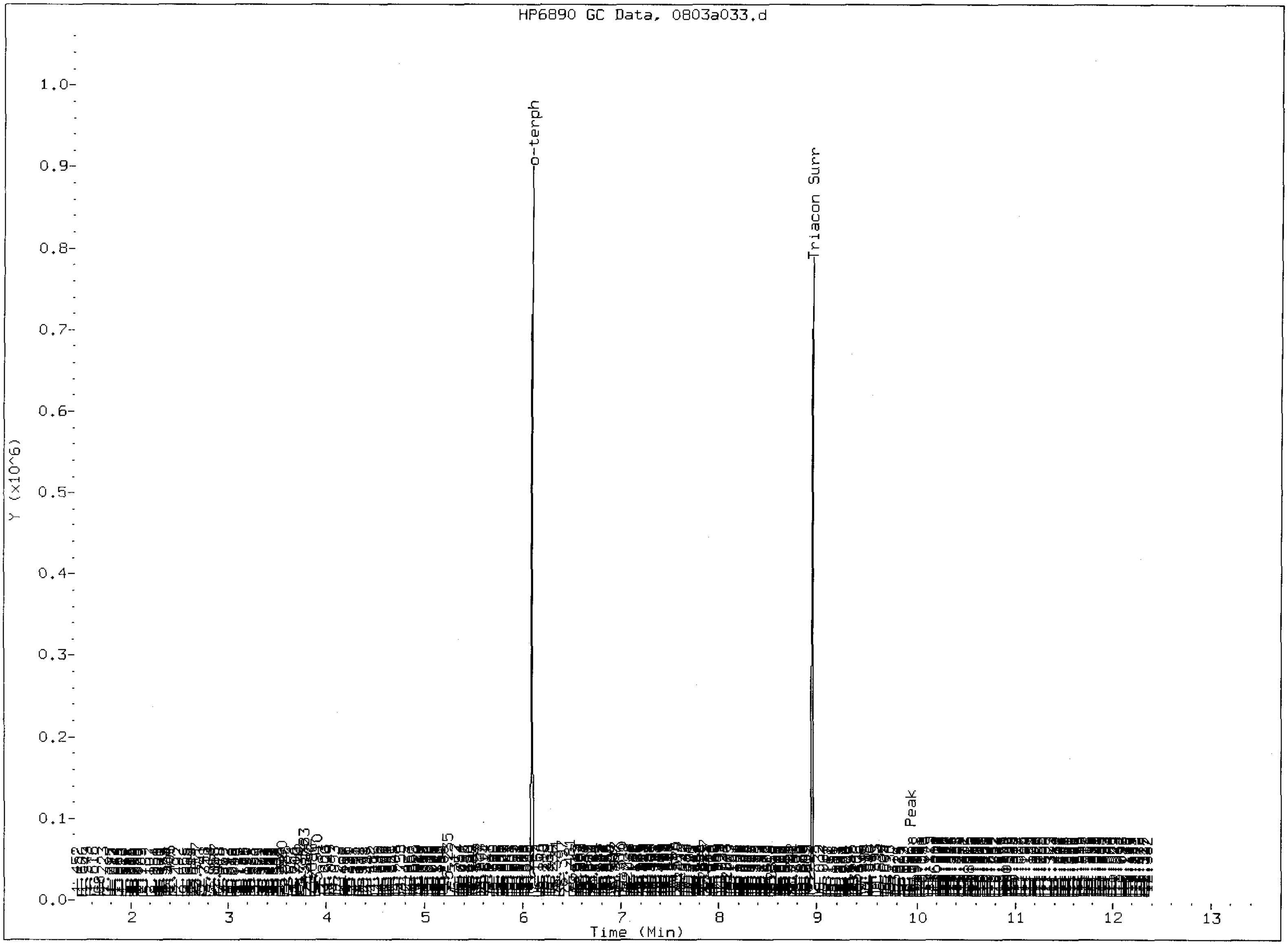
FID:4A-2C/RTX-1 VE38C FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: YZ Date: 8/6/12

YZ 8/6/12

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                          Analytical Resources Inc.
                           407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a034.d      ARI ID: VE38D
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m        Client ID: MW-12S-073112
Instrument: fid4a.i                                   Injection: 04-AUG-2012 00:25
Operator: AR
Report Date: 08/06/2012                              Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                     FID:4A RESULTS
Compound        RT     Shift    Height     Area          Range           Total Area    Conc
=========================================================================================
Toluene        1.395  -0.009     4139     10948 |   GAS (Tol-C12)          362290     24.08
C8             1.714   0.033      669      1744 | DIESEL (C12-C24)        3606354    246.17
C10            3.249   0.016     1655      3428 |  M.OIL (C24-C38)        1033244     82.21
C12            4.102  -0.021     9346      4985 | AK-102 (C10-C25)        3987276    230.49
C14            4.795  -0.010    29991     71953 | AK-103 (C25-C36)         863407    101.13
C16            5.400   0.012    18061     24738 |
C18            5.936  -0.012    15206     26223 |
C20            6.525   0.004    12952      7640 |  JET-A (C10-C18)        2624160    212.28
C22            7.075   0.003    12900      5110 |MIN.OIL (C24-C38)        1033244     76.87
C24            7.603   0.010    12746      8270 |
C25            7.837  -0.007    11798      9600 |
C26            8.082  -0.006    10200     15226 |
C28            8.551   0.005     7611      8394 |
C32            9.389   0.002     4924      4972 |
C34            9.785   0.002     3749      2119 |
Filter Peak    9.961   0.008     3397      3221 |BUNKERC (C10-C38)        4914941    643.82
C36           10.163  -0.005     3123      2908 |
C38           10.545   0.002     3230      4109 |
C40           10.902  -0.011     3643      5329 |
o-terph        6.093   0.002   928954    816652 |
Triacon Surr   8.961  -0.024   801764    792225 |NAS DIES (C10-C24)       3881697    226.55
=========================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)    Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)    OR Diesel(3.23 - 8.55)


    Surrogate        Area     Amount     %Rec
  ----------------------------------------------
    o-Terphenyl     816652     40.1      89.1
    Triacontane     792225     41.5      92.2

M  Indicates the peak was manually integrated

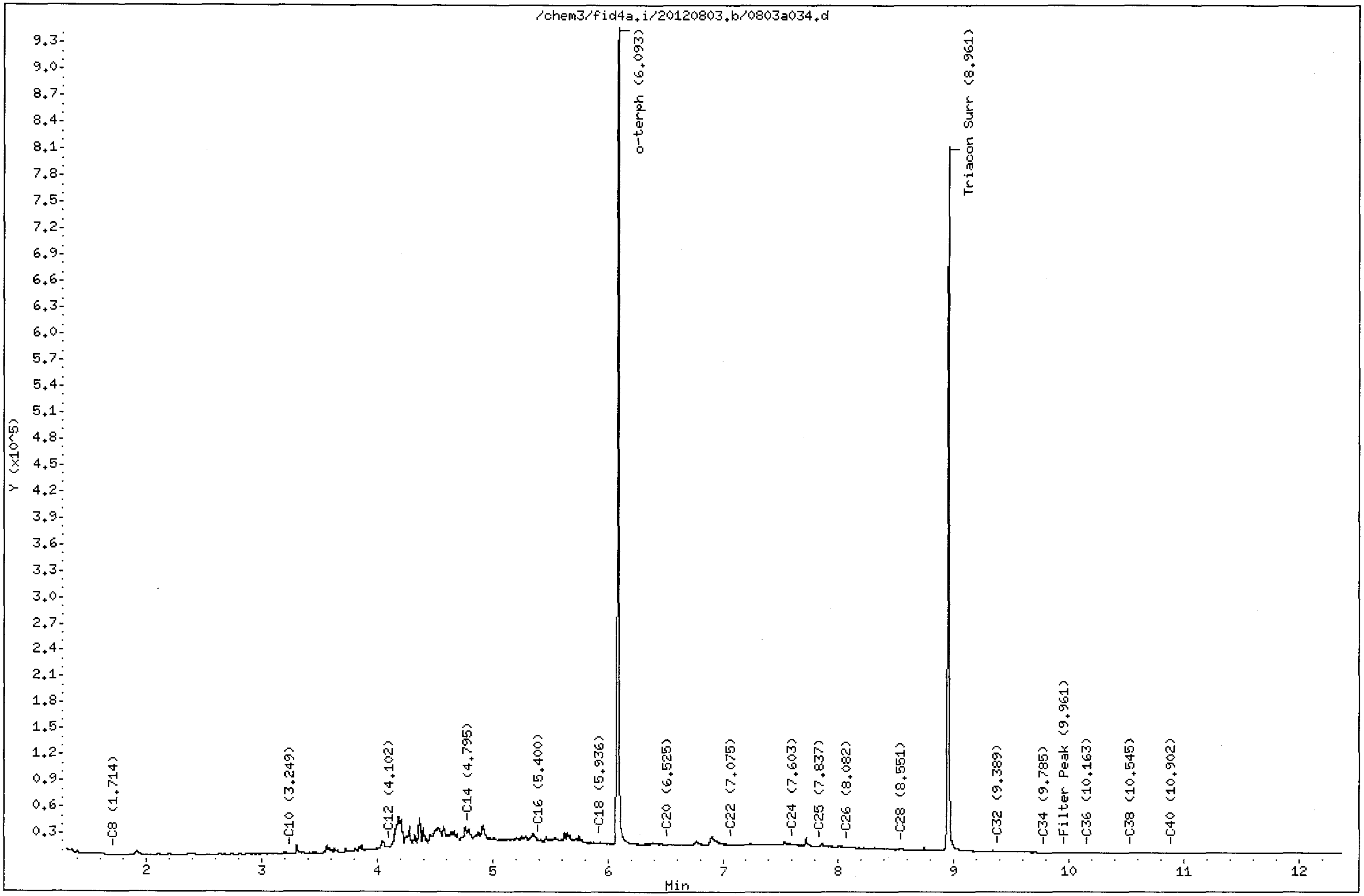

      Analyte            RF      Curve Date
    -------------------------------------------
     o-Terph Surr     20371.2   10-JUL-2012
     Triacon Surr     19086.0   12-JUN-2012
     Gas              15043.9   10-MAY-2012
     Diesel           14650.0   10-JUL-2012
     Motor Oil        12569.0   12-JUN-2012
     AK102            17299.0   10-JUL-2012
     AK103             8538.0   24-MAY-2012
     JetA             12362.0   31-JUL-2012
     Min Oil          13440.7   09-MAY-2012
     NAS Diesel        17134.0   10-JUL-2012
     Bunker C          7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120803.b/0803a034.d
Date : 04-AUG-2012 00:25
Client ID: MW-12S-073112
Sample Info: VE38D

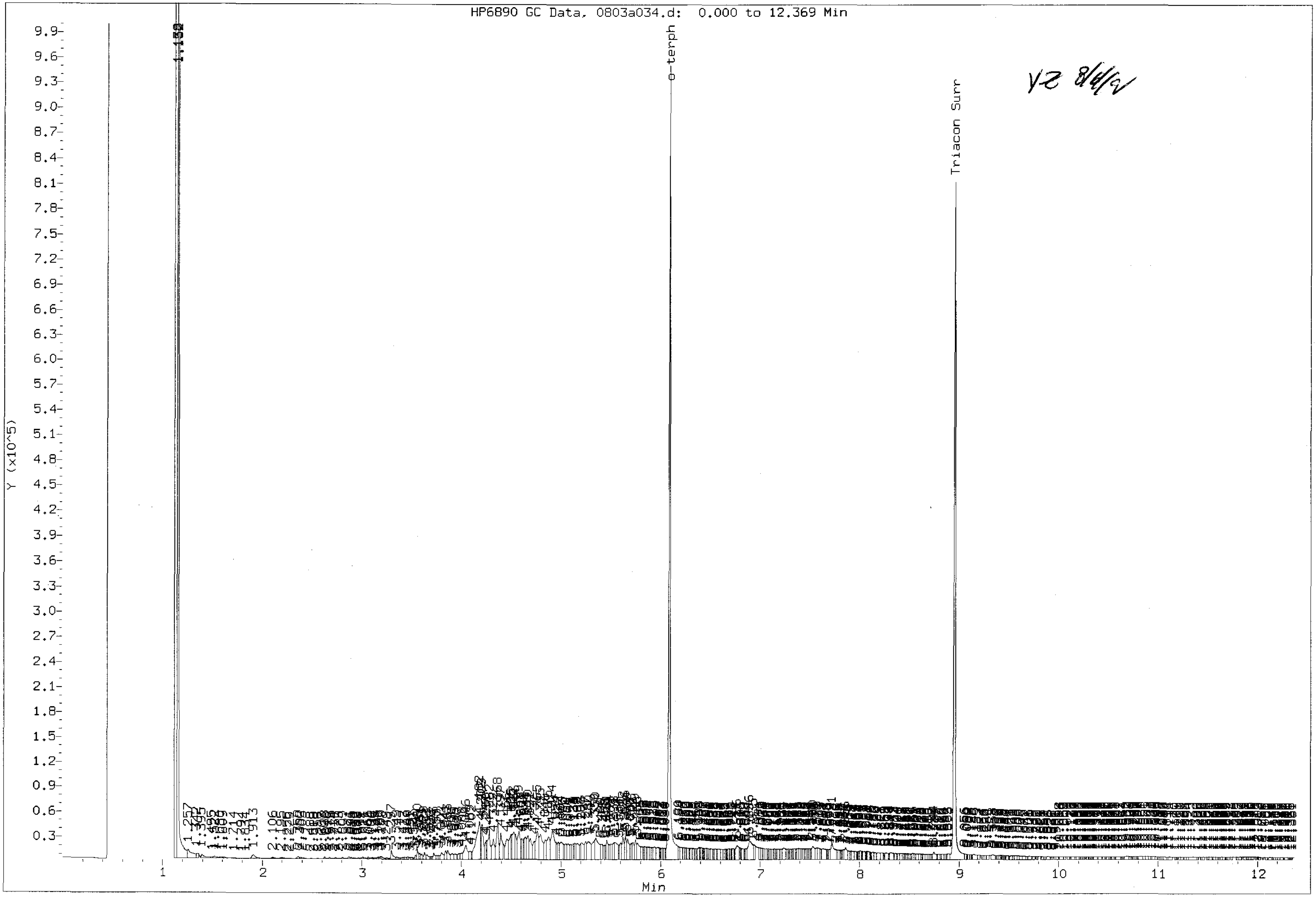
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



Data File: /chem3/fid4a.i/20120803.b/0803a034.d
Injection Date: 04-AUG-2012 00:25
Instrument: fid4a.i
Client Sample ID: MW-12S-073112



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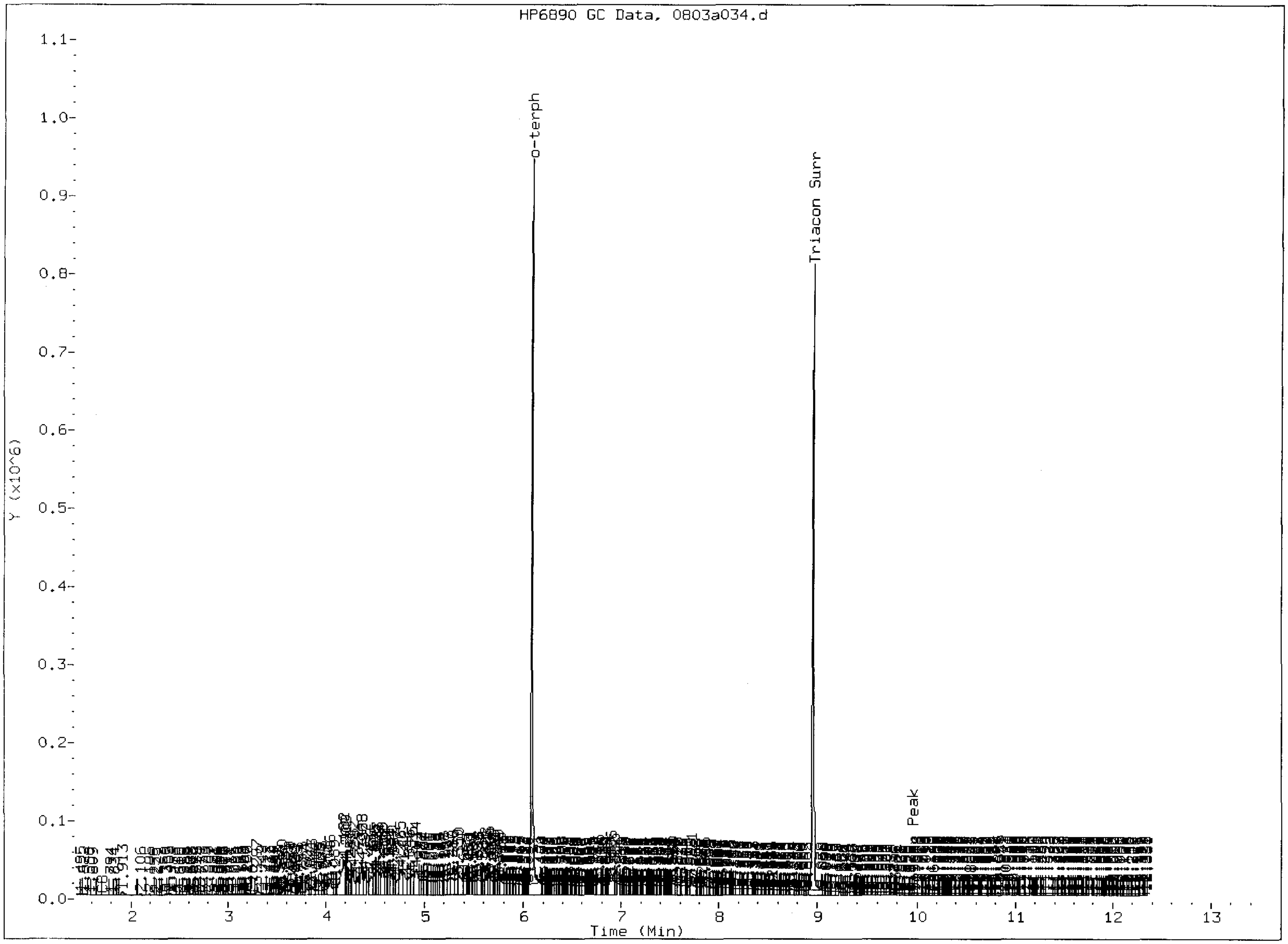
FID:4A-2C/RTX-1 VE38D FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: YZ Date: 8/6/12

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                         Analytical Resources Inc.
                          407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a035.d        ARI ID: VE38E
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m          Client ID: MW-11S-073112
Instrument: fid4a.i                                     Injection: 04-AUG-2012 00:47
Operator: AR
Report Date: 08/06/2012                                Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                     FID:4A RESULTS
Compound         RT     Shift    Height      Area          Range            Total Area   Conc
============================================================================================
Toluene        1.401  -0.003      5835      8813 |   GAS (Tol-C12)           194699    12.94
C8             1.718   0.037      1134      2255 | DIESEL (C12-C24)         2542149   173.53
C10            3.242   0.008       991       773 |  M.OIL (C24-C38)          852127    67.80
C12            4.118  -0.006      3629      4056 | AK-102 (C10-C25)         2770317   160.14
C14            4.802  -0.004     10312     23707 | AK-103 (C25-C36)          696205    81.54
C16            5.367  -0.021     13770     31669 |
C18            5.938  -0.010     12408     26071 |
C20            6.536   0.015     17603     45614 |  JET-A (C10-C18)         1203167    97.33
C22            7.084   0.012     14328     25818 |MIN.OIL (C24-C38)          852127    63.40
C24            7.567  -0.026     21724     18423 |
C25            7.836  -0.009     10389      7560 |
C26            8.081  -0.008      8210     13070 |
C28            8.551   0.005      6863     13135 |
C32            9.387   0.001      3891      8665 |
C34            9.766  -0.017      2865      3587 |
Filter Peak    9.960   0.006      2601      2670 |BUNKERC (C10-C38)        3521043   461.23
C36           10.165  -0.003      2438      2911 |
C38           10.544   0.001      2828      5346 |
C40           10.896  -0.016      3305      2696 |
o-terph        6.091   0.000    834033    786420 |
Triacon Surr   8.961  -0.024    799140    761309 |NAS DIES (C10-C24)       2668915   155.77
============================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)   OR Diesel(3.23 - 8.55)


    Surrogate        Area     Amount     %Rec
  ------------------------------------------
    o-Terphenyl     786420     38.6      85.8
    Triacontane     761309     39.9      88.6

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
     -------------------------------------
      o-Terph Surr    20371.2   10-JUL-2012
      Triacon Surr    19086.0   12-JUN-2012
      Gas             15043.9   10-MAY-2012
      Diesel          14650.0   10-JUL-2012
      Motor Oil       12569.0   12-JUN-2012
      AK102           17299.0   10-JUL-2012
      AK103            8538.0   24-MAY-2012
      JetA            12362.0   31-JUL-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       17134.0   10-JUL-2012
      Bunker C         7634.0   13-JUL-2012
```

YZ 8/6/12

Data File: /chem3/fid4a.i/20120803.b/0803a035.d

Date : 04-AUG-2012 00:47

Client ID: MW-11S-073112

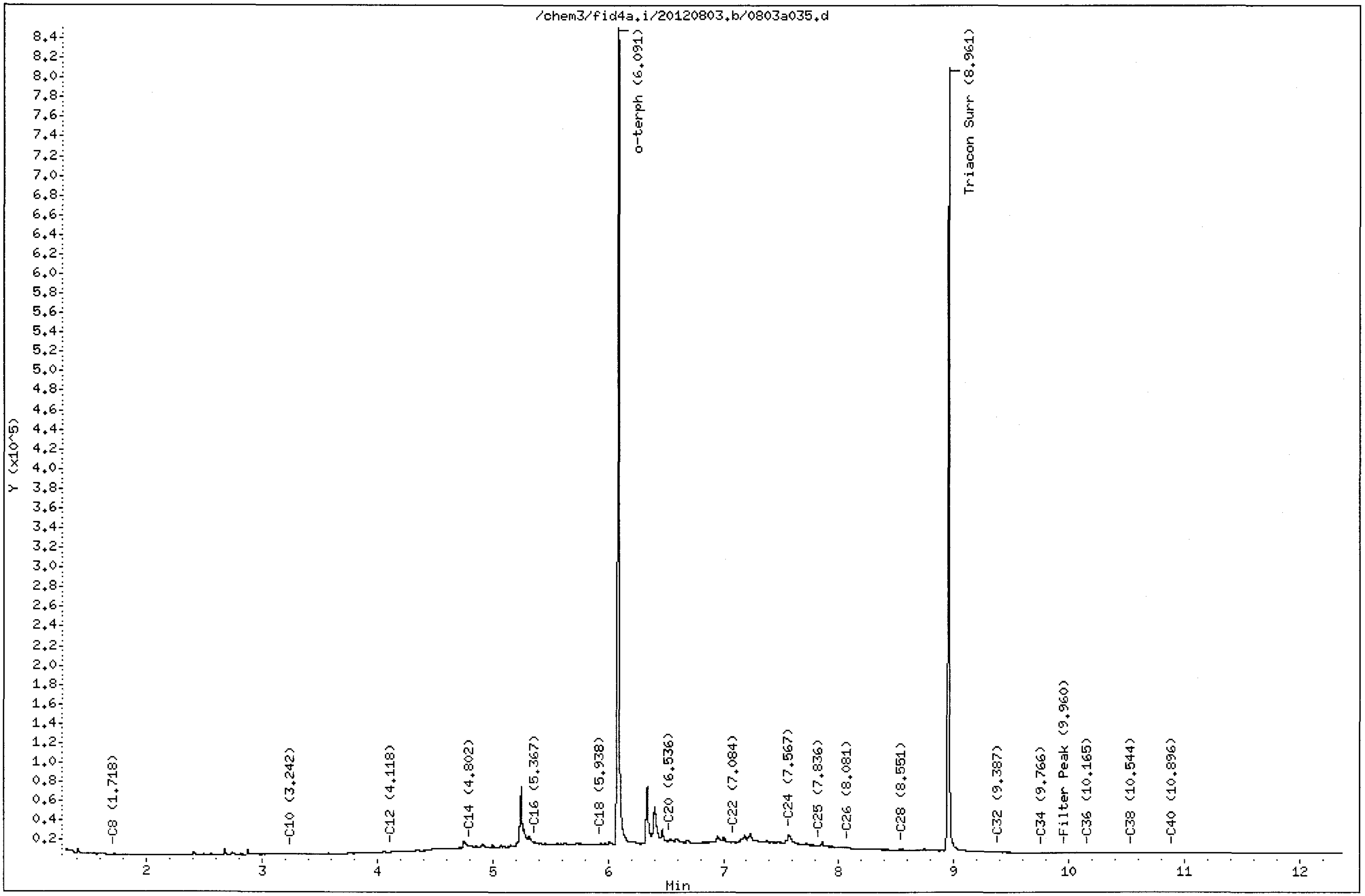
Instrument: fid4a.i

Sample Info: VE38E

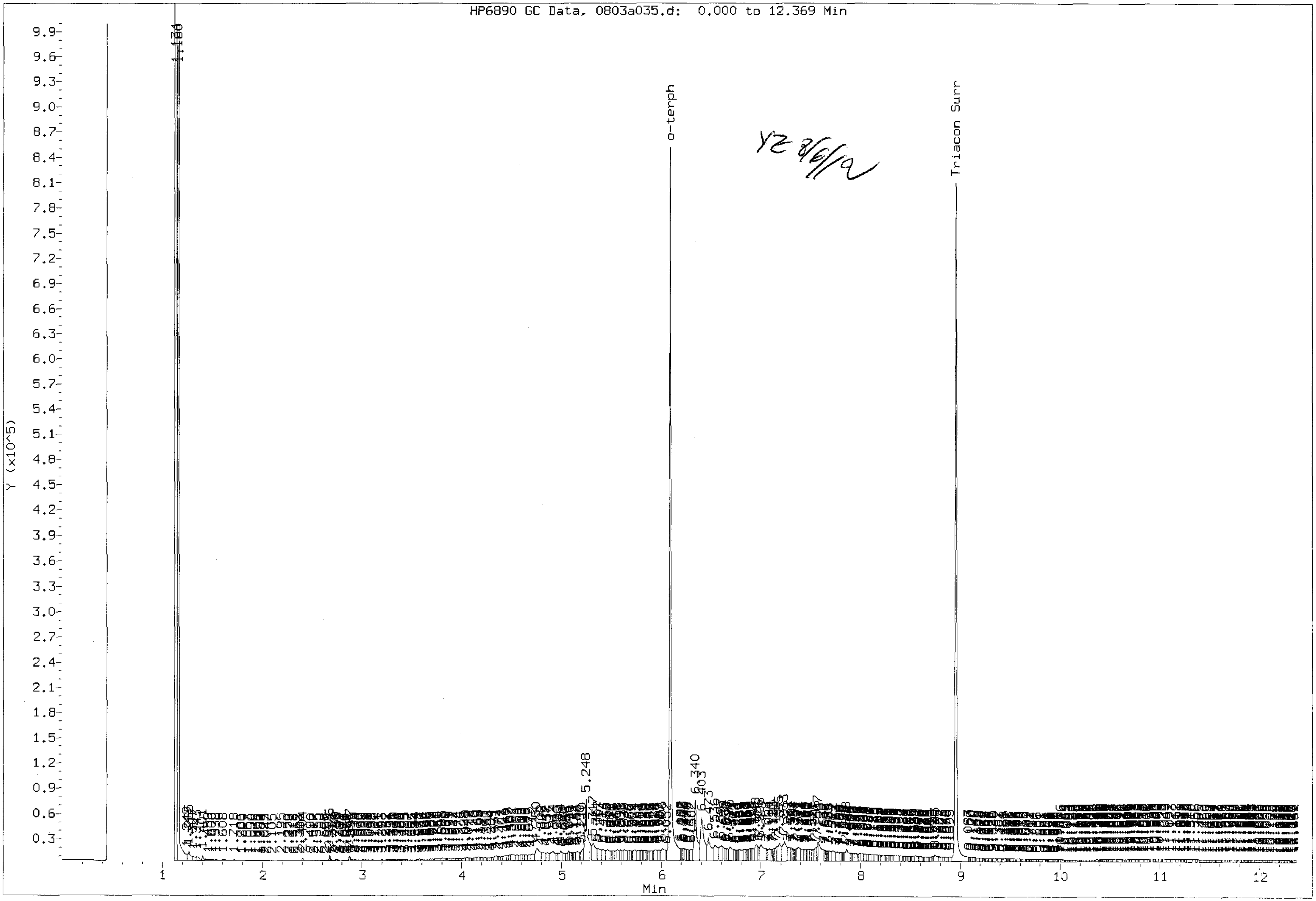
Operator: AR

Column phase: RTX-1

Column diameter: 0.25

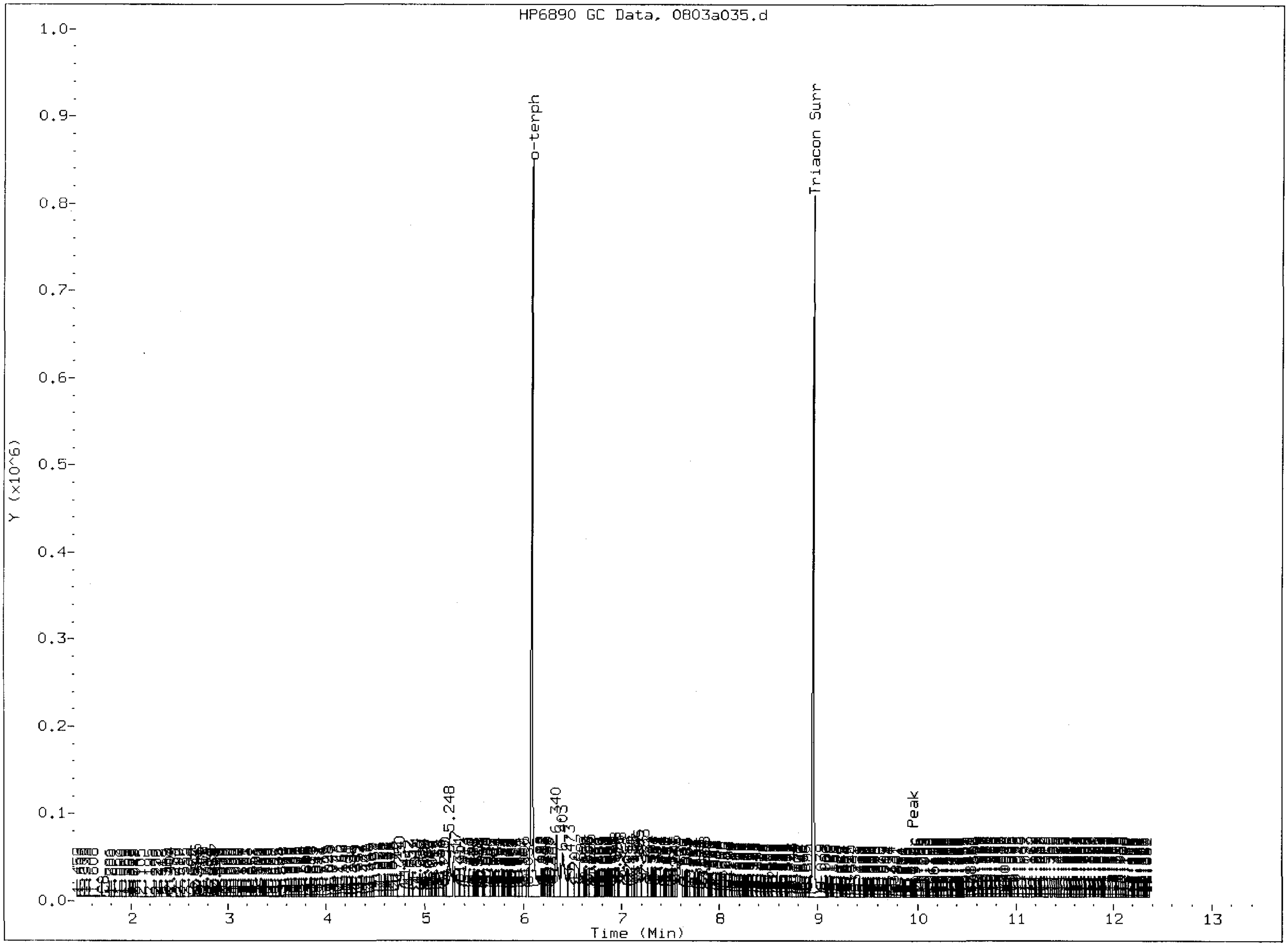


Data File: /chem3/fid4a.i/20120803.b/0803a035.d
Injection Date: 04-AUG-2012 00:47
Instrument: fid4a.i
Client Sample ID: MW-11S-073112



YZ 8/6/12

FID:4A-2C/RTX-1 VE38E FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: YZ Date: 2/6/12

HCID SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500

Client ID	O-TER	TOT OUT
MB-080312	84.9%	0
LCS-080312	85.1%	0
LCSD-080312	85.7%	0
MW-16D-073112	108%	0
MW-12D-073112	84.8%	0
MW-11D-073112	84.0%	0
MW-12S-073112	89.1%	0
MW-11S-073112	85.8%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(55-110)	(50-150)

Prep Method: SW3510C
Log Number Range: 12-14610 to 12-14614

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Page 1 of 1

Sample ID: LCS-080312
LCS/LCSD

Lab Sample ID: LCS-080312
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted LCS/LCSD: 08/03/12

Date Analyzed LCS: 08/03/12 22:39
LCSD: 08/03/12 23:00
Instrument/Analyst LCS: FID/YZ
LCSD: FID/YZ

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Diesel	2.51	3.00	83.7%	2.60	3.00	86.7%	3.5%

HCID Surrogate Recovery

	LCS	**LCSD**
o-Terphenyl	85.1%	85.7%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

```
                        Analytical Resources Inc.
                       407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a029.d       ARI ID: VE38LCSW1
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m         Client ID: VE38LCSW1
Instrument: fid4a.i                                    Injection: 03-AUG-2012 22:39
Operator: AR
Report Date: 08/06/2012                               Dilution Factor:    1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                     FID:4A RESULTS
Compound         RT     Shift    Height      Area            Range             Total Area    Conc
====================================================================================================
Toluene        1.414    0.010      5201     11168 |   GAS (Tol-C12)             3624700    240.94
C8             1.674   -0.006      4643     10647 | DIESEL (C12-C24)           18379191   1254.55
C10            3.235    0.002     63921     85950 |  M.OIL (C24-C38)             190206     15.13
C12            4.119   -0.005    189870    174921 | AK-102 (C10-C25)           21000866   1213.99
C14            4.794   -0.011    324003    383461 | AK-103 (C25-C36)             117280     13.74
C16            5.384   -0.003    518429    737232 |
C18            5.952    0.004    450212    612549 |
C20            6.517   -0.004    309566    412383 |  JET-A (C10-C18)           15387044   1244.71
C22            7.066   -0.006    149675    198343 |MIN.OIL (C24-C38)             190206     14.15
C24            7.596    0.003     30888     82790 |
C25            7.849    0.005     13746     10287 |
C26            8.091    0.002      6454     11363 |
C28            8.538   -0.008      1529      1256 |
C32            9.389    0.002      1703      2171 |
C34            9.790    0.007       201       394 |
Filter Peak    9.951   -0.003       318       356 |BUNKERC (C10-C38)          21134846   2768.52
C36           10.175    0.007       577       270 |
C38           10.508   -0.034      1184      1882 |
C40           10.879   -0.033      2212      8711 |
o-terph        6.097    0.006    905513    780206 |
Triacon Surr   8.962   -0.023    724084    797569 |NAS DIES (C10-C24)         20944640   1222.40
====================================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)    Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)    OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------------
    o-Terphenyl     780206      38.3      85.1
    Triacontane     797569      41.8      92.9

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
      --------------------------------------
       o-Terph Surr    20371.2   10-JUL-2012
       Triacon Surr    19086.0   12-JUN-2012
       Gas             15043.9   10-MAY-2012
       Diesel          14650.0   10-JUL-2012
       Motor Oil       12569.0   12-JUN-2012
       AK102           17299.0   10-JUL-2012
       AK103            8538.0   24-MAY-2012
       JetA            12362.0   31-JUL-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       17134.0   10-JUL-2012
       Bunker C         7634.0   13-JUL-2012
```

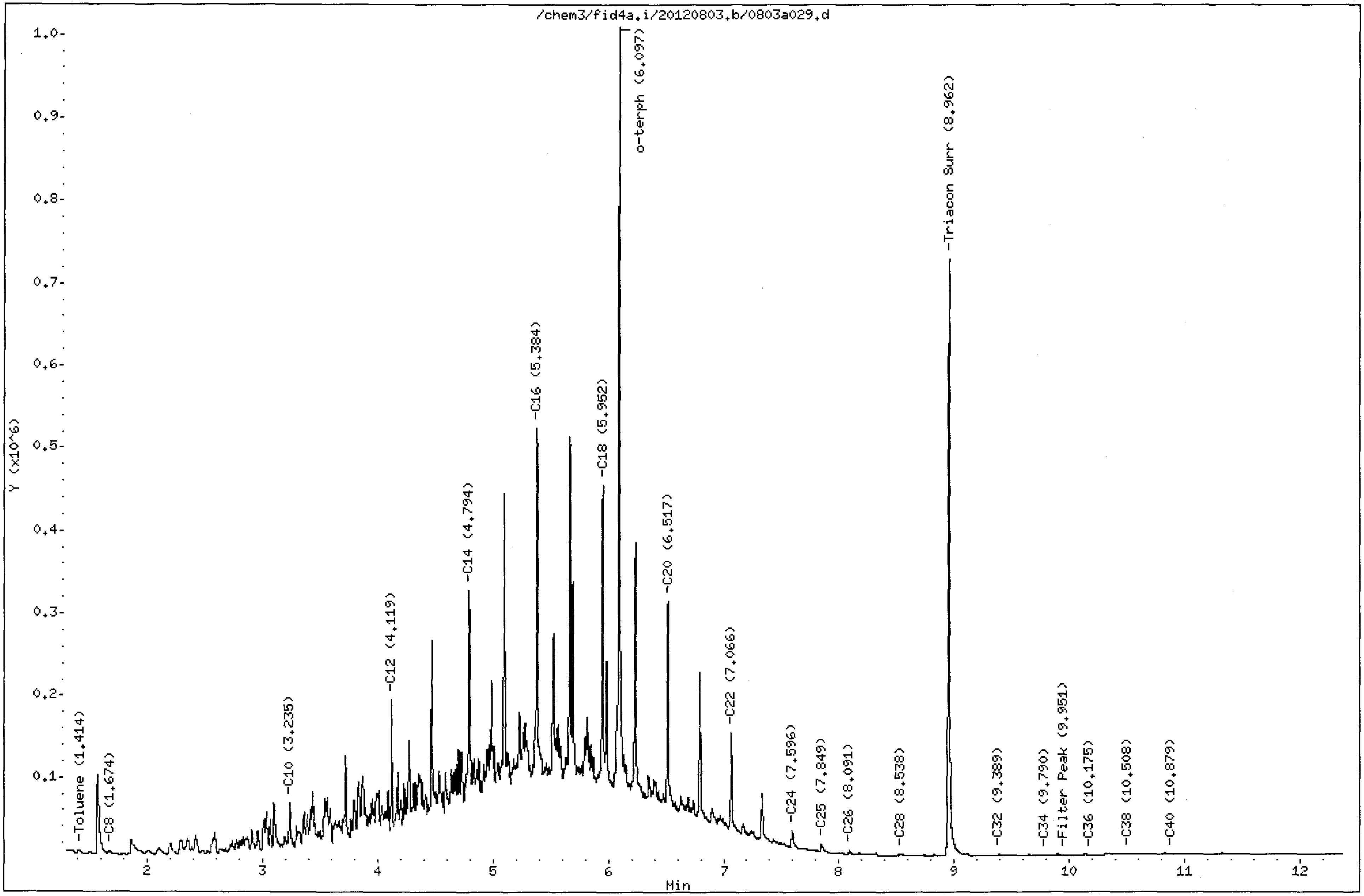
YZ 8/6/12

Data File: /chem3/fid4a.i/20120803.b/0803a029.d
Date : 03-AUG-2012 22:39
Client ID: VE38LCSW1
Sample Info: VE38LCSW1

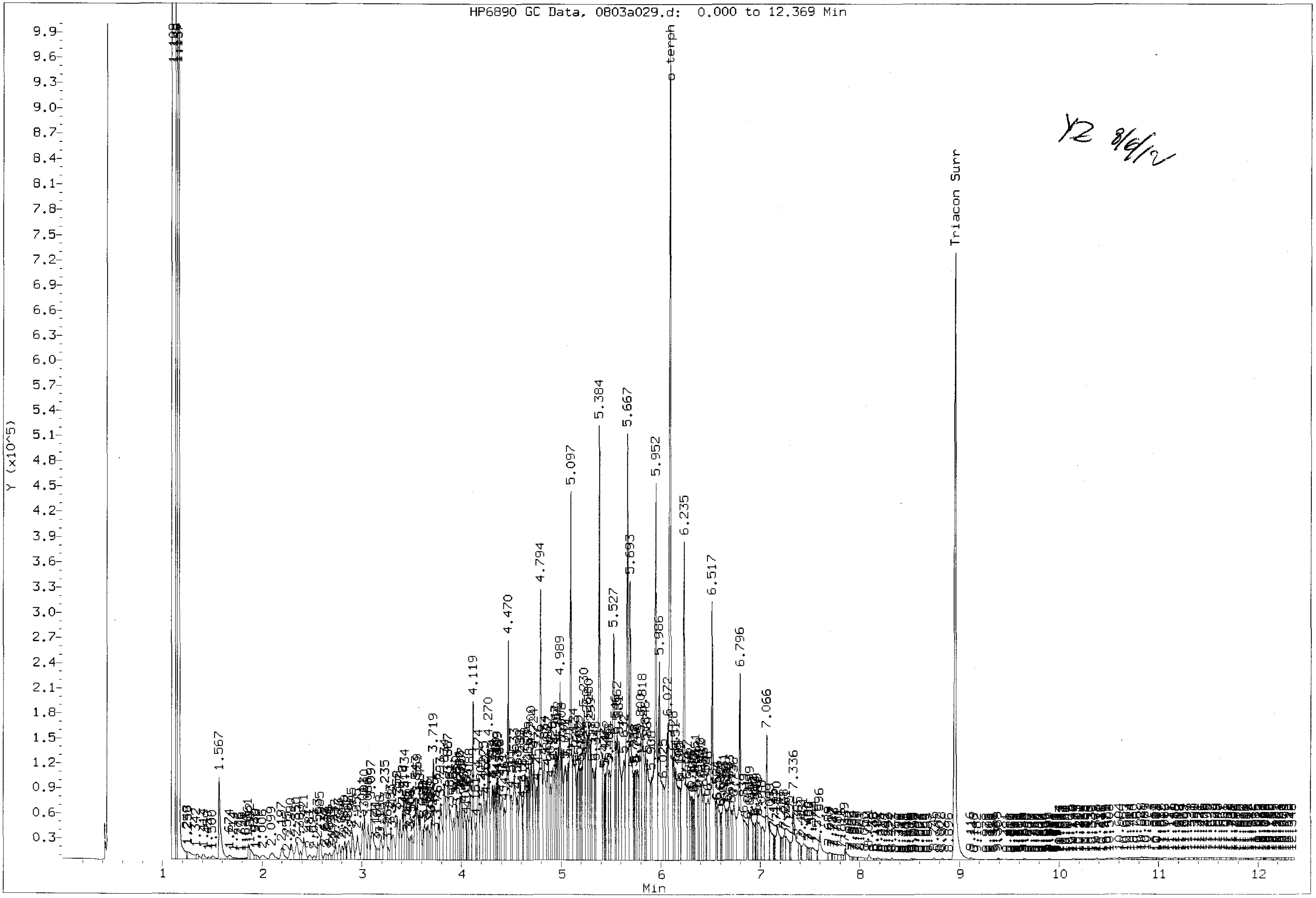
Instrument: fid4a.i

Operator: AR
Column diameter: 0.25

Column phase: RTX-1

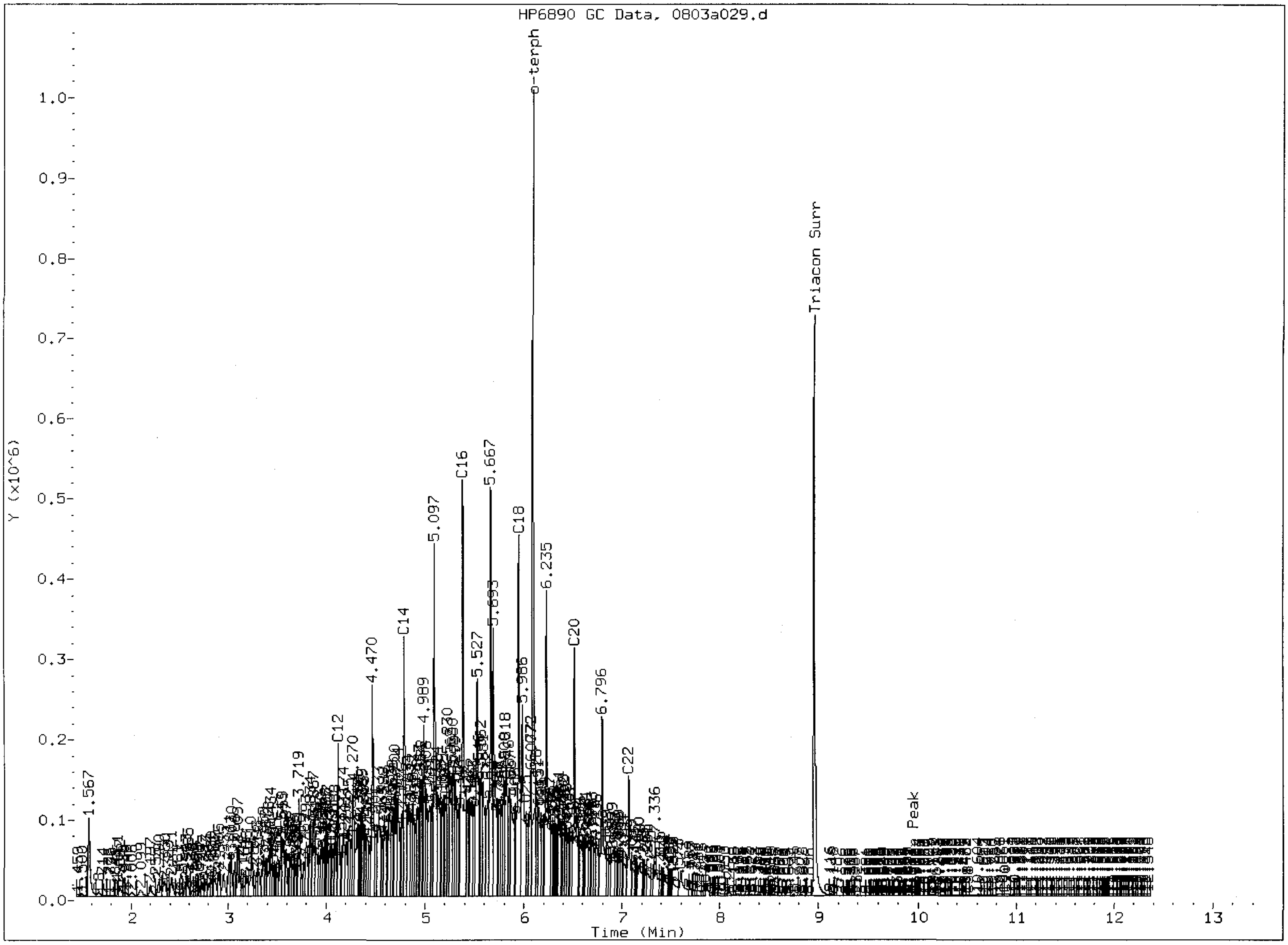


Data File: /chem3/fid4a.i/20120803.b/0803a029.d
Injection Date: 03-AUG-2012 22:39
Instrument: fid4a.i
Client Sample ID: VE38LCSW1


HP6890 GC Data, 0803a029.d: 0.000 to 12.369 Min

Y2 8/6/12

FID:4A-2C/RTX-1 VE38LCSW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: VZ Date: 8/6/[illegible]

```
                         Analytical Resources Inc.
                      407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120803.b/0803a030.d        ARI ID: VE38LCSDW1
Method: /chem3/fid4a.i/20120803.b/ftphfid4a.m          Client ID: VE38LCSDW1
Instrument: fid4a.i                                     Injection: 03-AUG-2012 23:00
Operator: AR
Report Date: 08/06/2012                                Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound        RT    Shift   Height     Area          Range          Total Area   Conc
===============================================================================================
Toluene        1.406   0.003    6205     11080 |  GAS (Tol-C12)          3564587    236.95
C8             1.677  -0.004    4770     10168 | DIESEL (C12-C24)       19024001   1298.57
C10            3.234   0.000   63870     83057 |  M.OIL (C24-C38)         200293     15.94
C12            4.119  -0.005  196721    174084 | AK-102 (C10-C25)       21601734   1248.73
C14            4.794  -0.012  339514    387091 | AK-103 (C25-C36)         129532     15.17
C16            5.384  -0.004  532614    649219 |
C18            5.952   0.004  470597    625751 |
C20            6.518  -0.003  322850    479604 |  JET-A (C10-C18)       15753691   1274.36
C22            7.067  -0.005  152779    173051 |MIN.OIL (C24-C38)         200293     14.90
C24            7.598   0.005   31345     72417 |
C25            7.851   0.006   14885     28339 |
C26            8.093   0.004    6524     10770 |
C28            8.538  -0.008    1459      1165 |
C32            9.386  -0.001    1892      2930 |
C34            9.786   0.002     124       146 |
Filter Peak    9.950  -0.004     261       228 |BUNKERC (C10-C38)      21756050   2849.89
C36           10.181   0.013     499       725 |
C38           10.550   0.007    1251       639 |
C40           10.909  -0.003    1880      3660 |
o-terph        6.097   0.006  905167    785789 |
Triacon Surr   8.962  -0.023  729263    801862 |NAS DIES (C10-C24)     21555757   1258.07
===============================================================================================
Range Times:  NW Diesel(4.124 - 7.593)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.95)
               NW M.Oil(7.59 - 10.54)    AK103(7.84 - 10.17)   OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  ------------------------------------------------
    o-Terphenyl     785789      38.6      85.7
    Triacontane     801862      42.0      93.4

M  Indicates the peak was manually integrated


        Analyte           RF      Curve Date
      ------------------------------------------
       o-Terph Surr    20371.2   10-JUL-2012
       Triacon Surr    19086.0   12-JUN-2012
       Gas             15043.9   10-MAY-2012
       Diesel          14650.0   10-JUL-2012
       Motor Oil       12569.0   12-JUN-2012
       AK102           17299.0   10-JUL-2012
       AK103            8538.0   24-MAY-2012
       JetA            12362.0   31-JUL-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       17134.0   10-JUL-2012
       Bunker C         7634.0   13-JUL-2012
```

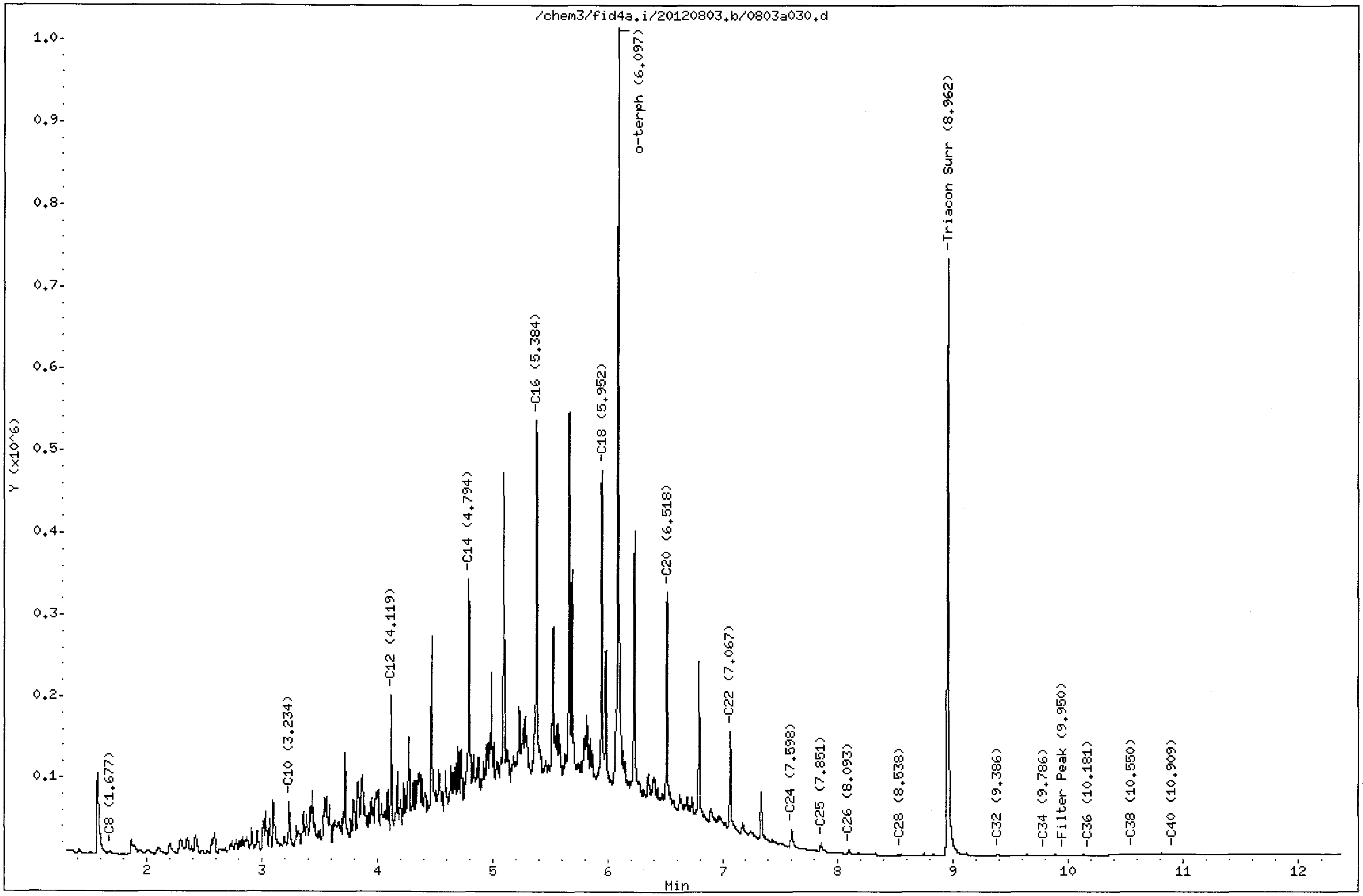
YZ 8/6/12

Data File: /chem3/fid4a.i/20120803.b/0803a030.d
Date : 03-AUG-2012 23:00
Client ID: VE38LCSDW1
Sample Info: VE38LCSDW1

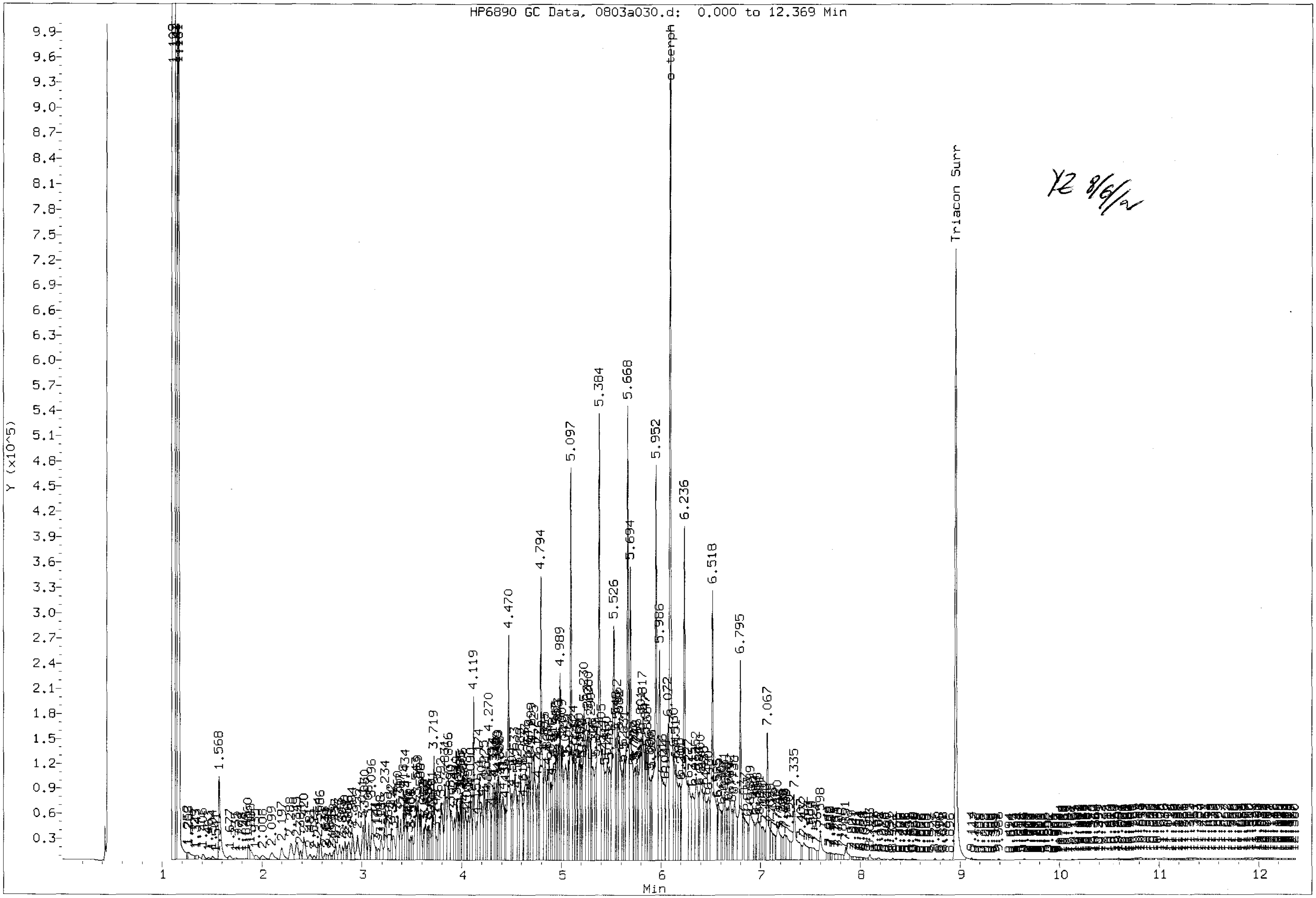
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25

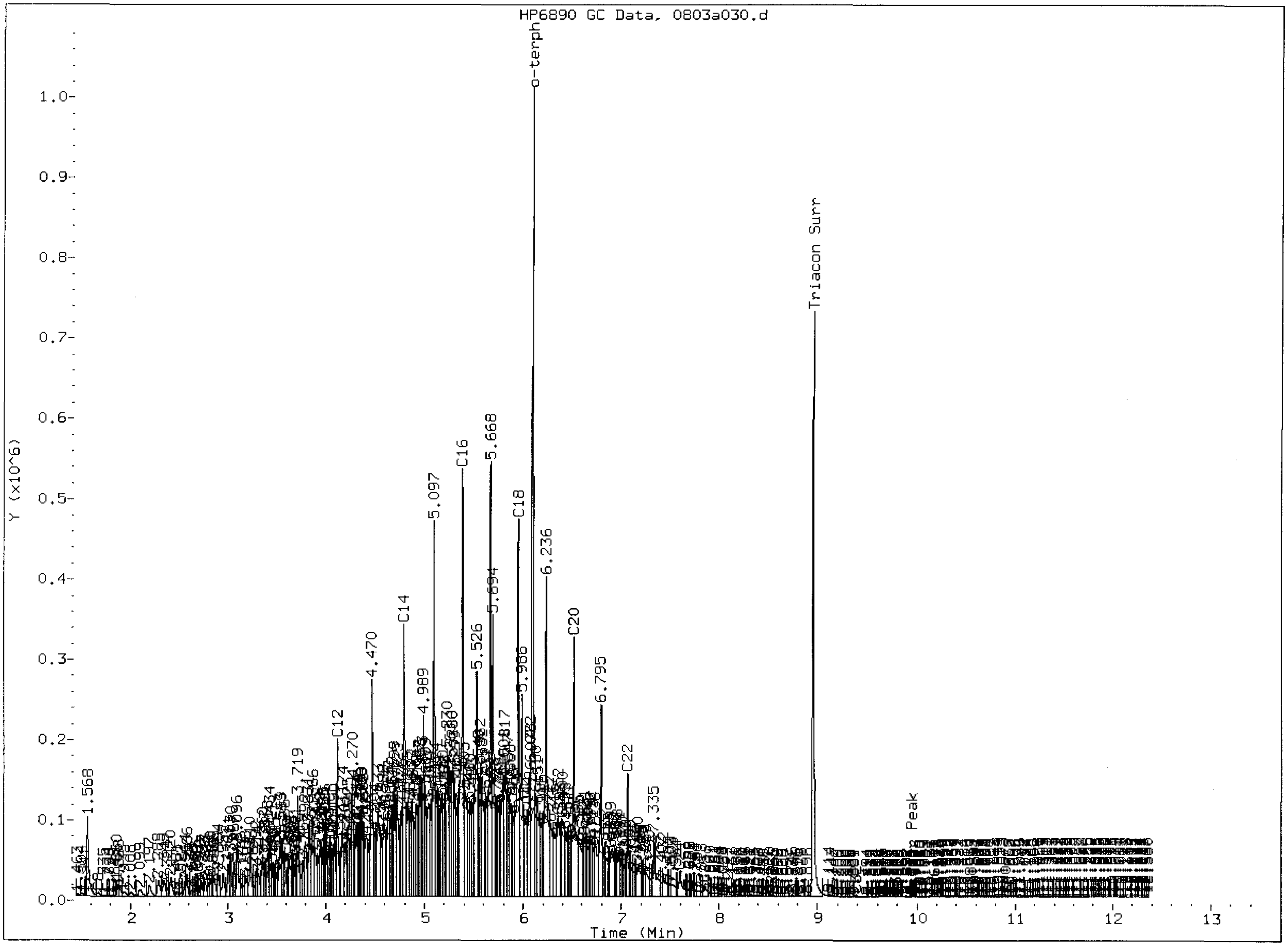


Data File: /chem3/fid4a.i/20120803.b/0803a030.d
Injection Date: 03-AUG-2012 23:00
Instrument: fid4a.i
Client Sample ID: VE38LCSDW1



Y2 8/6/12

FID:4A-2C/RTX-1 VE38LCSDW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate ✓

Analyst: YZ Date: 8/6/12

TOTAL HCID RANGE HYDROCARBONS-EXTRACTION REPORT

Matrix: Water
Date Received: 08/01/12

ARI Job: VE38
Project: Cornwall
0001020.400.500

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
12-14610-080312MB	Method Blank	500 mL	1.00 mL	08/03/12
12-14610-080312LCS	Lab Control	500 mL	1.00 mL	08/03/12
12-14610-080312LCSD	Lab Control Dup	500 mL	1.00 mL	08/03/12
12-14610-VE38A	MW-16D-073112	500 mL	1.00 mL	08/03/12
12-14611-VE38B	MW-12D-073112	500 mL	1.00 mL	08/03/12
12-14612-VE38C	MW-11D-073112	500 mL	1.00 mL	08/03/12
12-14613-VE38D	MW-12S-073112	500 mL	1.00 mL	08/03/12
12-14614-VE38E	MW-11S-073112	500 mL	1.00 mL	08/03/12

ORGANICS ANALYSIS DATA SHEET
TOTAL DIESEL RANGE HYDROCARBONS
NWTPHD by GC/FID-Silica and Acid Cleaned
Extraction Method:
Page 1 of 1

QC Report No: VE90-Landau Associates
Project: Cornwall
0001020.400.500

Matrix: Water
Data Release Authorized: MW
Reported: 08/07/12

ARI ID	Sample ID	Extraction Date	Analysis Date	EFV DL	Range/Surrogate	RL	Result
MB-080612	Method Blank	08/06/12	08/07/12	1.00	Diesel Range	0.10	< 0.10 U
12-14876	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		83.4%
VE90A	MW-16D-073112	08/06/12	08/07/12	1.00	Diesel Range	0.10	< 0.10 U
12-14876	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		81.3%

Reported in mg/L (ppm)

EFV-Effective Final Volume in mL.
DL-Dilution of extract prior to analysis.
RL-Reporting limit.

Diesel range quantitation on total peaks in the range from C12 to C24.
Motor Oil range quantitation on total peaks in the range from C24 to C38.
HC ID: DRO/RRO indicate results of organics or additional hydrocarbons in ranges are not identifiable.

CLEANED TPHD SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE90-Landau Associates
Project: Cornwall
0001020.400.500

Client ID	OTER	TOT OUT
MB-080612	83.4%	0
LCS-080612	79.0%	0
LCSD-080612	67.1%	0
MW-16D-073112	81.3%	0

	LCS/MB LIMITS	QC LIMITS
(OTER) = o-Terphenyl	(50-150)	(50-150)

Prep Method: SW3510C
Log Number Range: 12-14876 to 12-14876

ORGANICS ANALYSIS DATA SHEET
NWTPHD by GC/FID-Silica and Acid Cleaned
Page 1 of 1

Sample ID: LCS-080612
LCS/LCSD

Lab Sample ID: LCS-080612
LIMS ID: 12-14876
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE90-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Date Extracted LCS/LCSD: 08/06/12

Date Analyzed LCS: 08/07/12 09:13
LCSD: 08/07/12 09:35
Instrument/Analyst LCS: FID/AAR
LCSD: FID/AAR

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Diesel	2.32	3.00	77.3%	2.17	3.00	72.3%	6.7%

TPHD Surrogate Recovery

	LCS	**LCSD**
o-Terphenyl	79.0%	67.1%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

TOTAL DIESEL RANGE HYDROCARBONS-EXTRACTION REPORT

Matrix: Water
Date Received: 08/01/12

ARI Job: VE90
Project: Cornwall
0001020.400.500

ARI ID	Client ID	Samp Amt	Final Vol	Prep Date
12-14876-080612MB1	Method Blank	500 mL	1.00 mL	08/06/12
12-14876-080612LCS1	Lab Control	500 mL	1.00 mL	08/06/12
12-14876-080612LCSD1	Lab Control Dup	500 mL	1.00 mL	08/06/12
12-14876-VE90A	MW-16D-073112	500 mL	1.00 mL	08/06/12

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Page 1 of 1

Sample ID: MW-16D-073112
SAMPLE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/03/12	200.8	08/07/12	7440-38-2	Arsenic	1	1	U
200.8	08/03/12	200.8	08/07/12	7440-50-8	Copper	1	1	U
200.8	08/03/12	200.8	08/07/12	7439-92-1	Lead	0.2	0.2	U
200.8	08/03/12	200.8	08/07/12	**7439-96-5**	**Manganese**	1	**540**	
200.8	08/03/12	200.8	08/07/12	**7440-66-6**	**Zinc**	10	**40**	

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-12D-073112
SAMPLE

Lab Sample ID: VE38B
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/03/12	200.8	08/07/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	08/03/12	200.8	08/06/12	**7440-50-8**	**Copper**	0.5	**0.6**	
200.8	08/03/12	200.8	08/06/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/03/12	200.8	08/06/12	**7439-96-5**	**Manganese**	0.5	**163**	
200.8	08/03/12	200.8	08/06/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-11D-073112
SAMPLE

Lab Sample ID: VE38C
LIMS ID: 12-14612
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/03/12	200.8	08/06/12	**7440-38-2**	**Arsenic**	0.2	**0.4**	
200.8	08/03/12	200.8	08/07/12	**7440-50-8**	**Copper**	0.5	**0.7**	
200.8	08/03/12	200.8	08/06/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/03/12	200.8	08/06/12	**7439-96-5**	**Manganese**	0.5	**84.0**	
200.8	08/03/12	200.8	08/06/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-12S-073112
SAMPLE

Lab Sample ID: VE38D
LIMS ID: 12-14613
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/03/12	200.8	08/06/12	**7440-38-2**	**Arsenic**	0.2	**0.6**	
200.8	08/03/12	200.8	08/07/12	7440-50-8	Copper	1	1	U
200.8	08/03/12	200.8	08/06/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/03/12	200.8	08/09/12	**7439-96-5**	**Manganese**	10	**680**	
200.8	08/03/12	200.8	08/06/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-11S-073112
SAMPLE

Lab Sample ID: VE38E
LIMS ID: 12-14614
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/03/12	200.8	08/06/12	**7440-38-2**	**Arsenic**	0.2	**1.3**	
200.8	08/03/12	200.8	08/07/12	**7440-50-8**	**Copper**	0.5	**2.6**	
200.8	08/03/12	200.8	08/06/12	**7439-92-1**	**Lead**	0.1	**1.0**	
200.8	08/03/12	200.8	08/07/12	**7439-96-5**	**Manganese**	2	**1,430**	
200.8	08/03/12	200.8	08/06/12	**7440-66-6**	**Zinc**	4	**26**	

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-16D-073112
MATRIX SPIKE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Arsenic	200.8	1 U	25	25	100%	
Copper	200.8	1 U	26	25	104%	
Lead	200.8	0.2 U	25.6	25.0	102%	
Manganese	200.8	540	571	25	124%	H
Zinc	200.8	40	90	80	62.5%	N

Reported in µg/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-16D-073112
DUPLICATE

Lab Sample ID: VE38A
LIMS ID: 12-14610
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Arsenic	200.8	1 U	2	66.7%	+/- 1	L
Copper	200.8	1 U	1 U	0.0%	+/- 1	L
Lead	200.8	0.2 U	0.2 U	0.0%	+/- 0.2	L
Manganese	200.8	540	550	1.8%	+/- 20%	
Zinc	200.8	40	20	66.7%	+/- 10	L*

Reported in µg/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: VE38MB
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/03/12	200.8	08/07/12	7440-38-2	Arsenic	0.2	0.2	U
200.8	08/03/12	200.8	08/06/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/03/12	200.8	08/06/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/03/12	200.8	08/06/12	7439-96-5	Manganese	0.5	0.5	U
200.8	08/03/12	200.8	08/06/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: VE38LCS
LIMS ID: 12-14611
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE38-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	**Analysis Method**	**Spike Found**	**Spike Added**	**% Recovery**	**Q**
Arsenic	200.8	26.2	25.0	105%	
Copper	200.8	27.1	25.0	108%	
Lead	200.8	27.6	25.0	110%	
Manganese	200.8	25.5	25.0	102%	
Zinc	200.8	86	80	108%	

Reported in µg/L

N-Control limit not met
Control Limits: 80-120%

INORGANICS ANALYSIS DATA SHEET
Dissolved Mercury by Method SW7470A

Data Release Authorized:
Reported: 08/10/12
Date Received: 08/01/12
Page 1 of 1

QC Report No238: VE43-Landau Associates
Project: Cornwall
0001020.400.500

Client/ ARI ID	**Date Sampled**	**Matrix**	**Prep Date Anal Date**	**RL**	**Result**
MW-16D-073112 VE43A 12-14616	07/31/12	Water	08/02/12 08/10/12	20.0	20.0 U
MW-12D-073112 VE43B 12-14617	07/31/12	Water	08/02/12 08/10/12	20.0	20.0 U
MW-11D-073112 VE43C 12-14618	07/31/12	Water	08/02/12 08/10/12	20.0	20.0 U
MW-12S-073112 VE43D 12-14619	07/31/12	Water	08/02/12 08/10/12	20.0	20.0 U
MW-11S-073112 VE43E 12-14620	07/31/12	Water	08/02/12 08/10/12	20.0	20.0 U
MB-080212 Method Blank	NA	Water	08/02/12 08/10/12	20.0	20.0 U

Reported in ng/L

RL-Analytical reporting limit
U-Undetected at reported detection limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-16D-073112
MATRIX SPIKE

Lab Sample ID: VE43A
LIMS ID: 12-14616
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE43-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Mercury	7470A	20.0 U	106	100	106%	

Reported in ng/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-16D-073112
DUPLICATE

Lab Sample ID: VE43A
LIMS ID: 12-14616
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE43-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Mercury	7470A	20.0 U	20.0 U	0.0%	+/- 20.0	L

Reported in ng/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: VE43LCS
LIMS ID: 12-14617
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE43-Landau Associates
Project: Cornwall
0001020.400.500
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Mercury	7470A	251	200	126%	N

Reported in ng/L

N-Control limit not met
Control Limits: 80-120%

SAMPLE RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL
RESOURCES
INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Client ID: MW-16D-073112
ARI ID: 12-14610 VE38A

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	08/02/12 080212#1	EPA 300.0	mg-N/L	0.5	< 0.5 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.200	14.2
Sulfate	08/02/12 080212#1	EPA 300.0	mg/L	0.1	3.0
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.187
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	52.2
Biological Oxygen Demand	08/02/12 080212#1	EPA 405.1	mg/L	3.0	7.5
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	17.1

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE38-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Client ID: MW-12D-073112
ARI ID: 12-14611 VE38B

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.200	12.0
Sulfate	08/02/12 080212#1	EPA 300.0	mg/L	0.2	6.6
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.834
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	108
Biological Oxygen Demand	08/02/12 080212#1	EPA 405.1	mg/L	15.0	15.7
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	26.5

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Client ID: MW-11D-073112
ARI ID: 12-14612 VE38C

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.100	4.23
Sulfate	08/01/12 080112#1	EPA 300.0	mg/L	0.1	3.0
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.868
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	10.0	236
Biological Oxygen Demand	08/02/12 080212#1	EPA 405.1	mg/L	20.0	85.4
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	21.5

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Client ID: MW-12S-073112
ARI ID: 12-14613 VE38D

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.500	18.0
Sulfate	08/01/12 080112#1	EPA 300.0	mg/L	0.1	0.7
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.321
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	43.4
Biological Oxygen Demand	08/02/12 080212#1	EPA 405.1	mg/L	4.0	15.1
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	13.9

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Client ID: MW-11S-073112
ARI ID: 12-14614 VE38E

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	08/01/12 080112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.100	4.52
Sulfate	08/01/12 080112#1	EPA 300.0	mg/L	0.1	1.2
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.087
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	61.6
Biological Oxygen Demand	08/02/12 080212#1	EPA 405.1	mg/L	6.0	14.5
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	22.4

RL	Analytical reporting limit
U	Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
N-Nitrate	EPA 300.0	08/01/12	mg-N/L	< 0.1 U	
N-Nitrite	EPA 300.0	08/01/12 08/02/12	mg-N/L	< 0.1 U < 0.1 U	
Total Cyanide	EPA 335.4	08/10/12	mg/L	< 0.005 U	
N-Ammonia	EPA 350.1M	08/03/12	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	08/01/12 08/02/12	mg/L	< 0.1 U < 0.1 U	
Sulfide	EPA 376.2	08/02/12	mg/L	< 0.050 U	
Chemical Oxygen Demand	EPA 410.4	08/13/12	mg/L	< 5.00 U	
Biological Oxygen Demand	EPA 405.1	08/02/12	mg/L	< 1.0 U	
Total Organic Carbon	EPA 9060	08/07/12	mg/L	< 1.50 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Sulfide EPA 376.2	ICVL	08/02/12	mg/L	0.496	0.501	99.0%
Biological Oxygen Demand EPA 405.1	ICVL	08/02/12	mg/L	195	198	98.5%

STANDARD REFERENCE RESULTS-CONVENTIONALS
VE38-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	**Method**	**Date**	**Units**	**SRM**	**True Value**	**Recovery**
N-Nitrate ERA #230511	EPA 300.0	08/01/12	mg-N/L	3.0	3.0	100.0%
N-Nitrite ERA #401010	EPA 300.0	08/01/12 08/02/12	mg-N/L	3.0 3.0	3.0 3.0	100.0% 100.0%
Total Cyanide ERA 11107	EPA 335.4	08/10/12	mg/L	0.386	0.400	96.5%
N-Ammonia ERA #15125	EPA 350.1M	08/03/12	mg-N/L	0.498	0.500	99.6%
Sulfate ERA #070811	EPA 300.0	08/01/12 08/02/12	mg/L	3.0 3.1	3.0 3.0	100.0% 103.3%
Chemical Oxygen Demand Thermo Orion #I01	EPA 410.4	08/13/12	mg/L	84.8	90.0	94.2%
Total Organic Carbon ERA 0409-12-01	EPA 9060	08/07/12	mg/L	20.4	20.0	102.0%

REPLICATE RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

ARI ID: VE38A Client ID: MW-16D-073112

Analyte	**Method**	**Date**	**Units**	**Sample**	**Replicate(s)**	**RPD/RSD**
N-Nitrate	EPA 300.0	08/01/12	mg-N/L	< 0.1	< 0.1	NA
N-Nitrite	EPA 300.0	08/02/12	mg-N/L	< 0.5	< 0.5	NA
Sulfate	EPA 300.0	08/02/12	mg/L	3.0	2.9	3.4%
Sulfide	EPA 376.2	08/02/12	mg/L	0.187	0.191	2.1%

MS/MSD RESULTS-CONVENTIONALS
VE38-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.500
Date Sampled: 07/31/12
Date Received: 08/01/12

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: VE38A **Client ID: MW-16D-073112**							
N-Nitrate	EPA 300.0	08/01/12	mg-N/L	< 0.1	1.9	2.0	95.0%
N-Nitrite	EPA 300.0	08/02/12	mg-N/L	< 0.5	12.3	10.0	123.0%
Sulfate	EPA 300.0	08/02/12	mg/L	3.0	5.2	4.0	55.0%
Sulfide	EPA 376.2	08/02/12	mg/L	0.187	0.655	0.500	93.6%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

August 16, 2012

Mr. Larry Beard
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall 001020.400.500
ARI Job No: VE22, VE24

Dear Larry,

Please find enclosed analytical results for the conventionals analyses of samples received for the project referenced above. Analytical Resources, Inc. (ARI) accepted eight water samples and a trip blank on July 31, 2012. The samples were received in good condition and there were no discrepancies between the COC and containers' labels.

The samples were analyzed for SVOCs, SIM PAHs, HCID, VOCs, Pesticides, Herbicides, Dissolved Metals, Anions, Sulfide, COD, BOD, Ammonia, TOC, Cyanide and NWTPH-Dx follow ups as requested on the COC. The Tannins and Lignins were subcontracted to Aquatic Research, Inc.

The VOCs 8/6/12 method blank contained hexachlorobutadiene and n-Butylbenzene. All associated samples that contain analyte have been flagged with a "B" qualifier.

The VOCs 8/7/12 CCAL is out of control low for acrolein. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The SVOCs 8/3/12 CCAL is out of control high for 2,4-Dinitrophenol and Pentachlorophenol. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The SVOCs 8/6/12 CCAL is out of control low for 2,4-Dinitrophenol and 2,4,6-Tribromophenol. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The BOD ICV is out of control low. All sample volume was consumed during the analysis. All other QC is in control and no further corrective action was taken.

The herbicide surrogate DCPA is out of control high in association with sample MW-16S-073012. The sample was non-detect and no further corrective action was taken.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

The herbicide LCS and LCSD are out of control low for 2,4,5-T. All other spike recoveries are in control and no further corrective action was taken.

Quality control analyses are included for your review. No other analytical complications were noted.

A copy of these reports and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
206-695-6211
kellyb@arilabs.com

KFB/kfb
Enclosure
cc: File VE22 and VE24

LANDAU ASSOCIATES

☒ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ______

VE22

Date 7/30/12
Page 1 of 2

Chain-of-Custody Record

Project Name CORNWALL
Project No. 0001020.400.510
Project Location/Event BELLINGHAM, WA / ADDITIONAL GW INVESTIGATION
Sampler's Name CHRISTOPHE VENOT
Project Contact " / JEREMY DAVIS / LARRY BEARD
Send Results To ANNE HALVORSEN / " / "

Turnaround Time
☒ Standard
☐ Accelerated
☐ ______

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	*SVOCs	*SIM PAHs (LOW LEVEL)	HCID *	VOCs	*PESTICIDES	*HERBICIDES	DISSOLVED METALS **	ANIONS *** NO2, NO3, SO4	SULFIDE	NH3	TOT + FREE CYANIDE	TANNINS + LIGNINS
MW-15D-073012	073012	1050	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-16S-073012	073012	1215	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-15S-073012	073012	1220	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-14S-073012	073012	1350	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-13S-073012	073012	1505	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-14D-073012	073012	1540	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-13D-073012	073012	1625	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
MW-DUP-073012	073012	—	AQ	18	X	X	X	X	X	X	X	X	X	X	X	X
TBS		—	AQ	3				X								

Observations/Comments
X Allow water samples to settle, collect aliquot from clear portion
X NWTPH-Dx - run acid wash/silica gel cleanup
! Centrifuge! *
___ run samples standardized to ______ product
___ Analyze for EPH if no specific product identified
VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt
X Dissolved metal water samples field filtered
Other * LAI TO FOLLOW UP WITH NWTPHDX/NWTPHDX BASED ON RESULTS.
*** NOTE 48-hr HOLD TIME
** As, Cu, Pb, Mn, Zn, Hg
CCCS LL Hg

Special Shipment/Handling or Storage Requirements ON ICE

Method of Shipment PICK-UP

Relinquished by	Received by	Relinquished by	Received by
Signature Rosemary Timmer	Signature	Signature	Signature
Printed Name Rosemary Timmer	Printed Name Jeremy Davis	Printed Name Jeremy Davis	Printed Name Tayler Streeter
Company Landau Associates	Company Landau Associates	Company Landau Associates	Company ARI
Date 7/30/12 Time 7:30pm	Date 7/31/12 Time 0900	Date 7/31/12 Time 0930	Date 7-31-12 Time 1305
		Shipping via lab courier	

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

LANDAU ASSOCIATES

☒ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ____________

Date 7/30/12
Page 2 of 2

Chain-of-Custody Record

Project Name CORNWALL
Project No. ~~000~~1020.400.510
Project Location/Event BELLINGHAM, WA/ADDITIONAL GW INVESTIGATION
Sampler's Name CHRISTOPHE JENOT
Project Contact " / JEREMY DAVIS/ LARRY BEARD
Send Results To ANNE HALVORSEN/ " / "

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____________

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	TOC/COD	BOD*	NWTPH-DX**	NWTPH-GX**
MW-15D-073012	073012	1050	AQ	6	X	X		
MW-16S-073012	073012	1215	AQ	6	X	X		
MW-15S-073012	073012	1220	AQ	6	X	X		
MW-14S-073012	073012	1350	AQ	6	X	X		
MW-13S-073012	073012	1505	AQ	6	X	X		
MW-14D-073012	073012	1540	AQ	6	X	X		
MW-13D-073012	073012	1625	AQ	6	X	X		
MW-DUP-073012	073012	—	AQ	6	X	X		
TBS			AQ	2				X**

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash/silica gel cleanup

*! Centrifuge!

___ run samples standardized to ____________ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt

X Dissolved metal water samples field filtered

Other * NOTE 48-hr HOLD TIME
** LAB TO FOLLOWUP WITH DX/GX BASED ON HCID RESULTS.

Special Shipment/Handling or Storage Requirements ON ICE

Method of Shipment PICK-UP

Relinquished by	Received by	Relinquished by	Received by
Signature Rosemary Timmer	Signature	Signature Shipping via lab courier	Signature
Printed Name Rosemary Timmer	Printed Name Jeremy Davis	Printed Name Jeremy Davis	Printed Name Tayler Streeter
Company Landau Associates	Company Landau Associates	Company Landau Associates	Company ARI
Date 7/30/12 Time 7:30 pm	Date 7/31/12 Time 0800	Date 7/31/12 Time 0930	Date 7-31-12 Time 1305

WHITE COPY - Project File   YELLOW COPY - Laboratory   PINK COPY - Client Representative

Rev 8/09

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau
COC No(s): [✓ NA]
Assigned ARI Job No: VE21
Project Name: Cornwall
Delivered by: Fed-Ex UPS [✓ Courier] Hand Delivered Other:
Tracking No: [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	[✓ YES]	NO
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.1 5.1 1.6 5.1 3.4 4.5

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90877952

Cooler Accepted by: TS Date: 7-31-12 Time: 1305

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	[✓ NO]
Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		YES	[✓ NO]
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		~~YES~~ AV	~~NO~~ AV
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	NA	[✓ YES]	NO
Were all VOC vials free of air bubbles?	NA	YES	[✓ NO]
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	NA	7/25/12	

What kind of packing material was used? Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: Box

Was Sample Split by ARI: [✓ NA] YES Date/Time: Equipment: Split by:

Samples Logged by: AV Date: 7/31/12 Time: 1430

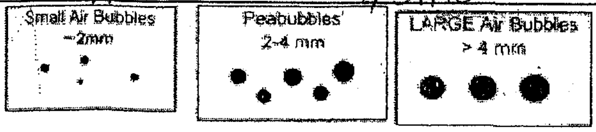
*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

3.3, 4.3, 2.9: Dup=3pb, 13D=4pb, 14D=5pb, 13S=3pb TB=4pb
14S=3pb, 15S=3pb, 16S=3pb, 15D=4pb ~~There are~~

By: AV Date: 7/31/12



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

PRESERVATION VERIFICATION 07/31/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VE22**

Inquiry Number: NONE
Analysis Requested: 07/31/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: AV
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

PC: Kelly
VTSR: 07/31/12

Project #: 0001020.400.510
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-14520 **VE22A**	MW-15D-073012	F		P	P		DIS P					P	F			Y						
12-14521 **VE22B**	MW-16S-073012	F		P	P		DIS P					P	F			Y						
12-14522 **VE22C**	MW-15S-073012	F		P	P		DIS Fail					P	F			Y			<2	MP1276	2ml	8/1/12 CB
12-14523 **VE22D**	MW-14S-073012	F		P	P		DIS Fail					P	F			Y			<2	MP1276	2ml	8/1/12 CB
12-14524 **VE22E**	MW-13S-073012	F		P	P		DIS P					P	F			Y						
12-14525 **VE22F**	MW-14D-073012	F		P	P		DIS P					P	F			Y						
12-14526 **VE22G**	MW-13D-073012	F		P	P		DIS P					P	F			Y						
12-14527 **VE22H**	MW-DUP-073012	F		P	P		DIS P					P	F			Y						

P=Pass ~~Fail=AV~~ F=Fail
Cyanide=unpreserved
Sulfide=only preserved with ZnOAC. Lab to adjust ph

preserved samples C-D in
196 - CB 08/01/12

Checked By AV Date 7/31/12

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau
COC No(s): [✓ NA]
Assigned ARI Job No: VE24 ~~VE21~~ AV

Project Name: Cornwall
Delivered by: Fed-Ex UPS [✓ Courier] Hand Delivered Other:
Tracking No: [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	[✓ YES]	NO
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)........ 4.1 5.1 1.6 5.1 3.4 4.5
If cooler temperature is out of compliance fill out form 00070F
Temp Gun ID#: 90877852
Cooler Accepted by: TS Date: 7-31-12 Time: 1305

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	[✓ NO]
What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: Box			
Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		YES	[✓ NO]
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		[✓ YES]	NO
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	[✓ YES]	NO
Were all VOC vials free of air bubbles?	[✓ NA]	YES	NO
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	[✓ NA]		

Was Sample Split by ARI : [✓ NA] YES Date/Time: Equipment: Split by:

Samples Logged by: AV Date: 7/31/12 Time: 1430

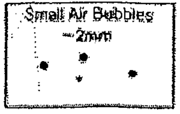
***** Notify Project Manager of discrepancies or concerns *****

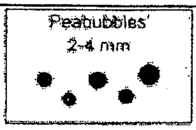
Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

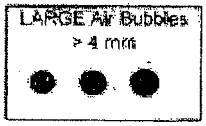
Additional Notes, Discrepancies, & Resolutions:

3.3, 4.3, 2.9

By: Date:







Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

PRESERVATION VERIFICATION 07/31/12
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **VE24**

PC: Kelly
VTSR: 07/31/12

Inquiry Number: NONE
Analysis Requested: 07/31/12
Contact: Davis, Jeremy
Client: Landau Associates
Logged by: AV
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0001020.400.510
Project: Cornwall
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
12-14529 **VE24A**	MW-15D-073012						DIS P									Y						
12-14530 **VE24B**	MW-16S-073012						DIS P									Y						
12-14531 **VE24C**	MW-15S-073012						DIS F									Y			<2	mP2276	2ml	8/1/12 CB
12-14532 **VE24D**	MW-14S-073012						DIS F									Y			<2	mP2276	2ml	8/1/12 CB
12-14533 **VE24E**	MW-13S-073012						DIS P									Y						
12-14534 **VE24F**	MW-14D-073012						DIS P									Y						
12-14535 **VE24G**	MW-13D-073012						DIS P									Y						
12-14536 **VE24H**	MW-DUP-073012						DIS P									Y						

P=Pass F=Fail

Preserved samples C-D in
196
CB 08/01/12

Checked By AV Date 7/31/12

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VE22
Client: Landau Associates
Project Event: 0001020.400.510
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-15D-073012	VE22A	12-14520	Water	07/30/12 10:50	07/31/12 13:05
2.	MW-16S-073012	VE22B	12-14521	Water	07/30/12 12:15	07/31/12 13:05
3.	MW-15S-073012	VE22C	12-14522	Water	07/30/12 12:20	07/31/12 13:05
4.	MW-14S-073012	VE22D	12-14523	Water	07/30/12 13:50	07/31/12 13:05
5.	MW-13S-073012	VE22E	12-14524	Water	07/30/12 15:05	07/31/12 13:05
6.	MW-14D-073012	VE22F	12-14525	Water	07/30/12 15:40	07/31/12 13:05
7.	MW-13D-073012	VE22G	12-14526	Water	07/30/12 16:25	07/31/12 13:05
8.	MW-DUP-073012	VE22H	12-14527	Water	07/30/12	07/31/12 13:05
9.	Trip Blanks	VE22I	12-14528	Water	07/30/12	07/31/12 13:05

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: VE24
Client: Landau Associates
Project Event: 0001020.400.510
Project Name: Cornwall

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-15D-073012	VE24A	12-14529	Water	07/30/12 10:50	07/31/12 13:05
2.	MW-16S-073012	VE24B	12-14530	Water	07/30/12 12:15	07/31/12 13:05
3.	MW-15S-073012	VE24C	12-14531	Water	07/30/12 12:20	07/31/12 13:05
4.	MW-14S-073012	VE24D	12-14532	Water	07/30/12 13:50	07/31/12 13:05
5.	MW-13S-073012	VE24E	12-14533	Water	07/30/12 15:05	07/31/12 13:05
6.	MW-14D-073012	VE24F	12-14534	Water	07/30/12 15:40	07/31/12 13:05
7.	MW-13D-073012	VE24G	12-14535	Water	07/30/12 16:25	07/31/12 13:05
8.	MW-DUP-073012	VE24H	12-14536	Water	07/30/12	07/31/12 13:05

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Data Reporting Qualifiers

Effective 2/14/2011

Inorganic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Duplicate RPD is not within established control limits
B	Reported value is less than the CRDL but ≥ the Reporting Limit
N	Matrix Spike recovery not within established control limits
NA	Not Applicable, analyte not spiked
H	The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
L	Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Flagged value is not within established control limits
B	Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J	Estimated concentration when the value is less than ARI's established reporting limits
D	The spiked compound was not detected due to sample extract dilution
E	Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

S	Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte
NA	The flagged analyte was not analyzed for
NR	Spiked compound recovery is not reported due to chromatographic interference
NS	The flagged analyte was not spiked into the sample
M	Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
M2	The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
Y	The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
EMPC	Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria" **(Dioxin/Furan analysis only)**
C	The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
P	The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference
X	Analyte signal includes interference from polychlorinated diphenyl ethers. **(Dioxin/Furan analysis only)**
Z	Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**

Geotechnical Data

A	The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
F	Samples were frozen prior to particle size determination
SM	Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
SS	Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
W	Weight of sample in some pipette aliquots was below the level required for accurate weighting

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: Landau Associates	**ARI Job No.:** VE22
Client Project: Cornwall	**Client Project No.:** 0001020.400.510

Case Narrative

1. Eight samples were submitted for analysis on July 31, 2012, and were in good condition. Each sample was received in eight 500 milliliters amber glass bottles, with a total of 32 liters for the entire job.
2. The samples were submitted for removal of solid particulate by means of centrifuging according to modified Corp of Engineers draft interim guide lines.
3. The samples were centrifuged in decontaminated 500mL glass bottles, in a pre-cooled centrifuge (4°C) at 1,000 x g for 30 minutes.
4. The supernatant water was decanted back into the original sample bottles and delivered to sample receiving for distribution.
5. There were no other anomalies in the sample or methods on this project.

Released by: ______________ Date: 8/2/12
Geotechnical Laboratory Manager

Reviewed by: ______________ Date: August 2, 2012
Technician

AQUATIC RESEARCH INCORPORATED
LABORATORY & CONSULTING SERVICES
3927 AURORA AVENUE NORTH, SEATTLE, WA 98103
PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: ARI098-45 **PAGE 1**
REPORT DATE: 08/16/12
DATE SAMPLED: 07/30/12 **DATE RECEIVED:** 08/02/12
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM ANALYTICAL RESOURCES INC. / VE22

CASE NARRATIVE

Eight water samples were received by the laboratory in good condition. Analysis was performed according to the chain of custody received with the samples. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on the following page.

SAMPLE DATA

SAMPLE ID	LAB ID	TANNIN/LIGNIN (mg/L)
12-14520-VE22A	MW-15D-073012	1.46
12-14521-VE22B	MW-16S-073012	1.46
12-14522-VE22C	MW-15S-073012	1.95
12-14523-VE22D	MW-14S-073012	1.19
12-14524-VE22E	MW-13S-073012	1.07
12-14525-VE22F	MW-14D-073012	1.24
12-14526-VE22G	MW-13D-073012	1.12
12-14527-VE22H	MW-DUP-073012	1.22

CASE FILE NUMBER:	**ARI098-45**		**PAGE 2**
REPORT DATE:	**08/16/12**		
DATE SAMPLED:	**07/30/12**	**DATE RECEIVED:**	**08/02/12**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM ANALYTICAL RESOURCES INC. / VE22

QA/QC DATA

QC PARAMETER	TANNIN/LIGNIN (mg/L)
METHOD	SM5550
DATE ANALYZED	08/16/12
DETECTION LIMIT	0.010
DUPLICATE	
SAMPLE ID	MW-DUP-073012
ORIGINAL	1.22
DUPLICATE	1.22
RPD	0.00%
SPIKE SAMPLE	
SAMPLE ID	MW-DUP-073012
ORIGINAL	1.22
SPIKED SAMPLE	2.16
SPIKE ADDED	1.00
% RECOVERY	94.85%
QC CHECK	
FOUND	1.04
TRUE	1.00
% RECOVERY	103.58%
BLANK	<0.010

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TOO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski
Project Manager

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 07/31/12

ANALYTICAL RESOURCES INCORPORATED

ARI Project: VE22
AR1098-45

Laboratory: Aquatic Research, Inc
Lab Contact: Steve Lazoff
Lab Address: 3927 Aurora Ave N.
Seattle, WA 98103
Phone: 206-632-2715
Fax: 206-632-2417

ARI Client: Landau Associates
Project ID: Cornwall
ARI PM: Kelly Bottem
Phone: 206-695-6211
Fax: 206-695-6201
Email: subdata@arilabs.com

Analytical Protocol: In-house
Special Instructions:

Requested Turn Around:
Email Results (Y/N): **email**

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses
12-14520-VE22A	MW-15D-073012	07/30/12 10:50	Water	1	Tannins & Lignins
Special Instructions: None					
12-14521-VE22B	MW-16S-073012	07/30/12 12:15	Water	1	Tannins & Lignins
Special Instructions: None					
12-14522-VE22C	MW-15S-073012	07/30/12 12:20	Water	1	Tannins & Lignins
Special Instructions: None					
12-14523-VE22D	MW-14S-073012	07/30/12 13:50	Water	1	Tannins & Lignins
Special Instructions: None					
12-14524-VE22E	MW-13S-073012	07/30/12 15:05	Water	1	Tannins & Lignins
Special Instructions: None					
12-14525-VE22F	MW-14D-073012	07/30/12 15:40	Water	1	Tannins & Lignins
Special Instructions: None					
12-14526-VE22G	MW-13D-073012	07/30/12 16:25	Water	1	Tannins & Lignins
Special Instructions: None					

Carrier	Airbill		Date
Relinquished by	Company ARI	Date 8/2/12	Time 1051
Received by	Company ARI	Date 8/2/12	Time 1051

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 07/31/12

ANALYTICAL RESOURCES INCORPORATED

ARI Project: VE22
AR1098-45

Laboratory: Aquatic Research, Inc
Lab Contact: Steve Lazoff

ARI Client: Landau Associates
Project ID: 0001020.400.510

ARI Sample ID	Client Sample ID/ Add'l Sample ID	Sampled	Matrix	Bottles	Analyses
12-14527-VE22H	MW-DUP-073012	07/30/12	Water	1	Tannins & Lignins

Special Instructions: None

Carrier		Airbill		Date			
Relinquished by		Company	ARI	Date	8/2/12	Time	1051
Received by		Company	ARI	Date	8/2/12	Time	1051

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 1 of 2

Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 16:02

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**0.64**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.36**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-15D-073012**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Date Analyzed: 08/07/12 16:02

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.41**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.83**	
99-87-6	**4-Isopropyltoluene**	**0.20**	**1.4**	
104-51-8	**n-Butylbenzene**	**0.20**	**0.26**	
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	99.2%
d8-Toluene	97.2%
Bromofluorobenzene	97.4%
d4-1,2-Dichlorobenzene	101%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16S-073012**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 16:24

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-16S-073012**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Date Analyzed: 08/06/12 16:24

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	99.2%
d8-Toluene	97.9%
Bromofluorobenzene	100%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-15S-073012**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 16:51

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	**Benzene**	**0.20**	**0.51**	
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**10**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.28**	
95-50-1	**1,2-Dichlorobenzene**	**0.20**	**0.32**	
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**3.2**	

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Date Analyzed: 08/06/12 16:51

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	**1,2,4-Trimethylbenzene**	**0.20**	**0.26**	
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.69**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	**tert-Butylbenzene**	**0.20**	**0.22**	
135-98-8	**sec-Butylbenzene**	**0.20**	**1.1**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.50**	**B**
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**7.6**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	100%
d8-Toluene	99.0%
Bromofluorobenzene	104%
d4-1,2-Dichlorobenzene	100%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 1 of 2

Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 17:17

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	**Benzene**	**0.20**	**0.22**	
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**4.2**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.23**	
95-50-1	**1,2-Dichlorobenzene**	**0.20**	**0.24**	
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**1.9**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Date Analyzed: 08/06/12 17:17

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.23**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	**tert-Butylbenzene**	**0.20**	**0.22**	
135-98-8	**sec-Butylbenzene**	**0.20**	**0.96**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.38**	**B**
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	101%
d8-Toluene	98.4%
Bromofluorobenzene	102%
d4-1,2-Dichlorobenzene	105%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

**ANALYTICAL
RESOURCES
INCORPORATED**

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13S-073012**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 17:44

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**1.6**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.25**	
95-50-1	**1,2-Dichlorobenzene**	**0.20**	**0.20**	
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.73**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13S-073012**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Date Analyzed: 08/06/12 17:44

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.35**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.25**	**B**
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**0.50**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	99.5%
d8-Toluene	98.3%
Bromofluorobenzene	103%
d4-1,2-Dichlorobenzene	104%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-14D-073012**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 18:10

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**3.6**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	**m,p-Xylene**	**0.40**	**1.1**	
95-47-6	**o-Xylene**	**0.20**	**0.50**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.38**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-14D-073012**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Date Analyzed: 08/06/12 18:10

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.42**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	100%
d8-Toluene	98.9%
Bromofluorobenzene	103%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13D-073012**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 18:37

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	**Toluene**	**0.20**	**0.20**	
108-90-7	**Chlorobenzene**	**0.20**	**0.30**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	**o-Xylene**	**0.20**	**0.31**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.24**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-13D-073012**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Date Analyzed: 08/06/12 18:37

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	**Isopropylbenzene**	**0.20**	**0.40**	
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.66**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.33**	**B**
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	**Naphthalene**	**0.50**	**0.66**	
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery	
d4-1,2-Dichloroethane	101%
d8-Toluene	98.8%
Bromofluorobenzene	103%
d4-1,2-Dichlorobenzene	105%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-DUP-073012**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 19:03

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	**Chlorobenzene**	**0.20**	**3.4**	
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	**m,p-Xylene**	**0.40**	**1.1**	
95-47-6	**o-Xylene**	**0.20**	**0.52**	
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	**1,4-Dichlorobenzene**	**0.20**	**0.38**	

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MW-DUP-073012**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Date Analyzed: 08/06/12 19:03

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	**sec-Butylbenzene**	**0.20**	**0.46**	
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	101%
d8-Toluene	100%
Bromofluorobenzene	101%
d4-1,2-Dichlorobenzene	102%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: Trip Blanks**
Page 1 of 2 **SAMPLE**

Lab Sample ID: VE22I
LIMS ID: 12-14528
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/06/12 19:30

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: Trip Blanks**
Page 2 of 2 **SAMPLE**

Lab Sample ID: VE22I
LIMS ID: 12-14528
Matrix: Water
Date Analyzed: 08/06/12 19:30

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	101%
d8-Toluene	99.5%
Bromofluorobenzene	102%
d4-1,2-Dichlorobenzene	105%

2-Chloroethylvinylether is an acid labile compound and may not be recovered from an acid preserved sample.

EPA SW-846 indicates that vinyl chloride and styrene may degrade in the presence of acid preservative.

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-080712A**
Page 1 of 2 **METHOD BLANK**

Lab Sample ID: MB-080712A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Instrument/Analyst: NT2/PKC
Date Analyzed: 08/07/12 11:56

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-080712A**
Page 2 of 2 **METHOD BLANK**

Lab Sample ID: MB-080712A
LIMS ID: 12-14520
Matrix: Water
Date Analyzed: 08/07/12 11:56

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	Hexachlorobutadiene	0.50	< 0.50	U
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	n-Butylbenzene	0.20	< 0.20	U
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	98.7%
d8-Toluene	96.7%
Bromofluorobenzene	97.7%
d4-1,2-Dichlorobenzene	100%

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-080612A**
METHOD BLANK
Page 1 of 2

Lab Sample ID: MB-080612A	QC Report No: VE22-Landau Associates
LIMS ID: 12-14521	Project: Cornwall 0001020.400.510
Matrix: Water	
Data Release Authorized:	Date Sampled: NA
Reported: 08/10/12	Date Received: NA
Instrument/Analyst: NT2/PKC	Sample Amount: 10.0 mL
Date Analyzed: 08/06/12 10:53	Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q
74-87-3	Chloromethane	0.50	< 0.50	U
74-83-9	Bromomethane	1.0	< 1.0	U
75-01-4	Vinyl Chloride	0.20	< 0.20	U
75-00-3	Chloroethane	0.20	< 0.20	U
75-09-2	Methylene Chloride	1.0	< 1.0	U
67-64-1	Acetone	5.0	< 5.0	U
75-15-0	Carbon Disulfide	0.20	< 0.20	U
75-35-4	1,1-Dichloroethene	0.20	< 0.20	U
75-34-3	1,1-Dichloroethane	0.20	< 0.20	U
156-60-5	trans-1,2-Dichloroethene	0.20	< 0.20	U
156-59-2	cis-1,2-Dichloroethene	0.20	< 0.20	U
67-66-3	Chloroform	0.20	< 0.20	U
107-06-2	1,2-Dichloroethane	0.20	< 0.20	U
78-93-3	2-Butanone	5.0	< 5.0	U
71-55-6	1,1,1-Trichloroethane	0.20	< 0.20	U
56-23-5	Carbon Tetrachloride	0.20	< 0.20	U
108-05-4	Vinyl Acetate	0.20	< 0.20	U
75-27-4	Bromodichloromethane	0.20	< 0.20	U
78-87-5	1,2-Dichloropropane	0.20	< 0.20	U
10061-01-5	cis-1,3-Dichloropropene	0.20	< 0.20	U
79-01-6	Trichloroethene	0.20	< 0.20	U
124-48-1	Dibromochloromethane	0.20	< 0.20	U
79-00-5	1,1,2-Trichloroethane	0.20	< 0.20	U
71-43-2	Benzene	0.20	< 0.20	U
10061-02-6	trans-1,3-Dichloropropene	0.20	< 0.20	U
110-75-8	2-Chloroethylvinylether	1.0	< 1.0	U
75-25-2	Bromoform	0.20	< 0.20	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	5.0	< 5.0	U
591-78-6	2-Hexanone	5.0	< 5.0	U
127-18-4	Tetrachloroethene	0.20	< 0.20	U
79-34-5	1,1,2,2-Tetrachloroethane	0.20	< 0.20	U
108-88-3	Toluene	0.20	< 0.20	U
108-90-7	Chlorobenzene	0.20	< 0.20	U
100-41-4	Ethylbenzene	0.20	< 0.20	U
100-42-5	Styrene	0.20	< 0.20	U
75-69-4	Trichlorofluoromethane	0.20	< 0.20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	0.20	< 0.20	U
179601-23-1	m,p-Xylene	0.40	< 0.40	U
95-47-6	o-Xylene	0.20	< 0.20	U
95-50-1	1,2-Dichlorobenzene	0.20	< 0.20	U
541-73-1	1,3-Dichlorobenzene	0.20	< 0.20	U
106-46-7	1,4-Dichlorobenzene	0.20	< 0.20	U

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: MB-080612A**
METHOD BLANK
Page 2 of 2

Lab Sample ID: MB-080612A
LIMS ID: 12-14521
Matrix: Water
Date Analyzed: 08/06/12 10:53

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	LOQ	Result	Q
107-02-8	Acrolein	5.0	< 5.0	U
74-88-4	Methyl Iodide	1.0	< 1.0	U
74-96-4	Bromoethane	0.20	< 0.20	U
107-13-1	Acrylonitrile	1.0	< 1.0	U
563-58-6	1,1-Dichloropropene	0.20	< 0.20	U
74-95-3	Dibromomethane	0.20	< 0.20	U
630-20-6	1,1,1,2-Tetrachloroethane	0.20	< 0.20	U
96-12-8	1,2-Dibromo-3-chloropropane	0.50	< 0.50	U
96-18-4	1,2,3-Trichloropropane	0.50	< 0.50	U
110-57-6	trans-1,4-Dichloro-2-butene	1.0	< 1.0	U
108-67-8	1,3,5-Trimethylbenzene	0.20	< 0.20	U
95-63-6	1,2,4-Trimethylbenzene	0.20	< 0.20	U
87-68-3	**Hexachlorobutadiene**	**0.50**	**0.45**	**J**
106-93-4	Ethylene Dibromide	0.20	< 0.20	U
74-97-5	Bromochloromethane	0.20	< 0.20	U
594-20-7	2,2-Dichloropropane	0.20	< 0.20	U
142-28-9	1,3-Dichloropropane	0.20	< 0.20	U
98-82-8	Isopropylbenzene	0.20	< 0.20	U
103-65-1	n-Propylbenzene	0.20	< 0.20	U
108-86-1	Bromobenzene	0.20	< 0.20	U
95-49-8	2-Chlorotoluene	0.20	< 0.20	U
106-43-4	4-Chlorotoluene	0.20	< 0.20	U
98-06-6	tert-Butylbenzene	0.20	< 0.20	U
135-98-8	sec-Butylbenzene	0.20	< 0.20	U
99-87-6	4-Isopropyltoluene	0.20	< 0.20	U
104-51-8	**n-Butylbenzene**	**0.20**	**0.16**	**J**
120-82-1	1,2,4-Trichlorobenzene	0.50	< 0.50	U
91-20-3	Naphthalene	0.50	< 0.50	U
87-61-6	1,2,3-Trichlorobenzene	0.50	< 0.50	U

Reported in µg/L (ppb)

Volatile Surrogate Recovery

d4-1,2-Dichloroethane	99.7%
d8-Toluene	98.9%
Bromofluorobenzene	98.4%
d4-1,2-Dichlorobenzene	101%

VOA SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
MB-080712A	Method Blank	10	98.7%	96.7%	97.7%	100%	0
LCS-080712A	Lab Control	10	99.9%	99.2%	98.6%	99.9%	0
LCSD-080712A	Lab Control Dup	10	101%	99.8%	99.0%	102%	0
VE22A	MW-15D-073012	10	99.2%	97.2%	97.4%	101%	0
MB-080612A	Method Blank	10	99.7%	98.9%	98.4%	101%	0
LCS-080612A	Lab Control	10	99.0%	99.6%	99.9%	100%	0
LCSD-080612A	Lab Control Dup	10	100%	100%	100%	101%	0
VE22B	MW-16S-073012	10	99.2%	97.9%	100%	102%	0
VE22C	MW-15S-073012	10	100%	99.0%	104%	100%	0
VE22D	MW-14S-073012	10	101%	98.4%	102%	105%	0
VE22E	MW-13S-073012	10	99.5%	98.3%	103%	104%	0
VE22F	MW-14D-073012	10	100%	98.9%	103%	102%	0
VE22G	MW-13D-073012	10	101%	98.8%	103%	105%	0
VE22H	MW-DUP-073012	10	101%	100%	101%	102%	0
VE22I	Trip Blanks	10	101%	99.5%	102%	105%	0

	LCS/MB LIMITS	QC LIMITS
SW8260C		
(DCE) = d4-1,2-Dichloroethane	(80-120)	(80-130)
(TOL) = d8-Toluene	(80-120)	(80-120)
(BFB) = Bromofluorobenzene	(80-120)	(80-120)
(DCB) = d4-1,2-Dichlorobenzene	(80-120)	(80-120)

Prep Method: SW5030B
Log Number Range: 12-14520 to 12-14528

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C **Sample ID: LCS-080712A**
Page 1 of 2 **LAB CONTROL SAMPLE**

Lab Sample ID: LCS-080712A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized: MW
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT2/PKC
LCSD: NT2/PKC
Date Analyzed LCS: 08/07/12 10:25
LCSD: 08/07/12 10:52

Sample Amount LCS: 10.0 mL
LCSD: 10.0 mL
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Chloromethane	8.72	10.0	87.2%	8.42	10.0	84.2%	3.5%
Bromomethane	8.94	10.0	89.4%	8.87	10.0	88.7%	0.8%
Vinyl Chloride	8.94	10.0	89.4%	8.67	10.0	86.7%	3.1%
Chloroethane	9.00	10.0	90.0%	8.75	10.0	87.5%	2.8%
Methylene Chloride	8.84	10.0	88.4%	8.50	10.0	85.0%	3.9%
Acetone	45.5	50.0	91.0%	45.6	50.0	91.2%	0.2%
Carbon Disulfide	9.30	10.0	93.0%	8.96	10.0	89.6%	3.7%
1,1-Dichloroethene	9.33	10.0	93.3%	9.12	10.0	91.2%	2.3%
1,1-Dichloroethane	9.29	10.0	92.9%	8.95	10.0	89.5%	3.7%
trans-1,2-Dichloroethene	8.73	10.0	87.3%	8.56	10.0	85.6%	2.0%
cis-1,2-Dichloroethene	8.99	10.0	89.9%	8.73	10.0	87.3%	2.9%
Chloroform	9.43	10.0	94.3%	9.11	10.0	91.1%	3.5%
1,2-Dichloroethane	9.63	10.0	96.3%	9.54	10.0	95.4%	0.9%
2-Butanone	45.3	50.0	90.6%	44.7	50.0	89.4%	1.3%
1,1,1-Trichloroethane	9.65	10.0	96.5%	9.25	10.0	92.5%	4.2%
Carbon Tetrachloride	9.88	10.0	98.8%	9.75	10.0	97.5%	1.3%
Vinyl Acetate	8.80	10.0	88.0%	8.56	10.0	85.6%	2.8%
Bromodichloromethane	9.79	10.0	97.9%	9.54	10.0	95.4%	2.6%
1,2-Dichloropropane	9.24	10.0	92.4%	9.14	10.0	91.4%	1.1%
cis-1,3-Dichloropropene	9.61	10.0	96.1%	9.35	10.0	93.5%	2.7%
Trichloroethene	9.58	10.0	95.8%	9.43	10.0	94.3%	1.6%
Dibromochloromethane	10.3	10.0	103%	9.84	10.0	98.4%	4.6%
1,1,2-Trichloroethane	9.59	10.0	95.9%	9.35	10.0	93.5%	2.5%
Benzene	9.31	10.0	93.1%	9.20	10.0	92.0%	1.2%
trans-1,3-Dichloropropene	9.74	10.0	97.4%	9.52	10.0	95.2%	2.3%
2-Chloroethylvinylether	9.04	10.0	90.4%	8.77	10.0	87.7%	3.0%
Bromoform	10.4	10.0	104%	9.85	10.0	98.5%	5.4%
4-Methyl-2-Pentanone (MIBK)	46.5	50.0	93.0%	45.8	50.0	91.6%	1.5%
2-Hexanone	47.9	50.0	95.8%	46.1	50.0	92.2%	3.8%
Tetrachloroethene	10.0	10.0	100%	9.56	10.0	95.6%	4.5%
1,1,2,2-Tetrachloroethane	9.47	10.0	94.7%	9.28	10.0	92.8%	2.0%
Toluene	9.57	10.0	95.7%	9.36	10.0	93.6%	2.2%
Chlorobenzene	10.1	10.0	101%	9.72	10.0	97.2%	3.8%
Ethylbenzene	9.91	10.0	99.1%	9.56	10.0	95.6%	3.6%
Styrene	10.0	10.0	100%	9.42	10.0	94.2%	6.0%
Trichlorofluoromethane	9.90	10.0	99.0%	9.50	10.0	95.0%	4.1%
1,1,2-Trichloro-1,2,2-trifluoroetha	9.56	10.0	95.6%	9.14	10.0	91.4%	4.5%
m,p-Xylene	20.3	20.0	102%	19.6	20.0	98.0%	3.5%
o-Xylene	10.1	10.0	101%	9.86	10.0	98.6%	2.4%
1,2-Dichlorobenzene	9.91	10.0	99.1%	9.90	10.0	99.0%	0.1%
1,3-Dichlorobenzene	9.91	10.0	99.1%	9.74	10.0	97.4%	1.7%
1,4-Dichlorobenzene	9.96	10.0	99.6%	9.71	10.0	97.1%	2.5%
Acrolein	42.0 Q	50.0	84.0%	41.4 Q	50.0	82.8%	1.4%
Methyl Iodide	9.58	10.0	95.8%	9.23	10.0	92.3%	3.7%
Bromoethane	9.56	10.0	95.6%	9.20	10.0	92.0%	3.8%
Acrylonitrile	8.43	10.0	84.3%	8.34	10.0	83.4%	1.1%
1,1-Dichloropropene	9.48	10.0	94.8%	9.31	10.0	93.1%	1.8%
Dibromomethane	9.72	10.0	97.2%	9.65	10.0	96.5%	0.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: LCS-080712A
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080712A
LIMS ID: 12-14520
Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
1,1,1,2-Tetrachloroethane	10.3	10.0	103%	10.1	10.0	101%	2.0%
1,2-Dibromo-3-chloropropane	8.63	10.0	86.3%	8.75	10.0	87.5%	1.4%
1,2,3-Trichloropropane	9.89	10.0	98.9%	9.54	10.0	95.4%	3.6%
trans-1,4-Dichloro-2-butene	9.35	10.0	93.5%	8.77	10.0	87.7%	6.4%
1,3,5-Trimethylbenzene	9.97	10.0	99.7%	9.81	10.0	98.1%	1.6%
1,2,4-Trimethylbenzene	10.0	10.0	100%	9.84	10.0	98.4%	1.6%
Hexachlorobutadiene	8.87	10.0	88.7%	9.25	10.0	92.5%	4.2%
Ethylene Dibromide	9.76	10.0	97.6%	9.46	10.0	94.6%	3.1%
Bromochloromethane	9.39	10.0	93.9%	8.96	10.0	89.6%	4.7%
2,2-Dichloropropane	9.42	10.0	94.2%	9.03	10.0	90.3%	4.2%
1,3-Dichloropropane	9.78	10.0	97.8%	9.32	10.0	93.2%	4.8%
Isopropylbenzene	9.85	10.0	98.5%	9.53	10.0	95.3%	3.3%
n-Propylbenzene	9.91	10.0	99.1%	9.61	10.0	96.1%	3.1%
Bromobenzene	9.79	10.0	97.9%	9.39	10.0	93.9%	4.2%
2-Chlorotoluene	9.88	10.0	98.8%	9.57	10.0	95.7%	3.2%
4-Chlorotoluene	9.82	10.0	98.2%	9.58	10.0	95.8%	2.5%
tert-Butylbenzene	10.2	10.0	102%	10.0	10.0	100%	2.0%
sec-Butylbenzene	9.96	10.0	99.6%	9.87	10.0	98.7%	0.9%
4-Isopropyltoluene	9.95	10.0	99.5%	9.92	10.0	99.2%	0.3%
n-Butylbenzene	9.49	10.0	94.9%	9.41	10.0	94.1%	0.8%
1,2,4-Trichlorobenzene	8.82	10.0	88.2%	9.25	10.0	92.5%	4.8%
Naphthalene	8.53	10.0	85.3%	8.95	10.0	89.5%	4.8%
1,2,3-Trichlorobenzene	8.28	10.0	82.8%	8.90	10.0	89.0%	7.2%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	**LCSD**
d4-1,2-Dichloroethane	99.9%	101%
d8-Toluene	99.2%	99.8%
Bromofluorobenzene	98.6%	99.0%
d4-1,2-Dichlorobenzene	99.9%	102%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 1 of 2

Sample ID: LCS-080612A
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080612A
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT2/PKC
LCSD: NT2/PKC
Date Analyzed LCS: 08/06/12 09:59
LCSD: 08/06/12 10:26

Sample Amount LCS: 10.0 mL
LCSD: 10.0 mL
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Chloromethane	9.61	10.0	96.1%	9.55	10.0	95.5%	0.6%
Bromomethane	9.38	10.0	93.8%	9.27	10.0	92.7%	1.2%
Vinyl Chloride	9.60	10.0	96.0%	9.70	10.0	97.0%	1.0%
Chloroethane	9.67	10.0	96.7%	9.70	10.0	97.0%	0.3%
Methylene Chloride	9.33	10.0	93.3%	9.43	10.0	94.3%	1.1%
Acetone	51.4	50.0	103%	50.6	50.0	101%	1.6%
Carbon Disulfide	9.83	10.0	98.3%	9.93	10.0	99.3%	1.0%
1,1-Dichloroethene	9.87	10.0	98.7%	9.99	10.0	99.9%	1.2%
1,1-Dichloroethane	9.91	10.0	99.1%	9.90	10.0	99.0%	0.1%
trans-1,2-Dichloroethene	9.20	10.0	92.0%	9.31	10.0	93.1%	1.2%
cis-1,2-Dichloroethene	9.42	10.0	94.2%	9.51	10.0	95.1%	1.0%
Chloroform	9.84	10.0	98.4%	9.93	10.0	99.3%	0.9%
1,2-Dichloroethane	10.1	10.0	101%	10.1	10.0	101%	0.0%
2-Butanone	52.7	50.0	105%	51.9	50.0	104%	1.5%
1,1,1-Trichloroethane	9.73	10.0	97.3%	9.87	10.0	98.7%	1.4%
Carbon Tetrachloride	10.2	10.0	102%	10.2	10.0	102%	0.0%
Vinyl Acetate	10.0	10.0	100%	9.99	10.0	99.9%	0.1%
Bromodichloromethane	10.3	10.0	103%	10.4	10.0	104%	1.0%
1,2-Dichloropropane	9.81	10.0	98.1%	9.91	10.0	99.1%	1.0%
cis-1,3-Dichloropropene	10.3	10.0	103%	10.2	10.0	102%	1.0%
Trichloroethene	9.98	10.0	99.8%	9.93	10.0	99.3%	0.5%
Dibromochloromethane	10.7	10.0	107%	10.7	10.0	107%	0.0%
1,1,2-Trichloroethane	10.2	10.0	102%	10.2	10.0	102%	0.0%
Benzene	9.74	10.0	97.4%	9.84	10.0	98.4%	1.0%
trans-1,3-Dichloropropene	10.4	10.0	104%	10.5	10.0	105%	1.0%
2-Chloroethylvinylether	10.3	10.0	103%	10.2	10.0	102%	1.0%
Bromoform	11.0	10.0	110%	11.1	10.0	111%	0.9%
4-Methyl-2-Pentanone (MIBK)	51.0	50.0	102%	51.5	50.0	103%	1.0%
2-Hexanone	51.3	50.0	103%	51.0	50.0	102%	0.6%
Tetrachloroethene	9.98	10.0	99.8%	9.99	10.0	99.9%	0.1%
1,1,2,2-Tetrachloroethane	9.86	10.0	98.6%	9.81	10.0	98.1%	0.5%
Toluene	10.1	10.0	101%	10.0	10.0	100%	1.0%
Chlorobenzene	10.0	10.0	100%	10.1	10.0	101%	1.0%
Ethylbenzene	9.94	10.0	99.4%	9.88	10.0	98.8%	0.6%
Styrene	10.1	10.0	101%	9.97	10.0	99.7%	1.3%
Trichlorofluoromethane	10.1	10.0	101%	10.1	10.0	101%	0.0%
1,1,2-Trichloro-1,2,2-trifluoroetha	10.0	10.0	100%	10.1	10.0	101%	1.0%
m,p-Xylene	20.3	20.0	102%	20.2	20.0	101%	0.5%
o-Xylene	10.1	10.0	101%	10.0	10.0	100%	1.0%
1,2-Dichlorobenzene	9.89	10.0	98.9%	9.78	10.0	97.8%	1.1%
1,3-Dichlorobenzene	9.73	10.0	97.3%	9.82	10.0	98.2%	0.9%
1,4-Dichlorobenzene	9.79	10.0	97.9%	9.79	10.0	97.9%	0.0%
Acrolein	49.0	50.0	98.0%	48.1	50.0	96.2%	1.9%
Methyl Iodide	9.96	10.0	99.6%	10.0	10.0	100%	0.4%
Bromoethane	9.82	10.0	98.2%	9.81	10.0	98.1%	0.1%
Acrylonitrile	9.73	10.0	97.3%	9.42	10.0	94.2%	3.2%
1,1-Dichloropropene	9.82	10.0	98.2%	9.93	10.0	99.3%	1.1%
Dibromomethane	10.2	10.0	102%	10.3	10.0	103%	1.0%

ORGANICS ANALYSIS DATA SHEET
Volatiles by Purge & Trap GC/MS-Method SW8260C
Page 2 of 2

Sample ID: LCS-080612A
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080612A
LIMS ID: 12-14521
Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
1,1,1,2-Tetrachloroethane	10.4	10.0	104%	10.3	10.0	103%	1.0%
1,2-Dibromo-3-chloropropane	9.84	10.0	98.4%	9.18	10.0	91.8%	6.9%
1,2,3-Trichloropropane	10.0	10.0	100%	10.0	10.0	100%	0.0%
trans-1,4-Dichloro-2-butene	10.1	10.0	101%	9.71	10.0	97.1%	3.9%
1,3,5-Trimethylbenzene	9.97	10.0	99.7%	10.0	10.0	100%	0.3%
1,2,4-Trimethylbenzene	9.87	10.0	98.7%	9.86	10.0	98.6%	0.1%
Hexachlorobutadiene	9.67 B	10.0	96.7%	9.51 B	10.0	95.1%	1.7%
Ethylene Dibromide	10.2	10.0	102%	10.2	10.0	102%	0.0%
Bromochloromethane	10.0	10.0	100%	9.97	10.0	99.7%	0.3%
2,2-Dichloropropane	9.34	10.0	93.4%	9.40	10.0	94.0%	0.6%
1,3-Dichloropropane	10.1	10.0	101%	10.1	10.0	101%	0.0%
Isopropylbenzene	9.77	10.0	97.7%	9.93	10.0	99.3%	1.6%
n-Propylbenzene	9.88	10.0	98.8%	9.99	10.0	99.9%	1.1%
Bromobenzene	9.75	10.0	97.5%	9.89	10.0	98.9%	1.4%
2-Chlorotoluene	9.71	10.0	97.1%	9.81	10.0	98.1%	1.0%
4-Chlorotoluene	9.79	10.0	97.9%	9.88	10.0	98.8%	0.9%
tert-Butylbenzene	10.1	10.0	101%	10.1	10.0	101%	0.0%
sec-Butylbenzene	9.95	10.0	99.5%	9.93	10.0	99.3%	0.2%
4-Isopropyltoluene	9.92	10.0	99.2%	9.95	10.0	99.5%	0.3%
n-Butylbenzene	9.58 B	10.0	95.8%	9.47 B	10.0	94.7%	1.2%
1,2,4-Trichlorobenzene	9.61	10.0	96.1%	9.52	10.0	95.2%	0.9%
Naphthalene	9.74	10.0	97.4%	9.37	10.0	93.7%	3.9%
1,2,3-Trichlorobenzene	9.69	10.0	96.9%	9.45	10.0	94.5%	2.5%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	**LCSD**
d4-1,2-Dichloroethane	99.0%	100%
d8-Toluene	99.6%	100%
Bromofluorobenzene	99.9%	100%
d4-1,2-Dichlorobenzene	100%	101%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/03/12 21:25
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Date Analyzed: 08/03/12 21:25

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**2.5**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	58.4%	2-Fluorobiphenyl	53.2%
d14-p-Terphenyl	56.4%	d4-1,2-Dichlorobenzene	36.9%
d5-Phenol	62.7%	2-Fluorophenol	58.9%
2,4,6-Tribromophenol	81.6%	d4-2-Chlorophenol	62.9%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-16S-073012
SAMPLE

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/03/12 21:59
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-16S-073012
SAMPLE

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Date Analyzed: 08/03/12 21:59

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**2.4**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	61.6%	2-Fluorobiphenyl	54.4%
d14-p-Terphenyl	65.6%	d4-1,2-Dichlorobenzene	38.4%
d5-Phenol	64.0%	2-Fluorophenol	60.3%
2,4,6-Tribromophenol	85.6%	d4-2-Chlorophenol	64.0%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/03/12 22:33
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	**1,4-Dichlorobenzene**	**1.0**	**1.4**
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	**Naphthalene**	**1.0**	**3.4**
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	**2-Methylnaphthalene**	**1.0**	**2.5**
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	**Acenaphthene**	**1.0**	**1.2**
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Date Analyzed: 08/03/12 22:33

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	**Fluorene**	**1.0**	**1.1**
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	**Phenanthrene**	**1.0**	**1.4**
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**3.0**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	**1-Methylnaphthalene**	**1.0**	**2.8**
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	62.0%	2-Fluorobiphenyl	56.4%
d14-p-Terphenyl	73.6%	d4-1,2-Dichlorobenzene	40.8%
d5-Phenol	66.4%	2-Fluorophenol	61.9%
2,4,6-Tribromophenol	86.9%	d4-2-Chlorophenol	65.6%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/03/12 23:07
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Date Analyzed: 08/03/12 23:07

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**2.2**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	58.8%	2-Fluorobiphenyl	53.2%
d14-p-Terphenyl	59.6%	d4-1,2-Dichlorobenzene	39.8%
d5-Phenol	61.1%	2-Fluorophenol	58.1%
2,4,6-Tribromophenol	80.3%	d4-2-Chlorophenol	61.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13S-073012
SAMPLE

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/06/12 13:04
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-13S-073012
SAMPLE

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Date Analyzed: 08/06/12 13:04

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**2.5**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	59.2%	2-Fluorobiphenyl	54.4%
d14-p-Terphenyl	69.2%	d4-1,2-Dichlorobenzene	41.2%
d5-Phenol	62.7%	2-Fluorophenol	59.7%
2,4,6-Tribromophenol	82.1%	d4-2-Chlorophenol	62.9%

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ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-14D-073012
SAMPLE

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/06/12 13:38
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

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ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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Sample ID: MW-14D-073012
SAMPLE

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Date Analyzed: 08/06/12 13:38

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**2.2**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	67.2%	2-Fluorobiphenyl	61.6%
d14-p-Terphenyl	77.6%	d4-1,2-Dichlorobenzene	44.0%
d5-Phenol	70.4%	2-Fluorophenol	66.9%
2,4,6-Tribromophenol	92.8%	d4-2-Chlorophenol	71.2%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
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ANALYTICAL RESOURCES INCORPORATED

Sample ID: MW-13D-073012
SAMPLE

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/06/12 14:13
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

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INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-13D-073012
SAMPLE

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Date Analyzed: 08/06/12 14:13

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**2.1**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	62.4%	2-Fluorobiphenyl	60.8%
d14-p-Terphenyl	75.2%	d4-1,2-Dichlorobenzene	44.8%
d5-Phenol	64.0%	2-Fluorophenol	60.3%
2,4,6-Tribromophenol	86.1%	d4-2-Chlorophenol	64.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MW-DUP-073012
SAMPLE

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/06/12 14:47
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MW-DUP-073012
SAMPLE

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Date Analyzed: 08/06/12 14:47

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.9**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	54.0%	2-Fluorobiphenyl	47.6%
d14-p-Terphenyl	56.0%	d4-1,2-Dichlorobenzene	36.3%
d5-Phenol	54.4%	2-Fluorophenol	53.3%
2,4,6-Tribromophenol	68.5%	d4-2-Chlorophenol	56.5%

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 1 of 2

Sample ID: MB-080212
METHOD BLANK

Lab Sample ID: MB-080212
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Date Extracted: 08/02/12
Date Analyzed: 08/03/12 19:43
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
Extraction Method: SW3520C
Page 2 of 2

Sample ID: MB-080212
METHOD BLANK

Lab Sample ID: MB-080212
LIMS ID: 12-14520
Matrix: Water
Date Analyzed: 08/03/12 19:43

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	66.4%	2-Fluorobiphenyl	60.0%
d14-p-Terphenyl	80.4%	d4-1,2-Dichlorobenzene	46.4%
d5-Phenol	69.6%	2-Fluorophenol	67.2%
2,4,6-Tribromophenol	81.1%	d4-2-Chlorophenol	70.4%

SW8270 SEMIVOLATILES WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT OUT
MB-080212	66.4%	60.0%	80.4%	46.4%	69.6%	67.2%	81.1%	70.4%	0
LCS-080212	62.4%	60.8%	77.2%	48.0%	64.8%	61.3%	86.9%	64.3%	0
LCSD-080212	61.2%	60.4%	76.0%	45.6%	63.5%	59.7%	87.7%	63.7%	0
MW-15D-073012	58.4%	53.2%	56.4%	36.9%	62.7%	58.9%	81.6%	62.9%	0
MW-16S-073012	61.6%	54.4%	65.6%	38.4%	64.0%	60.3%	85.6%	64.0%	0
MW-15S-073012	62.0%	56.4%	73.6%	40.8%	66.4%	61.9%	86.9%	65.6%	0
MW-14S-073012	58.8%	53.2%	59.6%	39.8%	61.1%	58.1%	80.3%	61.3%	0
MW-13S-073012	59.2%	54.4%	69.2%	41.2%	62.7%	59.7%	82.1%	62.9%	0
MW-14D-073012	67.2%	61.6%	77.6%	44.0%	70.4%	66.9%	92.8%	71.2%	0
MW-13D-073012	62.4%	60.8%	75.2%	44.8%	64.0%	60.3%	86.1%	64.3%	0
MW-DUP-073012	54.0%	47.6%	56.0%	36.3%	54.4%	53.3%	68.5%	56.5%	0

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(50-100)	(34-101)
(FBP) = 2-Fluorobiphenyl	(51-100)	(38-100)
(TPH) = d14-p-Terphenyl	(54-117)	(27-122)
(DCB) = d4-1,2-Dichlorobenzene	(40-100)	(27-100)
(PHL) = d5-Phenol	(15-121)	(16-106)
(2FP) = 2-Fluorophenol	(33-100)	(23-100)
(TBP) = 2,4,6-Tribromophenol	(46-125)	(31-128)
(2CP) = d4-2-Chlorophenol	(46-102)	(33-100)

Prep Method: SW3520C
Log Number Range: 12-14520 to 12-14527

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS
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Sample ID: LCS-080212
LCS/LCSD

Lab Sample ID: LCS-080212
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/06/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted LCS/LCSD: 08/02/12

Date Analyzed LCS: 08/03/12 20:17
LCSD: 08/03/12 20:51
Instrument/Analyst LCS: NT6/JZ
LCSD: NT6/JZ
GPC Cleanup: NO

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Phenol	17.1	25.0	68.4%	17.4	25.0	69.6%	1.7%
Bis-(2-Chloroethyl) Ether	16.1	25.0	64.4%	16.4	25.0	65.6%	1.8%
2-Chlorophenol	17.1	25.0	68.4%	17.3	25.0	69.2%	1.2%
1,3-Dichlorobenzene	9.9	25.0	39.6%	9.6	25.0	38.4%	3.1%
1,4-Dichlorobenzene	10.4	25.0	41.6%	10.0	25.0	40.0%	3.9%
Benzyl Alcohol	14.1	25.0	56.4%	14.6	25.0	58.4%	3.5%
1,2-Dichlorobenzene	10.9	25.0	43.6%	10.6	25.0	42.4%	2.8%
2-Methylphenol	16.8	25.0	67.2%	17.3	25.0	69.2%	2.9%
2,2'-Oxybis(1-Chloropropane)	15.5	25.0	62.0%	15.6	25.0	62.4%	0.6%
4-Methylphenol	33.2	50.0	66.4%	34.7	50.0	69.4%	4.4%
N-Nitroso-Di-N-Propylamine	16.0	25.0	64.0%	16.7	25.0	66.8%	4.3%
Hexachloroethane	8.9	25.0	35.6%	8.5	25.0	34.0%	4.6%
Nitrobenzene	16.0	25.0	64.0%	16.5	25.0	66.0%	3.1%
Isophorone	18.4	25.0	73.6%	19.4	25.0	77.6%	5.3%
2-Nitrophenol	18.2	25.0	72.8%	19.0	25.0	76.0%	4.3%
2,4-Dimethylphenol	44.5	75.0	59.3%	48.2	75.0	64.3%	8.0%
Benzoic Acid	112	138	81.2%	115	138	83.3%	2.6%
bis(2-Chloroethoxy) Methane	16.1	25.0	64.4%	16.7	25.0	66.8%	3.7%
2,4-Dichlorophenol	49.4	75.0	65.9%	51.9	75.0	69.2%	4.9%
1,2,4-Trichlorobenzene	11.2	25.0	44.8%	11.1	25.0	44.4%	0.9%
Naphthalene	12.6	25.0	50.4%	12.7	25.0	50.8%	0.8%
4-Chloroaniline	36.8	75.0	49.1%	40.0	75.0	53.3%	8.3%
Hexachlorobutadiene	9.7	25.0	38.8%	9.6	25.0	38.4%	1.0%
4-Chloro-3-methylphenol	52.5	75.0	70.0%	54.8	75.0	73.1%	4.3%
2-Methylnaphthalene	12.1	25.0	48.4%	12.3	25.0	49.2%	1.6%
Hexachlorocyclopentadiene	23.5	75.0	31.3%	27.8	75.0	37.1%	16.8%
2,4,6-Trichlorophenol	54.8	75.0	73.1%	58.1	75.0	77.5%	5.8%
2,4,5-Trichlorophenol	54.6	75.0	72.8%	58.1	75.0	77.5%	6.2%
2-Chloronaphthalene	15.3	25.0	61.2%	15.7	25.0	62.8%	2.6%
2-Nitroaniline	41.6	75.0	55.5%	44.3	75.0	59.1%	6.3%
Dimethylphthalate	18.7	25.0	74.8%	19.6	25.0	78.4%	4.7%
Acenaphthylene	15.3	25.0	61.2%	15.9	25.0	63.6%	3.8%
3-Nitroaniline	46.8	75.0	62.4%	50.6	75.0	67.5%	7.8%
Acenaphthene	14.9	25.0	59.6%	15.6	25.0	62.4%	4.6%
2,4-Dinitrophenol	137 Q	138	99.3%	139 Q	138	101%	1.4%
4-Nitrophenol	66.4	75.0	88.5%	70.0	75.0	93.3%	5.3%
Dibenzofuran	14.1	25.0	56.4%	14.7	25.0	58.8%	4.2%
2,6-Dinitrotoluene	55.7	75.0	74.3%	58.8	75.0	78.4%	5.4%
2,4-Dinitrotoluene	57.1	75.0	76.1%	60.2	75.0	80.3%	5.3%
Diethylphthalate	19.0	25.0	76.0%	19.8	25.0	79.2%	4.1%
4-Chlorophenyl-phenylether	17.2	25.0	68.8%	17.8	25.0	71.2%	3.4%
Fluorene	16.3	25.0	65.2%	16.8	25.0	67.2%	3.0%
4-Nitroaniline	48.5	75.0	64.7%	52.5	75.0	70.0%	7.9%
4,6-Dinitro-2-Methylphenol	122	138	88.4%	126	138	91.3%	3.2%
N-Nitrosodiphenylamine	16.7	25.0	66.8%	17.6	25.0	70.4%	5.2%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-080212
LCS/LCSD

Lab Sample ID: LCS-080212
LIMS ID: 12-14520
Matrix: Water
Date Analyzed LCS: 08/03/12 20:17
LCSD: 08/03/12 20:51

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
4-Bromophenyl-phenylether	17.8	25.0	71.2%	18.3	25.0	73.2%	2.8%
Hexachlorobenzene	17.3	25.0	69.2%	17.7	25.0	70.8%	2.3%
Pentachlorophenol	68.9 Q	75.0	91.9%	72.4 Q	75.0	96.5%	5.0%
Phenanthrene	17.0	25.0	68.0%	17.3	25.0	69.2%	1.7%
Carbazole	18.9	25.0	75.6%	19.6	25.0	78.4%	3.6%
Anthracene	15.2	25.0	60.8%	15.9	25.0	63.6%	4.5%
Di-n-Butylphthalate	19.5	25.0	78.0%	20.0	25.0	80.0%	2.5%
Fluoranthene	17.0	25.0	68.0%	17.7	25.0	70.8%	4.0%
Pyrene	17.1	25.0	68.4%	17.5	25.0	70.0%	2.3%
Butylbenzylphthalate	18.8	25.0	75.2%	18.8	25.0	75.2%	0.0%
3,3'-Dichlorobenzidine	49.0	75.0	65.3%	53.3	75.0	71.1%	8.4%
Benzo(a)anthracene	17.2	25.0	68.8%	17.8	25.0	71.2%	3.4%
bis(2-Ethylhexyl)phthalate	19.4	25.0	77.6%	20.0	25.0	80.0%	3.0%
Chrysene	16.1	25.0	64.4%	16.4	25.0	65.6%	1.8%
Di-n-Octyl phthalate	18.4	25.0	73.6%	19.2	25.0	76.8%	4.3%
Benzo(a)pyrene	16.5	25.0	66.0%	17.0	25.0	68.0%	3.0%
Indeno(1,2,3-cd)pyrene	15.9	25.0	63.6%	16.3	25.0	65.2%	2.5%
Dibenz(a,h)anthracene	15.1	25.0	60.4%	15.5	25.0	62.0%	2.6%
Benzo(g,h,i)perylene	14.5	25.0	58.0%	14.8	25.0	59.2%	2.0%
1-Methylnaphthalene	17.7	25.0	70.8%	17.8	25.0	71.2%	0.6%
Total Benzofluoranthenes	32.8	50.0	65.6%	34.2	50.0	68.4%	4.2%

Semivolatile Surrogate Recovery

	LCS	**LCSD**
d5-Nitrobenzene	62.4%	61.2%
2-Fluorobiphenyl	60.8%	60.4%
d14-p-Terphenyl	77.2%	76.0%
d4-1,2-Dichlorobenzene	48.0%	45.6%
d5-Phenol	64.8%	63.5%
2-Fluorophenol	61.3%	59.7%
2,4,6-Tribromophenol	86.9%	87.7%
d4-2-Chlorophenol	64.3%	63.7%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 12:40
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.17**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.21**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.40**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.10**
86-73-7	**Fluorene**	**0.010**	**0.10**
85-01-8	**Phenanthrene**	**0.010**	**0.11**
120-12-7	**Anthracene**	**0.010**	**0.011**
206-44-0	**Fluoranthene**	**0.010**	**0.017**
129-00-0	**Pyrene**	**0.010**	**0.015**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	**Dibenzofuran**	**0.010**	**0.016**
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	68.0%
d14-Dibenzo(a,h)anthracene	66.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-16S-073012
SAMPLE

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 13:08
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
91-20-3	**Naphthalene**	**0.010**	**0.14**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.016**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.049**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.19**
86-73-7	**Fluorene**	**0.010**	**0.070**
85-01-8	**Phenanthrene**	**0.010**	**0.017**
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	Fluoranthene	0.010	< 0.010 U
129-00-0	Pyrene	0.010	< 0.010 U
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	71.0%
d14-Dibenzo(a,h)anthracene	73.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
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Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized: MW
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 13:37
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**3.7 E**
91-57-6	**2-Methylnaphthalene**	**0.010**	**3.1 E**
90-12-0	**1-Methylnaphthalene**	**0.010**	**2.4 E**
208-96-8	**Acenaphthylene**	**0.010**	**0.038**
83-32-9	**Acenaphthene**	**0.010**	**1.4 E**
86-73-7	**Fluorene**	**0.010**	**1.3 E**
85-01-8	**Phenanthrene**	**0.010**	**1.4 E**
120-12-7	**Anthracene**	**0.010**	**0.14**
206-44-0	**Fluoranthene**	**0.010**	**0.18**
129-00-0	**Pyrene**	**0.010**	**0.11**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	**Dibenzofuran**	**0.010**	**0.54**
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	71.7%
d14-Dibenzo(a,h)anthracene	69.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
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Sample ID: MW-15S-073012
DILUTION

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 16:58
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 10.0

CAS Number	**Analyte**	**RL**	**Result**
91-20-3	**Naphthalene**	**0.10**	**3.9**
91-57-6	**2-Methylnaphthalene**	**0.10**	**3.3**
90-12-0	**1-Methylnaphthalene**	**0.10**	**2.5**
208-96-8	Acenaphthylene	0.10	< 0.10 U
83-32-9	**Acenaphthene**	**0.10**	**1.4**
86-73-7	**Fluorene**	**0.10**	**1.4**
85-01-8	**Phenanthrene**	**0.10**	**1.5**
120-12-7	**Anthracene**	**0.10**	**0.19**
206-44-0	**Fluoranthene**	**0.10**	**0.24**
129-00-0	**Pyrene**	**0.10**	**0.17**
56-55-3	Benzo(a)anthracene	0.10	< 0.10 U
218-01-9	Chrysene	0.10	< 0.10 U
50-32-8	Benzo(a)pyrene	0.10	< 0.10 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.10	< 0.10 U
53-70-3	Dibenz(a,h)anthracene	0.10	< 0.10 U
191-24-2	Benzo(g,h,i)perylene	0.10	< 0.10 U
132-64-9	**Dibenzofuran**	**0.10**	**0.58**
TOTBFA	Total Benzofluoranthenes	0.20	< 0.20 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	73.0%
d14-Dibenzo(a,h)anthracene	58.7%

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
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Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 14:06
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.084**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.32**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.56**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.18**
86-73-7	**Fluorene**	**0.010**	**0.14**
85-01-8	**Phenanthrene**	**0.010**	**0.12**
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	**Fluoranthene**	**0.010**	**0.024**
129-00-0	**Pyrene**	**0.010**	**0.030**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	63.3%
d14-Dibenzo(a,h)anthracene	61.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
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Sample ID: MW-13S-073012
SAMPLE

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 14:35
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.14**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.12**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.27**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.16**
86-73-7	**Fluorene**	**0.010**	**0.12**
85-01-8	**Phenanthrene**	**0.010**	**0.11**
120-12-7	**Anthracene**	**0.010**	**0.015**
206-44-0	**Fluoranthene**	**0.010**	**0.020**
129-00-0	**Pyrene**	**0.010**	**0.018**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	67.3%
d14-Dibenzo(a,h)anthracene	66.0%

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-14D-073012
SAMPLE

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 15:04
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.12**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.13**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.21**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.18**
86-73-7	**Fluorene**	**0.010**	**0.12**
85-01-8	**Phenanthrene**	**0.010**	**0.14**
120-12-7	**Anthracene**	**0.010**	**0.014**
206-44-0	**Fluoranthene**	**0.010**	**0.026**
129-00-0	**Pyrene**	**0.010**	**0.020**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	**Dibenzofuran**	**0.010**	**0.019**
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	65.7%
d14-Dibenzo(a,h)anthracene	59.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
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Sample ID: MW-13D-073012
SAMPLE

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 16:00
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.31**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.48**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.66**
208-96-8	**Acenaphthylene**	**0.010**	**0.011**
83-32-9	**Acenaphthene**	**0.010**	**0.091**
86-73-7	**Fluorene**	**0.010**	**0.16**
85-01-8	**Phenanthrene**	**0.010**	**0.18**
120-12-7	**Anthracene**	**0.010**	**0.018**
206-44-0	**Fluoranthene**	**0.010**	**0.028**
129-00-0	**Pyrene**	**0.010**	**0.025**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	**Dibenzofuran**	**0.010**	**0.024**
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery

d10-2-Methylnaphthalene	71.7%
d14-Dibenzo(a,h)anthracene	69.7%

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-DUP-073012
SAMPLE

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 16:29
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	**Naphthalene**	**0.010**	**0.12**
91-57-6	**2-Methylnaphthalene**	**0.010**	**0.13**
90-12-0	**1-Methylnaphthalene**	**0.010**	**0.22**
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	**Acenaphthene**	**0.010**	**0.20**
86-73-7	**Fluorene**	**0.010**	**0.14**
85-01-8	**Phenanthrene**	**0.010**	**0.16**
120-12-7	**Anthracene**	**0.010**	**0.018**
206-44-0	**Fluoranthene**	**0.010**	**0.030**
129-00-0	**Pyrene**	**0.010**	**0.024**
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	**Dibenzofuran**	**0.010**	**0.021**
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	66.7%
d14-Dibenzo(a,h)anthracene	69.0%

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MB-080312
METHOD BLANK

Lab Sample ID: MB-080312
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: NA
Date Received: NA

Date Extracted: 08/03/12
Date Analyzed: 08/08/12 10:44
Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL
Final Extract Volume: 0.5 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
91-20-3	Naphthalene	0.010	< 0.010 U
91-57-6	2-Methylnaphthalene	0.010	< 0.010 U
90-12-0	1-Methylnaphthalene	0.010	< 0.010 U
208-96-8	Acenaphthylene	0.010	< 0.010 U
83-32-9	Acenaphthene	0.010	< 0.010 U
86-73-7	Fluorene	0.010	< 0.010 U
85-01-8	Phenanthrene	0.010	< 0.010 U
120-12-7	Anthracene	0.010	< 0.010 U
206-44-0	Fluoranthene	0.010	< 0.010 U
129-00-0	Pyrene	0.010	< 0.010 U
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
191-24-2	Benzo(g,h,i)perylene	0.010	< 0.010 U
132-64-9	Dibenzofuran	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

SIM Semivolatile Surrogate Recovery	
d10-2-Methylnaphthalene	62.7%
d14-Dibenzo(a,h)anthracene	65.7%

SIM SW8270 SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Client ID	MNP	DBA	TOT OUT
MB-080312	62.7%	65.7%	0
LCS-080312	70.7%	77.3%	0
LCSD-080312	63.0%	68.0%	0
MW-15D-073012	68.0%	66.7%	0
MW-16S-073012	71.0%	73.7%	0
MW-15S-073012	71.7%	69.7%	0
MW-15S-073012 DL	73.0%	58.7%	0
MW-14S-073012	63.3%	61.3%	0
MW-13S-073012	67.3%	66.0%	0
MW-14D-073012	65.7%	59.7%	0
MW-13D-073012	71.7%	69.7%	0
MW-DUP-073012	66.7%	69.0%	0

	LCS/MB LIMITS	QC LIMITS
(MNP) = d10-2-Methylnaphthalene	(40-93)	(35-94)
(DBA) = d14-Dibenzo(a,h)anthracene	(31-115)	(26-115)

Prep Method: SW3510C
Log Number Range: 12-14520 to 12-14527

ORGANICS ANALYSIS DATA SHEET
PNAs by Low Level SW8270D-SIM GC/MS
Page 1 of 1

Sample ID: LCS-080312
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080312
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
Event: 0001020.400.510
Date Sampled: NA
Date Received: NA

Date Extracted LCS/LCSD: 08/03/12

Date Analyzed LCS: 08/08/12 11:13
LCSD: 08/08/12 11:42
Instrument/Analyst LCS: NT11/VTS
LCSD: NT11/VTS

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Naphthalene	0.200	0.300	66.7%	0.183	0.300	61.0%	8.9%
2-Methylnaphthalene	0.200	0.300	66.7%	0.181	0.300	60.3%	10.0%
1-Methylnaphthalene	0.200	0.300	66.7%	0.181	0.300	60.3%	10.0%
Acenaphthylene	0.230	0.300	76.7%	0.209	0.300	69.7%	9.6%
Acenaphthene	0.211	0.300	70.3%	0.196	0.300	65.3%	7.4%
Fluorene	0.228	0.300	76.0%	0.219	0.300	73.0%	4.0%
Phenanthrene	0.213	0.300	71.0%	0.200	0.300	66.7%	6.3%
Anthracene	0.200	0.300	66.7%	0.167	0.300	55.7%	18.0%
Fluoranthene	0.240	0.300	80.0%	0.217	0.300	72.3%	10.1%
Pyrene	0.243	0.300	81.0%	0.214	0.300	71.3%	12.7%
Benzo(a)anthracene	0.236	0.300	78.7%	0.217	0.300	72.3%	8.4%
Chrysene	0.224	0.300	74.7%	0.208	0.300	69.3%	7.4%
Benzo(a)pyrene	0.200	0.300	66.7%	0.166	0.300	55.3%	18.6%
Indeno(1,2,3-cd)pyrene	0.215	0.300	71.7%	0.194	0.300	64.7%	10.3%
Dibenz(a,h)anthracene	0.213	0.300	71.0%	0.192	0.300	64.0%	10.4%
Benzo(g,h,i)perylene	0.227	0.300	75.7%	0.206	0.300	68.7%	9.7%
Dibenzofuran	0.194	0.300	64.7%	0.182	0.300	60.7%	6.4%
Total Benzofluoranthenes	0.665	0.600	111%	0.612	0.600	102%	8.3%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

SIM Semivolatile Surrogate Recovery

	LCS	**LCSD**
d10-2-Methylnaphthalene	70.7%	63.0%
d14-Dibenzo(a,h)anthracene	77.3%	68.0%

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 14:02
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	59.8%
Tetrachlorometaxylene	45.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-16S-073012
SAMPLE

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 14:19
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	**Analyte**	**RL**	**Result**
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	66.0%
Tetrachlorometaxylene	51.0%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 14:37
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	60.2%
Tetrachlorometaxylene	52.5%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 14:55
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	56.0%
Tetrachlorometaxylene	49.8%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13S-073012
SAMPLE

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Data Release Authorized: MW
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 15:13
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	**Analyte**	**RL**	**Result**
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	60.8%
Tetrachlorometaxylene	53.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MW-14D-073012
SAMPLE

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Data Release Authorized: MW
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 15:31
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	54.2%
Tetrachlorometaxylene	50.0%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-13D-073012
SAMPLE

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 15:48
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	57.5%
Tetrachlorometaxylene	50.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
Page 1 of 1

Sample ID: MW-DUP-073012
SAMPLE

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 16:06
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	**Analyte**	**RL**	**Result**
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane #	0.050	< 0.050 U
5103-71-9	cis-Chlordane $	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	59.0%
Tetrachlorometaxylene	48.2%

This analyte (CAS registry No. 5103-74-2) is named trans-Chlordane in EPA Method 8081B(Feb 2007). It has also been named gamma-Chlordane and beta-Chlordane.

$ This analyte (CAS registry No. 5103-71-9) is named cis-Chlordane in EPA Method 8081B(Feb 2007). It has also been named alpha-Chlordane.

ORGANICS ANALYSIS DATA SHEET
Pesticides by GC/ECD Method SW8081B
Extraction Method: SW3510C
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Sample ID: MB-080312
METHOD BLANK

Lab Sample ID: MB-080312
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Date Extracted: 08/03/12
Date Analyzed: 08/07/12 12:50
Instrument/Analyst: ECD6/AAR
GPC Cleanup: No
Sulfur Cleanup: Yes

Sample Amount: 500 mL
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
pH: NA
Florisil Cleanup: No
Silica Gel: Yes

CAS Number	Analyte	RL	Result
319-84-6	alpha-BHC	0.050	< 0.050 U
319-85-7	beta-BHC	0.050	< 0.050 U
319-86-8	delta-BHC	0.050	< 0.050 U
58-89-9	gamma-BHC (Lindane)	0.050	< 0.050 U
76-44-8	Heptachlor	0.050	< 0.050 U
309-00-2	Aldrin	0.050	< 0.050 U
1024-57-3	Heptachlor Epoxide	0.050	< 0.050 U
959-98-8	Endosulfan I	0.050	< 0.050 U
60-57-1	Dieldrin	0.10	< 0.10 U
72-55-9	4,4'-DDE	0.10	< 0.10 U
72-20-8	Endrin	0.10	< 0.10 U
33213-65-9	Endosulfan II	0.10	< 0.10 U
72-54-8	4,4'-DDD	0.10	< 0.10 U
1031-07-8	Endosulfan Sulfate	0.10	< 0.10 U
50-29-3	4,4'-DDT	0.10	< 0.10 U
72-43-5	Methoxychlor	0.50	< 0.50 U
53494-70-5	Endrin Ketone	0.10	< 0.10 U
7421-93-4	Endrin Aldehyde	0.10	< 0.10 U
5103-74-2	trans-Chlordane	0.050	< 0.050 U
5103-71-9	cis-Chlordane	0.050	< 0.050 U
8001-35-2	Toxaphene	5.0	< 5.0 U

Reported in µg/L (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	72.0%
Tetrachlorometaxylene	54.5%

SW8081/PESTICIDE WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Client ID	DCBP	TCMX	TOT OUT
MB-080312	72.0%	54.5%	0
LCS-080312	67.5%	54.5%	0
LCSD-080312	59.5%	52.8%	0
MW-15D-073012	59.8%	45.5%	0
MW-16S-073012	66.0%	51.0%	0
MW-15S-073012	60.2%	52.5%	0
MW-14S-073012	56.0%	49.8%	0
MW-13S-073012	60.8%	53.2%	0
MW-14D-073012	54.2%	50.0%	0
MW-13D-073012	57.5%	50.2%	0
MW-DUP-073012	59.0%	48.2%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(54-100)	(32-116)
(TCMX) = Tetrachlorometaxylene	(52-100)	(43-106)

Prep Method: SW3510C
Log Number Range: 12-14520 to 12-14527

ORGANICS ANALYSIS DATA SHEET

Pesticides/PCB by GC/ECD Method SW8081B
Page 1 of 1

Sample ID: LCS-080312
LCS/LCSD

Lab Sample ID: LCS-080312
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/09/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted LCS/LCSD: 08/03/12

Date Analyzed LCS: 08/07/12 13:08
LCSD: 08/07/12 13:26
Instrument/Analyst LCS: ECD6/AAR
LCSD: ECD6/AAR
GPC Cleanup: No
Florisil Cleanup: No

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 5.0 mL
LCSD: 5.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00
Sulfur Cleanup: Yes
Silica Gel: Yes

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
alpha-BHC	0.163	0.200	81.5%	0.162	0.200	81.0%	0.6%
beta-BHC	0.159	0.200	79.5%	0.158	0.200	79.0%	0.6%
delta-BHC	0.105	0.200	52.5%	0.0971	0.200	48.6%	7.8%
gamma-BHC (Lindane)	0.162	0.200	81.0%	0.159	0.200	79.5%	1.9%
Heptachlor	0.161	0.200	80.5%	0.158	0.200	79.0%	1.9%
Aldrin	0.136	0.200	68.0%	0.135	0.200	67.5%	0.7%
Heptachlor Epoxide	0.201	0.200	100%	0.199	0.200	99.5%	1.0%
Endosulfan I	0.205	0.200	102%	0.201	0.200	100%	2.0%
Dieldrin	0.402	0.400	100%	0.392	0.400	98.0%	2.5%
4,4'-DDE	0.394	0.400	98.5%	0.386	0.400	96.5%	2.1%
Endrin	0.359	0.400	89.8%	0.326	0.400	81.5%	9.6%
Endosulfan II	0.353	0.400	88.2%	0.322	0.400	80.5%	9.2%
4,4'-DDD	0.355	0.400	88.8%	0.325	0.400	81.2%	8.8%
Endosulfan Sulfate	0.312	0.400	78.0%	0.286	0.400	71.5%	8.7%
4,4'-DDT	0.332	0.400	83.0%	0.302	0.400	75.5%	9.5%
Methoxychlor	1.67	2.00	83.5%	1.51	2.00	75.5%	10.1%
Endrin Ketone	0.377	0.400	94.2%	0.350	0.400	87.5%	7.4%
Endrin Aldehyde	0.273	0.400	68.2%	0.265	0.400	66.2%	3.0%
trans-Chlordane	0.209	0.200	104%	0.207	0.200	104%	1.0%
cis-Chlordane	0.188	0.200	94.0%	0.191	0.200	95.5%	1.6%

Pest/PCB Surrogate Recovery

	LCS	**LCSD**
Decachlorobiphenyl	67.5%	59.5%
Tetrachlorometaxylene	54.5%	52.8%

Results reported in µg/L (ppb)
RPD calculated using sample concentrations per SW846.

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/15/12 11:23
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	105%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-16S-073012
SAMPLE

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/15/12 13:47
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	306%

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 19:46
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery

2,4-Dichlorophenylacetic Acid	95.0%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 20:22
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	95.7%

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-13S-073012
SAMPLE

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 20:58
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	98.5%

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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-14D-073012
SAMPLE

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 21:34
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	107%

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-13D-073012
SAMPLE

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 22:10
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	**Analyte**	**RL**	**Result**
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	98.8%

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MW-DUP-073012
SAMPLE

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 22:46
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	110%

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Extraction Method: SW3510C
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Sample ID: MB-080212
METHOD BLANK

Lab Sample ID: MB-080212
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Date Extracted: 08/02/12
Date Analyzed: 08/08/12 16:11
Instrument/Analyst: ECD1/AAR

Sample Amount: 500 mL
Final Extract Volume: 50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
93-72-1	2,4,5-TP (Silvex)	0.25	< 0.25 U
93-76-5	2,4,5-T	0.25	< 0.25 U
88-85-7	Dinoseb	0.50	< 0.50 U
1918-00-9	Dicamba	0.50	< 0.50 U
94-75-7	2,4-D	1.0	< 1.0 U
94-82-6	2,4-DB	5.0	< 5.0 U
75-99-0	Dalapon	1.0	< 1.0 U
94-74-6	MCPA	250	< 250 U
120-36-5	Dichloroprop	1.0	< 1.0 U

Reported in µg/L (ppb)

Herbicide Surrogate Recovery	
2,4-Dichlorophenylacetic Acid	104%

SW8151A/HERBICIDE WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Client ID	DCPA	TOT OUT
MB-080212	104%	0
LCS-080212	87.8%	0
LCSD-080212	104%	0
MW-15D-073012	105%	0
MW-16S-073012	306%*	1
MW-15S-073012	95.0%	0
MW-14S-073012	95.7%	0
MW-13S-073012	98.5%	0
MW-14D-073012	107%	0
MW-13D-073012	98.8%	0
MW-DUP-073012	110%	0

	LCS/MB LIMITS	QC LIMITS
(DCPA) = 2,4-Dichlorophenylacetic Acid	(66-112)	(28-140)

Log Number Range: 12-14520 to 12-14527

ORGANICS ANALYSIS DATA SHEET
Herbicides by SW8151A GC/ECD
Page 1 of 1

Sample ID: LCS-080212
LCS/LCSD

Lab Sample ID: LCS-080212
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/15/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted LCS/LCSD: 08/02/12

Date Analyzed LCS: 08/15/12 10:47
LCSD: 08/08/12 17:22
Instrument/Analyst LCS: ECD1/AAR
LCSD: ECD1/AAR

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 50 mL
LCSD: 50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
2,4,5-TP (Silvex)	7.05	10.0	70.5%	6.99	10.0	69.9%	0.9%
2,4,5-T	1.71	2.50	68.4%	1.72	2.50	68.8%	0.6%
Dinoseb	2.64	5.00	52.8%	2.55	5.00	51.0%	3.5%
Dicamba	3.88	5.00	77.6%	4.52	5.00	90.4%	15.2%
2,4-D	8.49	10.0	84.9%	8.00	10.0	80.0%	5.9%
2,4-DB	45.0	50.0	90.0%	46.8	50.0	93.6%	3.9%
Dalapon	5.79	10.0	57.9%	6.60	10.0	66.0%	13.1%
Dichloroprop	7.61	10.0	76.1%	7.43	10.0	74.3%	2.4%

Herbicide Surrogate Recovery

	LCS	**LCSD**
2,4-Dichlorophenylacetic	87.8%	104%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL
RESOURCES
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ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Extraction Method: SW3510C
Page 1 of 1

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Matrix: Water

Data Release Authorized:
Reported: 08/03/12

ARI ID	**Sample ID**	**Extraction Date**	**Analysis Date**	**DL**	**Range**	**Result**
MB-080112	Method Blank	08/01/12	08/02/12	1.0	Gas	< 0.25 U
12-14520					Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	87.6%
VE22A	MW-15D-073012	08/01/12	08/02/12	1.0	Gas	< 0.25 U
12-14520	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	83.0%
VE22B	MW-16S-073012	08/01/12	08/02/12	1.0	Gas	< 0.25 U
12-14521	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	81.0%
VE22C	MW-15S-073012	08/01/12	08/02/12	1.0	Gas	< 0.25 U
12-14522	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	80.9%
VE22D	MW-14S-073012	08/01/12	08/02/12	1.0	Gas	< 0.25 U
12-14523	HC ID: **DRO**				**Diesel**	**> 0.50**
					Oil	< 0.50 U
					o-Terphenyl	82.9%
VE22E	MW-13S-073012	08/01/12	08/03/12	1.0	Gas	< 0.25 U
12-14524	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	75.8%
VE22F	MW-14D-073012	08/01/12	08/03/12	1.0	Gas	< 0.25 U
12-14525	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	82.6%
VE22G	MW-13D-073012	08/01/12	08/03/12	1.0	Gas	< 0.25 U
12-14526	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	81.3%
VE22H	MW-DUP-073012	08/01/12	08/03/12	1.0	Gas	< 0.25 U
12-14527	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	84.8%

Reported in mg/L (ppm)

Gas value based on total peaks in the range from Toluene to C12.
Diesel value based on the total peaks in the range from C12 to C24.
Oil value based on the total peaks in the range from C24 to C38.

FORM I

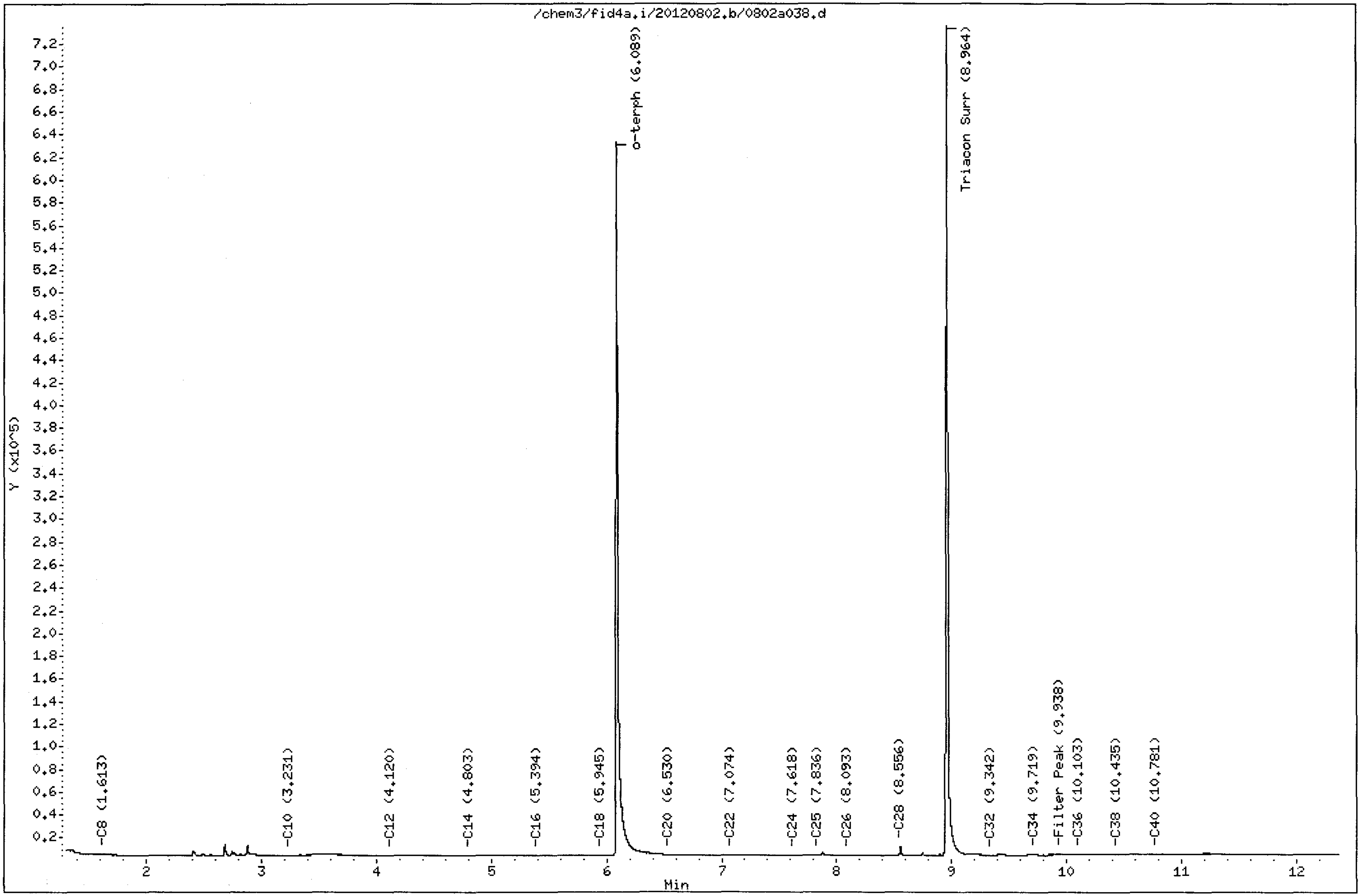
```
                         Analytical Resources Inc.
                         407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a038.d       ARI ID: VE22MBW1
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-AUG-2012 21:50
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                              FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range           Total Area   Conc
==========================================================================================
Toluene        1.405   0.018     2634      7882 |  GAS (Tol-C12)          110130      7.32
C8             1.613  -0.051     1210      3285 | DIESEL (C12-C24)         34039      2.32
C10            3.231   0.001      536       385 |  M.OIL (C24-C38)         65819      5.24
C12            4.120  -0.004      402       220 | AK-102 (C10-C25)         62770      3.63
C14            4.803   0.000      198       185 | AK-103 (C25-C36)         47434      5.56
C16            5.394   0.010      149       244 |
C18            5.945   0.000      135       193 |
C20            6.530   0.013      351       658 |  JET-A (C10-C18)         47395      3.83
C22            7.074   0.005      138       233 |MIN.OIL (C24-C38)         65819      4.90
C24            7.618   0.028      110       180 |
C25            7.836  -0.007       53        19 |
C26            8.093   0.008       93       117 |
C28            8.556   0.017     7599      6658 |
C32            9.342  -0.005      557      1314 |
C34            9.719  -0.001      690      1787 |
Filter Peak    9.938  -0.007      697       275 |BUNKERC (C10-C38)        128388     16.82
C36           10.103   0.020      868      1149 |
C38           10.435   0.000     1029      1568 |
C40           10.781   0.000     1521      2006 |
o-terph        6.089   0.000   628537    802553 |
Triacon Surr   8.964   0.000   731554    792964 |NAS DIES (C10-C24)        62569      3.65
=========================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area     Amount    %Rec
  ----------------------------------------
    o-Terphenyl     802553     39.4     87.5
    Triacontane     792964     41.5     92.3

M  Indicates the peak was manually integrated


        Analyte           RF      Curve Date
    ------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a038.d
Date : 02-AUG-2012 21:50
Client ID:
Sample Info: VE22MBW1

Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



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                          Analytical Resources Inc.
                           407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a041.d        ARI ID: VE22A
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m          Client ID:
Instrument: fid4a.i                                     Injection: 02-AUG-2012 22:54
Operator: AR
Report Date: 08/03/2012                                Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                    FID:4A RESULTS
Compound         RT     Shift    Height     Area           Range             Total Area    Conc
===========================================================================================
Toluene         1.403   0.016     3550      7028 |   GAS (Tol-C12)           808096      53.72 GRO
C8              1.667   0.003      954      1866 | DIESEL (C12-C24)         6681177     456.05 DRO
C10             3.246   0.015     2797      4301 |  M.OIL (C24-C38)         1434542     114.13 RRO
C12             4.120  -0.003    21668     11496 | AK-102 (C10-C25)         7519008     434.65
C14             4.788  -0.014    65971    141479 | AK-103 (C25-C36)         1193629     139.80
C16             5.360  -0.024    56988    157424 |
C18             5.931  -0.013    33220     65607 |
C20             6.509  -0.008    23290     32308 |  JET-A (C10-C18)         5182208     419.20
C22             7.076   0.007    20261     18509 |MIN.OIL (C24-C38)         1434542     106.73
C24             7.568  -0.022    25676     87516 |
C25             7.841  -0.002    17095      5419 |
C26             8.077  -0.008    15286     21100 |
C28             8.549   0.010    11269     26297 |
C32             9.329  -0.018     7613     20490 |
C34             9.696  -0.024     5345      9527 |
Filter Peak     9.957   0.012     4251      5482 |BUNKERC (C10-C38)         8776852    1149.71
C36            10.087   0.005     3944      2340 |
C38            10.441   0.006     3244      3721 |
C40            10.769  -0.012     3256      3762 |
o-terph         6.091   0.003   898677    761352 |
Triacon Surr    8.957  -0.006   789768    734414 |NAS DIES (C10-C24)        7342310     428.52
===========================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area     Amount     %Rec
  ----------------------------------------
    o-Terphenyl     761352     37.4      83.1 M
    Triacontane     734414     38.5      85.5 M

M  Indicates the peak was manually integrated

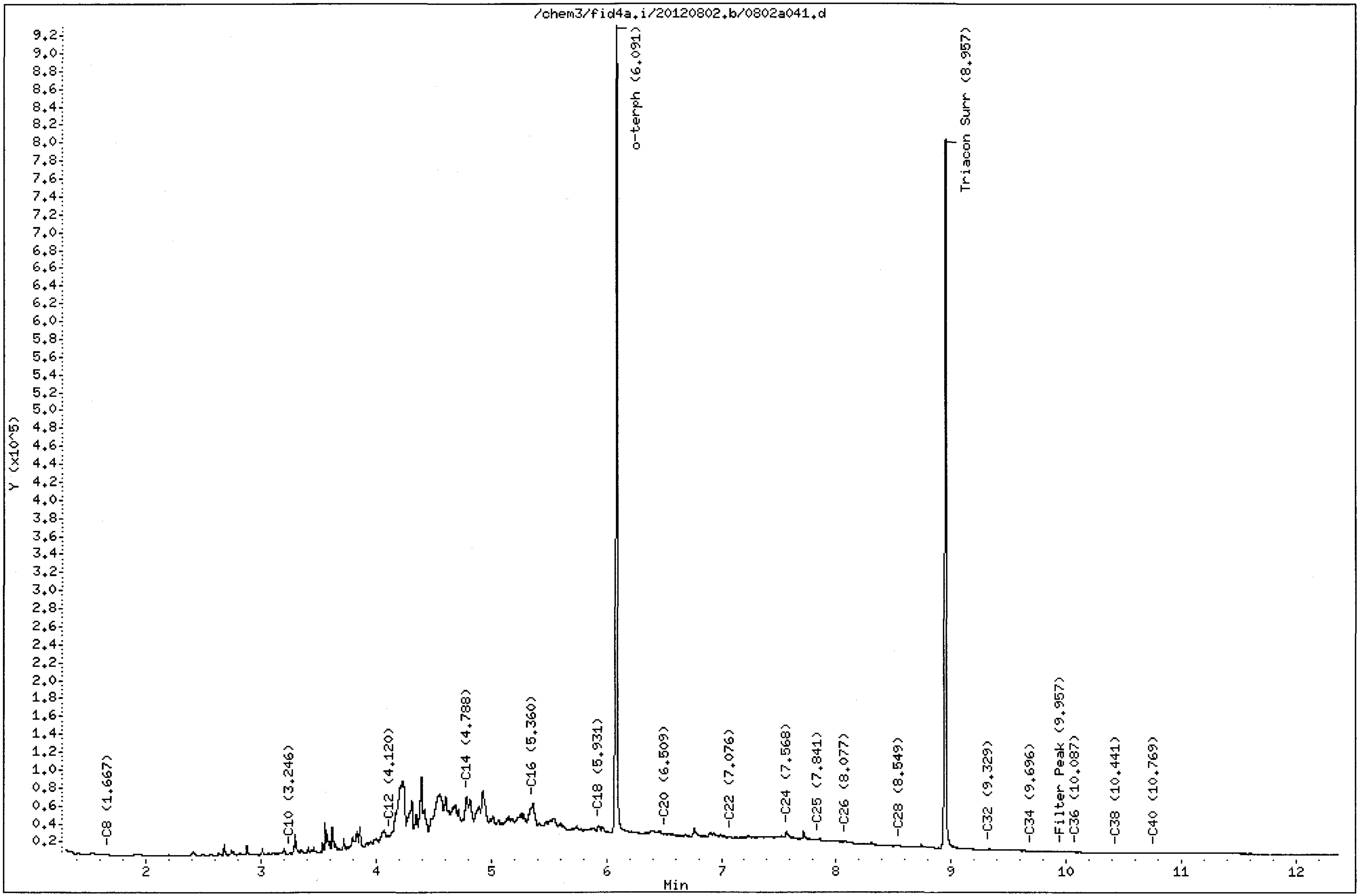

        Analyte          RF      Curve Date
    ------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a041.d
Date : 02-AUG-2012 22:54
Client ID:
Sample Info: VE22A

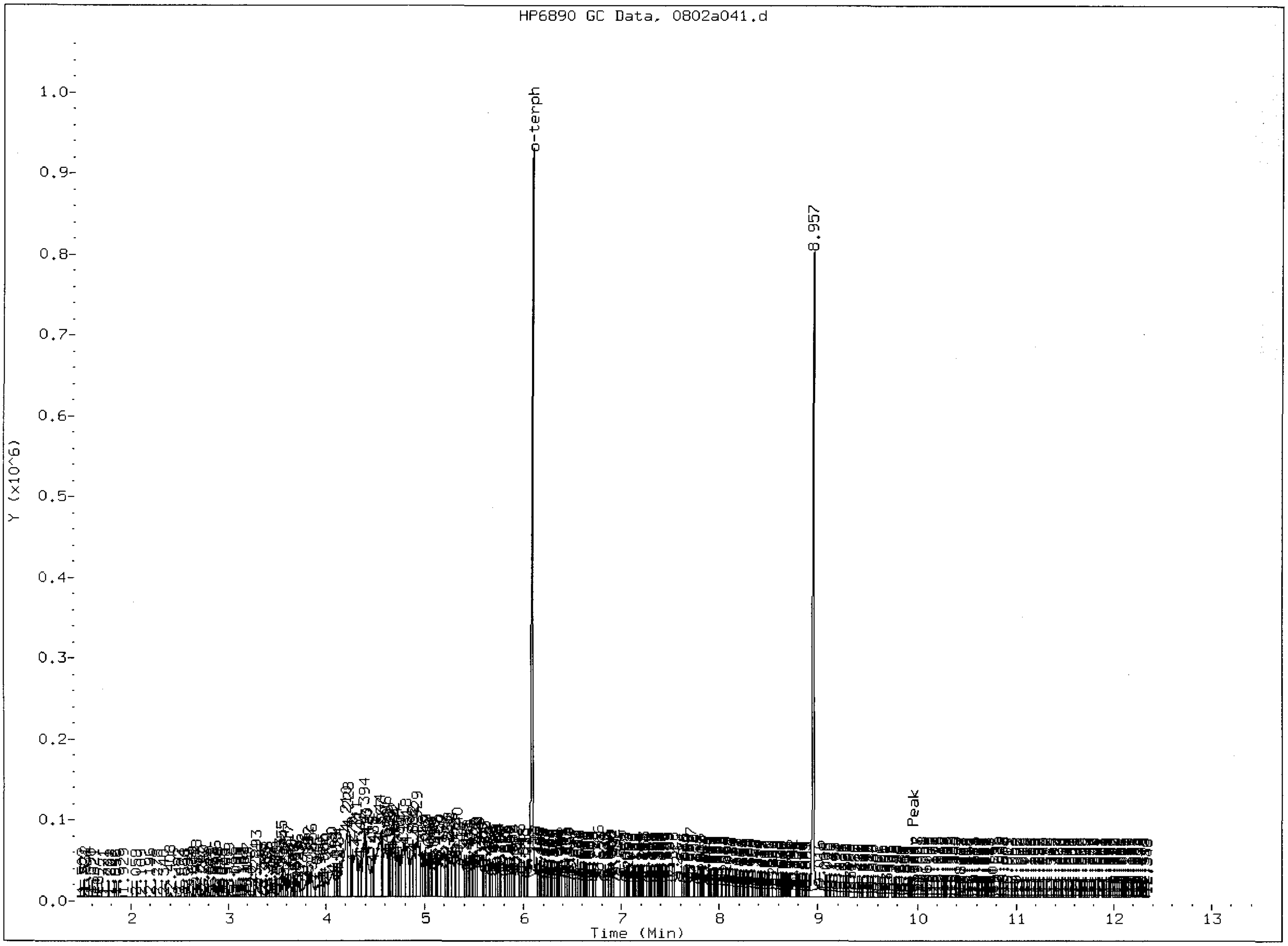
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22A FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate

Analyst: AR

Date: 8/13/12

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                    Analytical Resources Inc.
                  407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a042.d       ARI ID: VE22B
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-AUG-2012 23:15
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range            Total Area   Conc
===================================================================================================
Toluene        1.400   0.013     4988     12027 |   GAS (Tol-C12)          312457     20.77 GRO
C8             1.718   0.054     1073      2719 | DIESEL (C12-C24)        4388798    299.58 DRO
C10            3.248   0.018     1076      1619 |  M.OIL (C24-C38)        1587345    126.29 RRO
C12            4.125   0.002    11152     18857 | AK-102 (C10-C25)        4757392    275.01
C14            4.827   0.024    18716     10681 | AK-103 (C25-C36)        1347633    157.84
C16            5.411   0.027    28567     55850 |
C18            5.935  -0.010    25037     42916 |
C20            6.525   0.008    23405     11092 |  JET-A (C10-C18)        2449119    198.12
C22            7.057  -0.012    20932     42395 |MIN.OIL (C24-C38)        1587345    118.10
C24            7.582  -0.009    25367     60611 |
C25            7.835  -0.008    19862     24772 |
C26            8.077  -0.008    17822     42318 |
C28            8.548   0.009    15088     22959 |
C32            9.354   0.006     7984      7630 |
C34            9.734   0.014     5811      3450 |
Filter Peak    9.943  -0.003     5209      2477 |BUNKERC (C10-C38)        6181223    809.70
C36           10.080  -0.003     4667      2025 |
C38           10.442   0.007     3759      2009 |
C40           10.777  -0.004     3881      7224 |
o-terph        6.091   0.002   864099    742771 |
Triacon Surr   8.954  -0.010   790653    737283 |NAS DIES (C10-C24)       4593877    268.11
===================================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl     742771      36.5      81.0 M
    Triacontane     737283      38.6      85.8 M

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
    -------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```
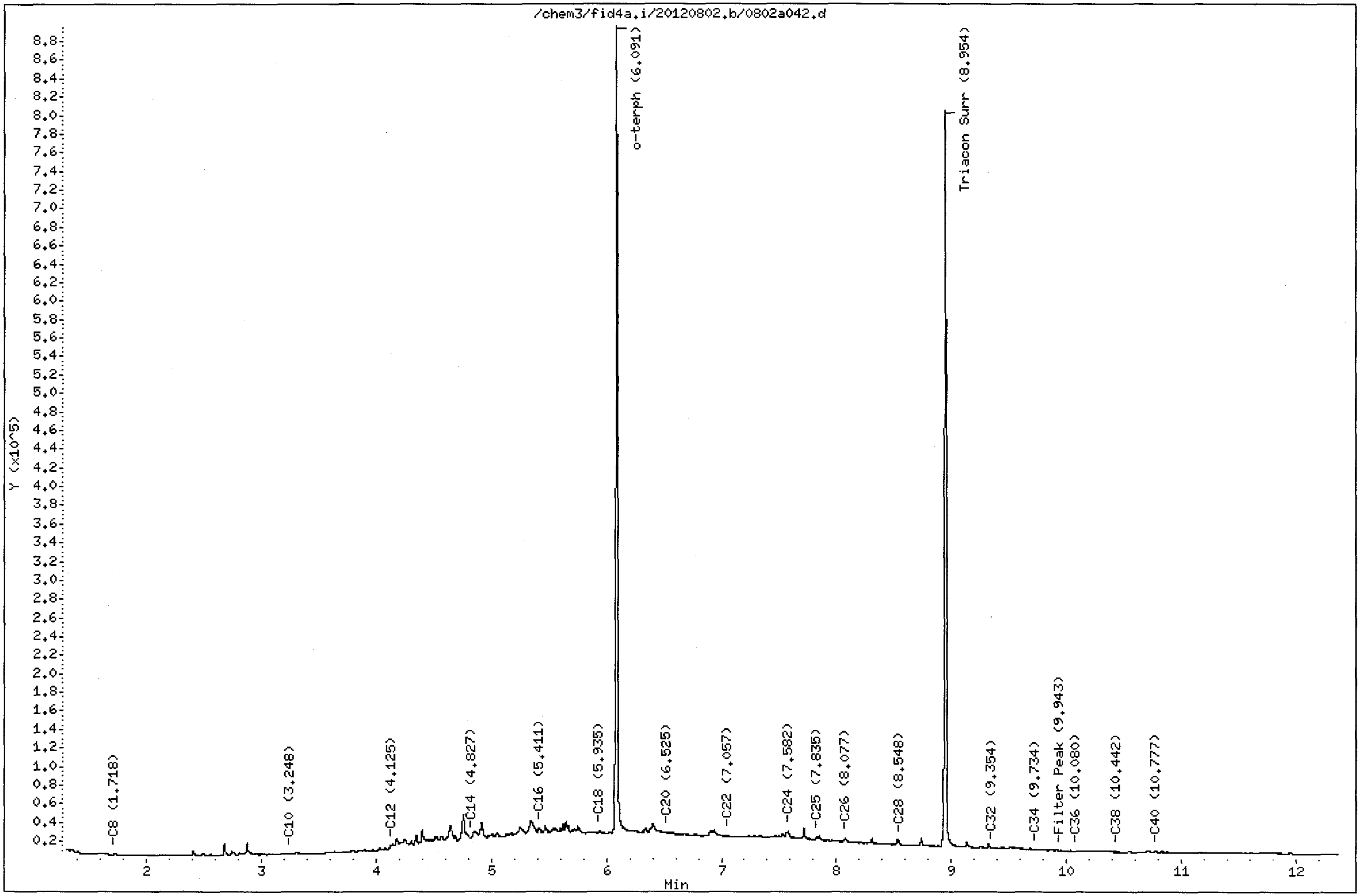

Data File: /chem3/fid4a.i/20120802.b/0802a042.d
Date : 02-AUG-2012 23:15
Client ID:
Sample Info: VE22B

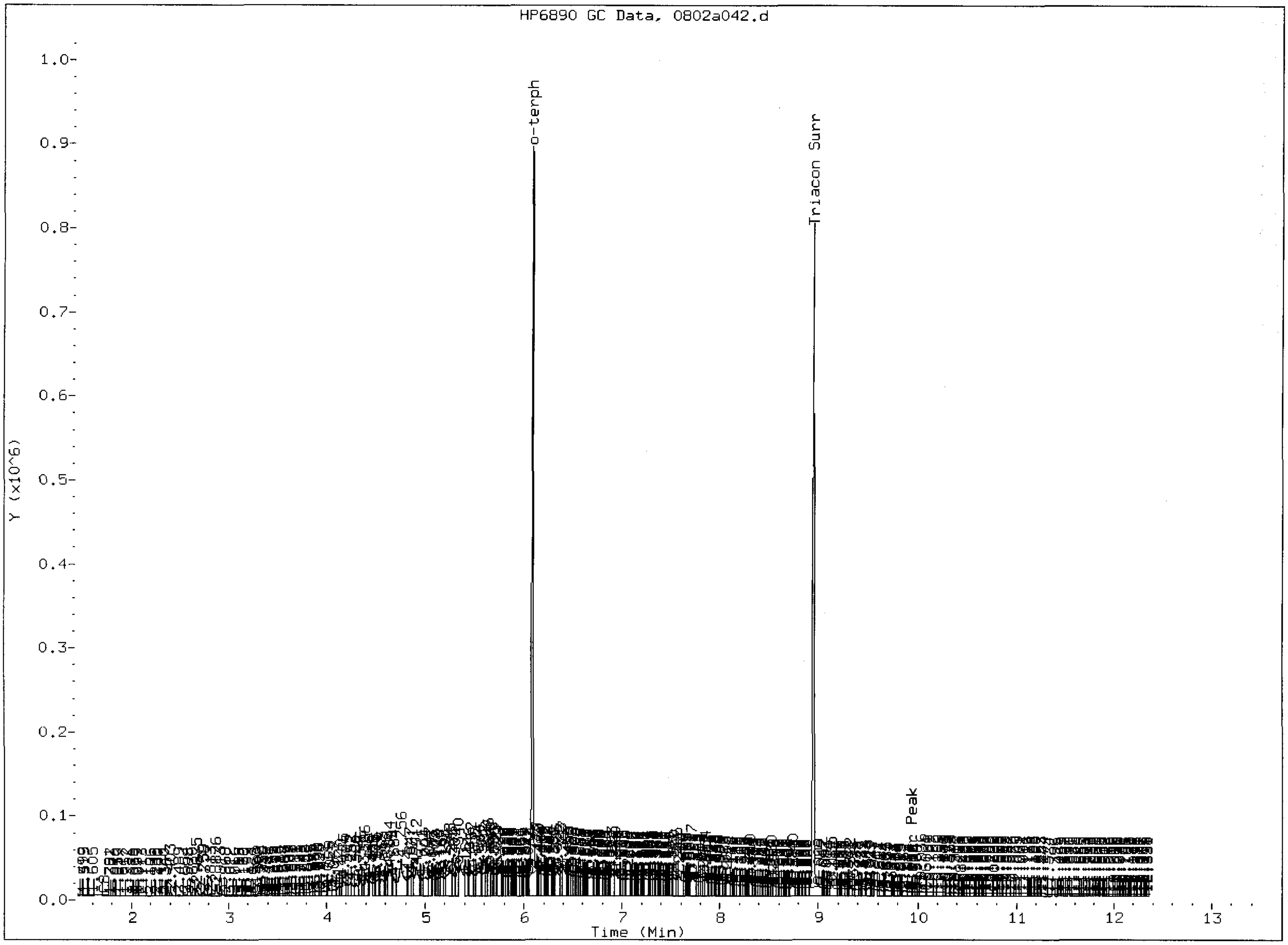
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22B FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
~~5~~. Skimmed surrogate

Analyst: AL Date: 8/3/2012

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                         Analytical Resources Inc.
                          407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a043.d       ARI ID: VE22C
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-AUG-2012 23:36
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound        RT     Shift   Height     Area         Range           Total Area   Conc
==============================================================================
Toluene        1.404   0.017    3608      9914 |   GAS (Tol-C12)         700654    46.57
C8             1.620  -0.045    1334      4935 | DIESEL (C12-C24)       4937676   337.04
C10            3.247   0.016    4026      4946 |  M.OIL (C24-C38)       1296671   103.16
C12            4.099  -0.024   14563     15274 | AK-102 (C10-C25)       5616801   324.69
C14            4.826   0.023   27099      9669 | AK-103 (C25-C36)       1086418   127.25
C16            5.408   0.024   28706     20771 |
C18            5.937  -0.008   25571     37147 |
C20            6.523   0.006   19676     32074 |  JET-A (C10-C18)       3617603   292.64
C22            7.073   0.004   16838     12662 |MIN.OIL (C24-C38)       1296671    96.47
C24            7.601   0.010   16577     10123 |
C25            7.840  -0.003   14284      3384 |
C26            8.082  -0.003   12432     11169 |
C28            8.532  -0.007    9857      9934 |
C32            9.337  -0.011    7187     18214 |
C34            9.707  -0.013    5220     16643 |
Filter Peak    9.950   0.004    4240      4967 |BUNKERC (C10-C38)       6766107   886.31
C36           10.083   0.001    3840      2445 |
C38           10.442   0.007    3182      4717 |
C40           10.780  -0.001    3255      1621 |
o-terph        6.091   0.002  885868    741593 |
Triacon Surr   8.959  -0.005  789282    735725 |NAS DIES (C10-C24)      5469436   319.22
==============================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl     741593      36.4      80.9 M
    Triacontane     735725      38.5      85.7 M

M  Indicates the peak was manually integrated

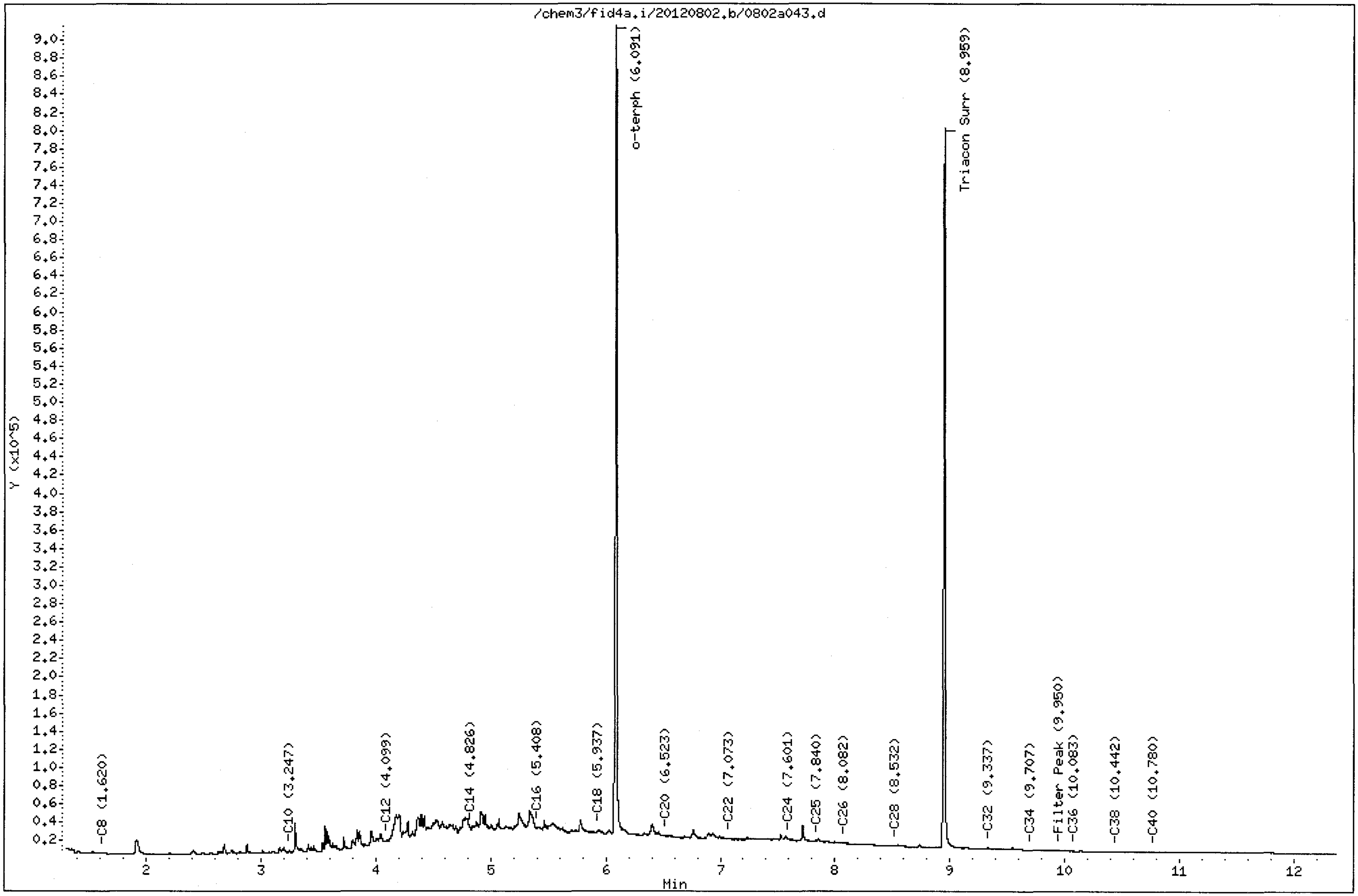

        Analyte           RF      Curve Date
      --------------------------------------
       o-Terph Surr    20371.2   10-JUL-2012
       Triacon Surr    19086.0   12-JUN-2012
       Gas             15043.9   10-MAY-2012
       Diesel          14650.0   10-JUL-2012
       Motor Oil       12569.0   12-JUN-2012
       AK102           17299.0   10-JUL-2012
       AK103            8538.0   24-MAY-2012
       JetA            12362.0   31-JUL-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       17134.0   10-JUL-2012
       Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a043.d
Date : 02-AUG-2012 23:36
Client ID:
Sample Info: VE22C

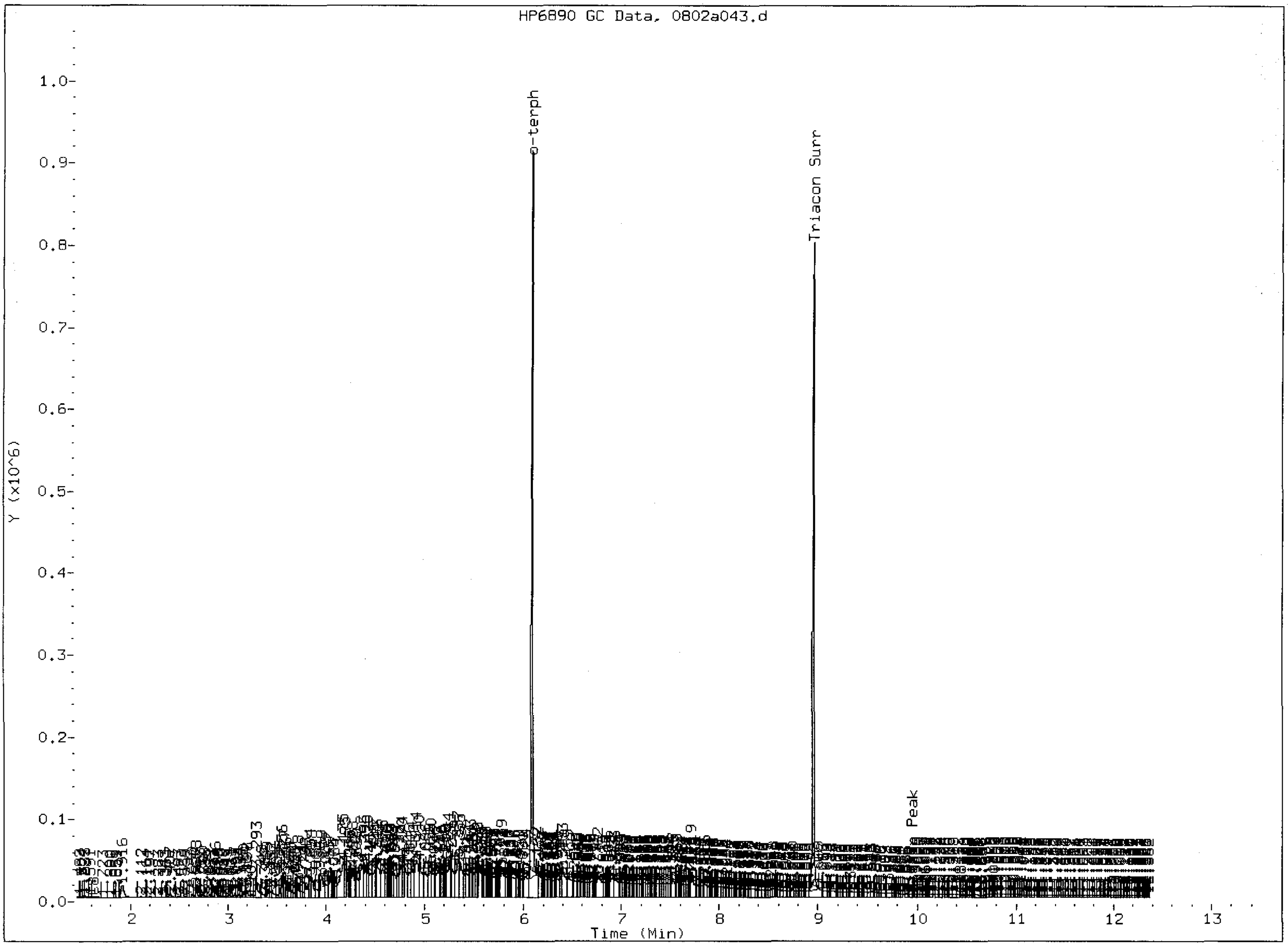
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22C FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate

Analyst: AR

Date: 8/3/2012

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                            Analytical Resources Inc.
                             407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a044.d       ARI ID: VE22D
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-AUG-2012 23:57
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                     FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range           Total Area   Conc
==========================================================================================
Toluene       1.388   0.000     3356      5537 |  GAS (Tol-C12)           711364    47.29
C8            1.708   0.044      534      1550 | DIESEL (C12-C24)        4406956   300.82
C10           3.241   0.011     3102      5293 |  M.OIL (C24-C38)        1240482    98.69
C12           4.099  -0.025    14256     14146 | AK-102 (C10-C25)        5097901   294.69
C14           4.796  -0.006    37554     64549 | AK-103 (C25-C36)        1025597   120.12
C16           5.401   0.017    24966     12344 |
C18           5.952   0.007    19422      8104 |
C20           6.510  -0.007    17043     24875 |  JET-A (C10-C18)        3328297   269.24
C22           7.071   0.002    15863      6553 |MIN.OIL (C24-C38)        1240482    92.29
C24           7.601   0.011    15415     10950 |
C25           7.843   0.000    13949      5205 |
C26           8.095   0.010    11738     14276 |
C28           8.531  -0.008     9382     11079 |
C32           9.328  -0.020     7031     20597 |
C34           9.715  -0.005     4688      4174 |
Filter Peak   9.957   0.012     4115      5638 |BUNKERC (C10-C38)        6193530   811.31
C36          10.085   0.003     3780      3077 |
C38          10.433  -0.002     3240      4896 |
C40          10.776  -0.005     3510      7035 |
o-terph       6.091   0.002   904428    759930 |
Triacon Surr  8.956  -0.007   793565    748755 |NAS DIES (C10-C24)       4953048   289.08
==========================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl     759930       37.3     82.9 M
    Triacontane     748755       39.2     87.2 M

M  Indicates the peak was manually integrated


      Analyte           RF      Curve Date
    ------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```
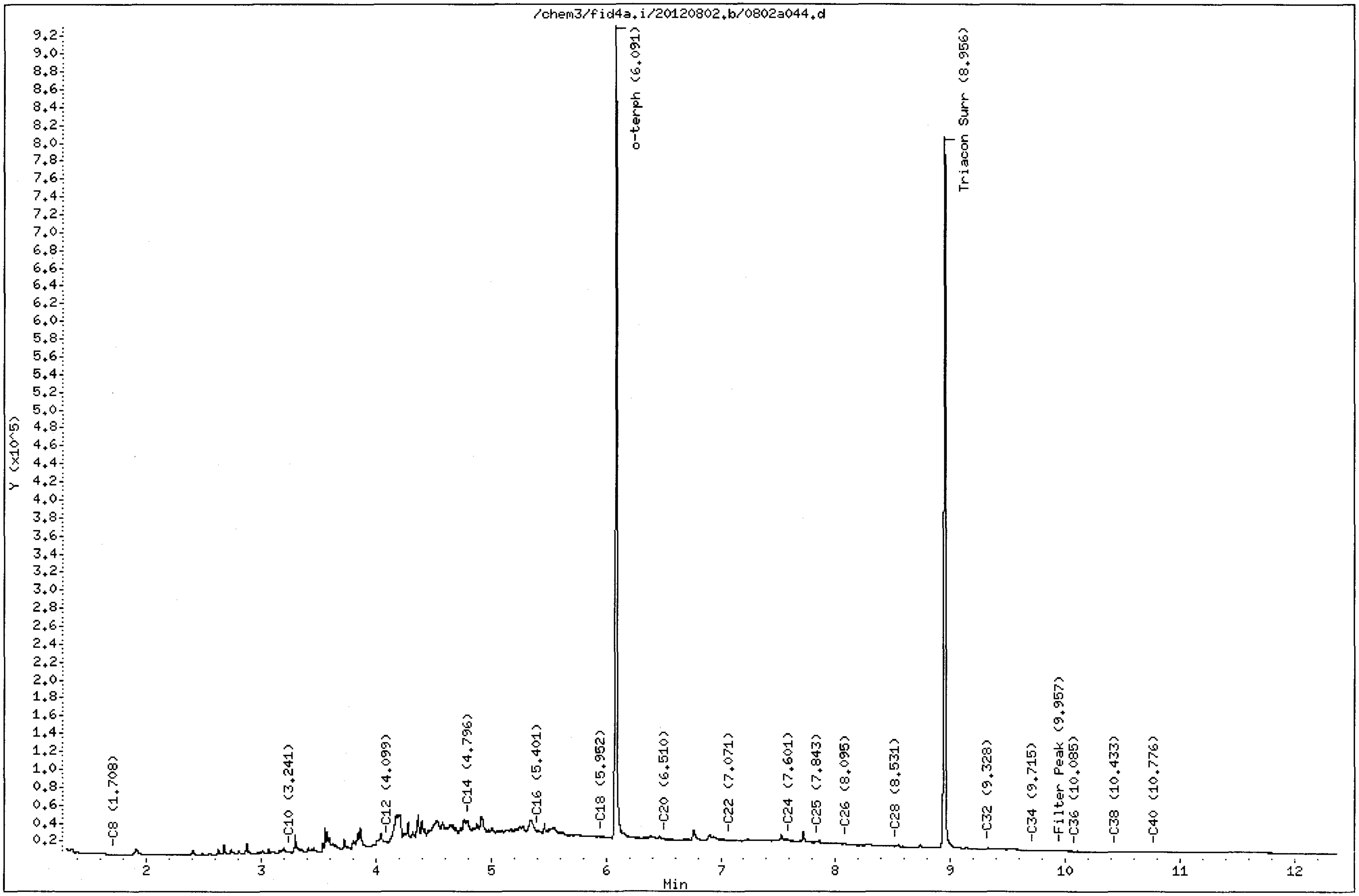

Data File: /chem3/fid4a.i/20120802.b/0802a044.d
Date : 02-AUG-2012 23:57
Client ID:
Sample Info: VE22D

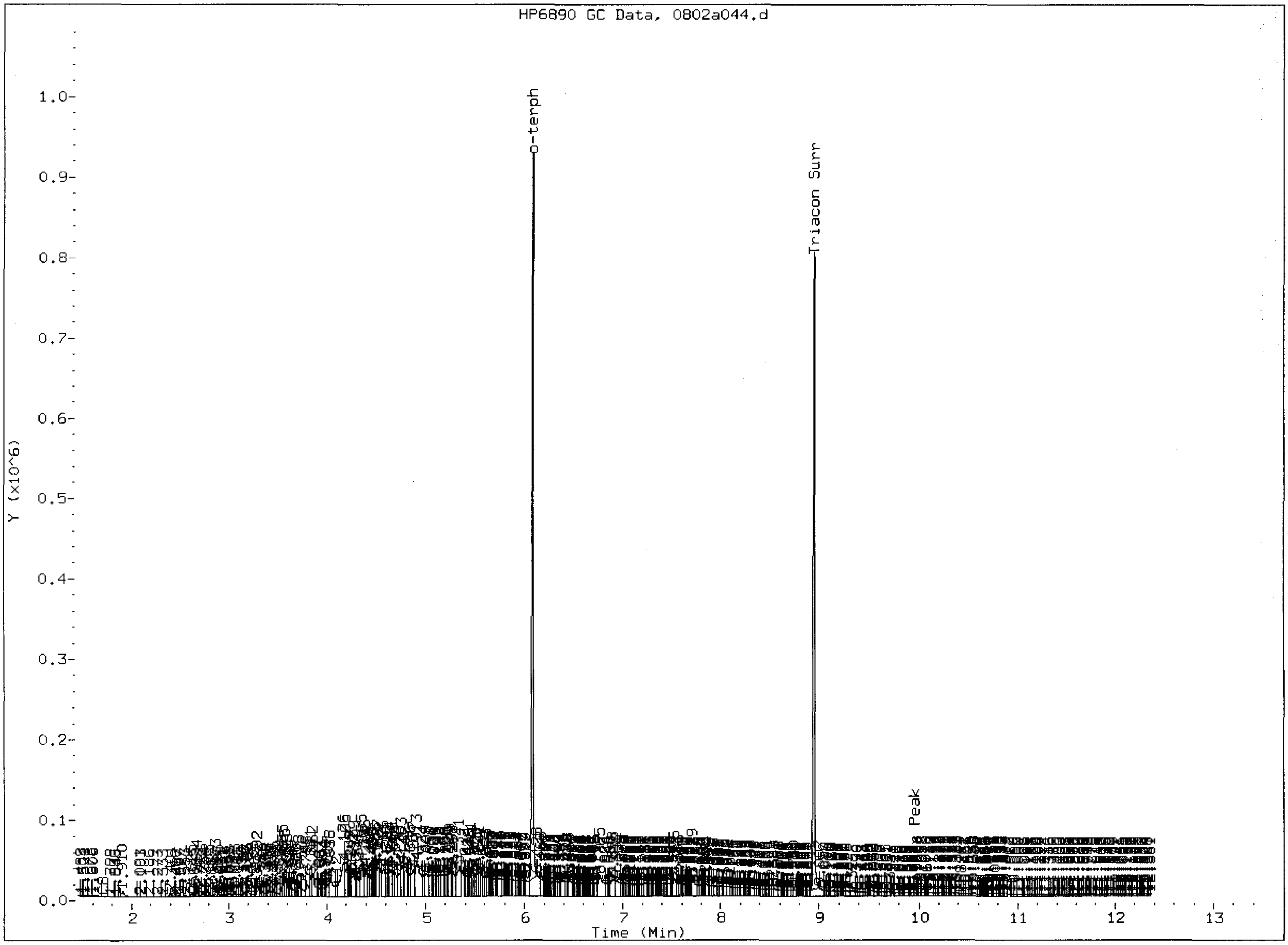
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22D FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
/5. Skimmed surrogate

Analyst: AR Date: 8/7/2012

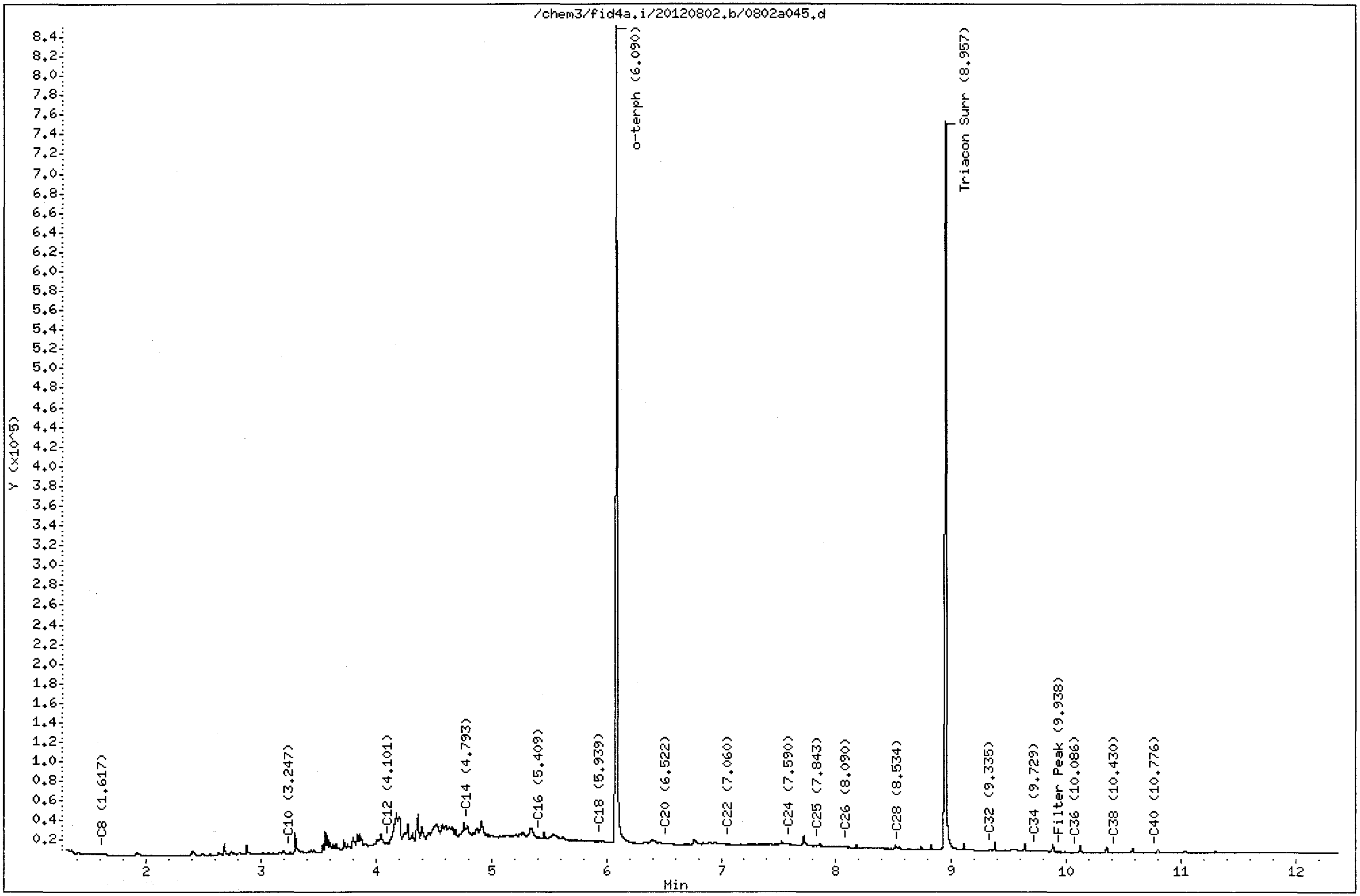
```
                         Analytical Resources Inc.
                        407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a045.d       ARI ID: VE22E
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 03-AUG-2012 00:19
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                  FID:4A RESULTS
Compound         RT     Shift   Height     Area          Range           Total Area   Conc
==================================================================================================
Toluene        1.402    0.014     3209     10477 |   GAS (Tol-C12)          579702     38.53
C8             1.617   -0.047     1467      5484 | DIESEL (C12-C24)        3320446    226.65
C10            3.247    0.017     3289      5086 |  M.OIL (C24-C38)         964819     76.76
C12            4.101   -0.022    12365     11205 | AK-102 (C10-C25)        3863798    223.35
C14            4.793   -0.010    29545     77131 | AK-103 (C25-C36)         810244     94.90
C16            5.409    0.025    18428     31693 |
C18            5.939   -0.006    14605     26854 |
C20            6.522    0.006    11072      6116 |  JET-A (C10-C18)        2671331    216.09
C22            7.060   -0.009    10836     17549 |MIN.OIL (C24-C38)        964819     71.78
C24            7.590   -0.001    11397     19822 |
C25            7.843    0.000     9769      9326 |
C26            8.090    0.005     8246      5647 |
C28            8.534   -0.005     7510      4416 |
C32            9.335   -0.013     5602     14807 |
C34            9.729    0.009     4201      6773 |
Filter Peak    9.938   -0.007     3591      4332 |BUNKERC (C10-C38)       4738876    620.76
C36           10.086    0.004     3262      3504 |
C38           10.430   -0.005     2898      2755 |
C40           10.776   -0.005     3113      1606 |
o-terph        6.090    0.001   831146    694835 |
Triacon Surr   8.957   -0.007   741285    695765 |NAS DIES (C10-C24)      3774056    220.27
=================================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl     694835      34.1      75.8 M
    Triacontane     695765      36.5      81.0 M

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
     ---------------------------------------
      o-Terph Surr    20371.2   10-JUL-2012
      Triacon Surr    19086.0   12-JUN-2012
      Gas             15043.9   10-MAY-2012
      Diesel          14650.0   10-JUL-2012
      Motor Oil       12569.0   12-JUN-2012
      AK102           17299.0   10-JUL-2012
      AK103            8538.0   24-MAY-2012
      JetA            12362.0   31-JUL-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       17134.0   10-JUL-2012
      Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a045.d
Date : 03-AUG-2012 00:19
Client ID:
Sample Info: VE22E

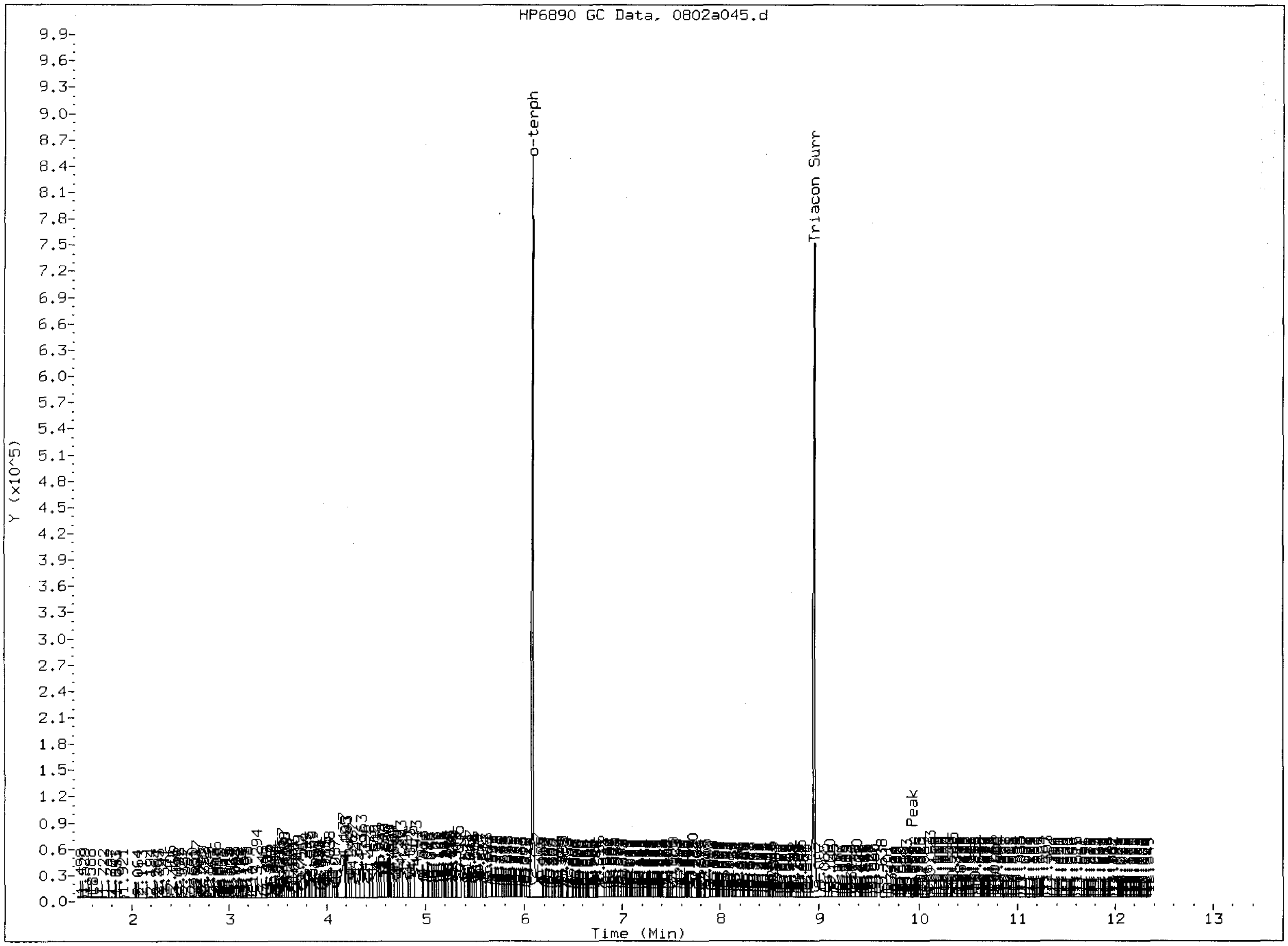
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22E   FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate

Analyst: AR   Date: 8/13/2012

Analytical Resources Inc.
407S TPH Quantitation Report

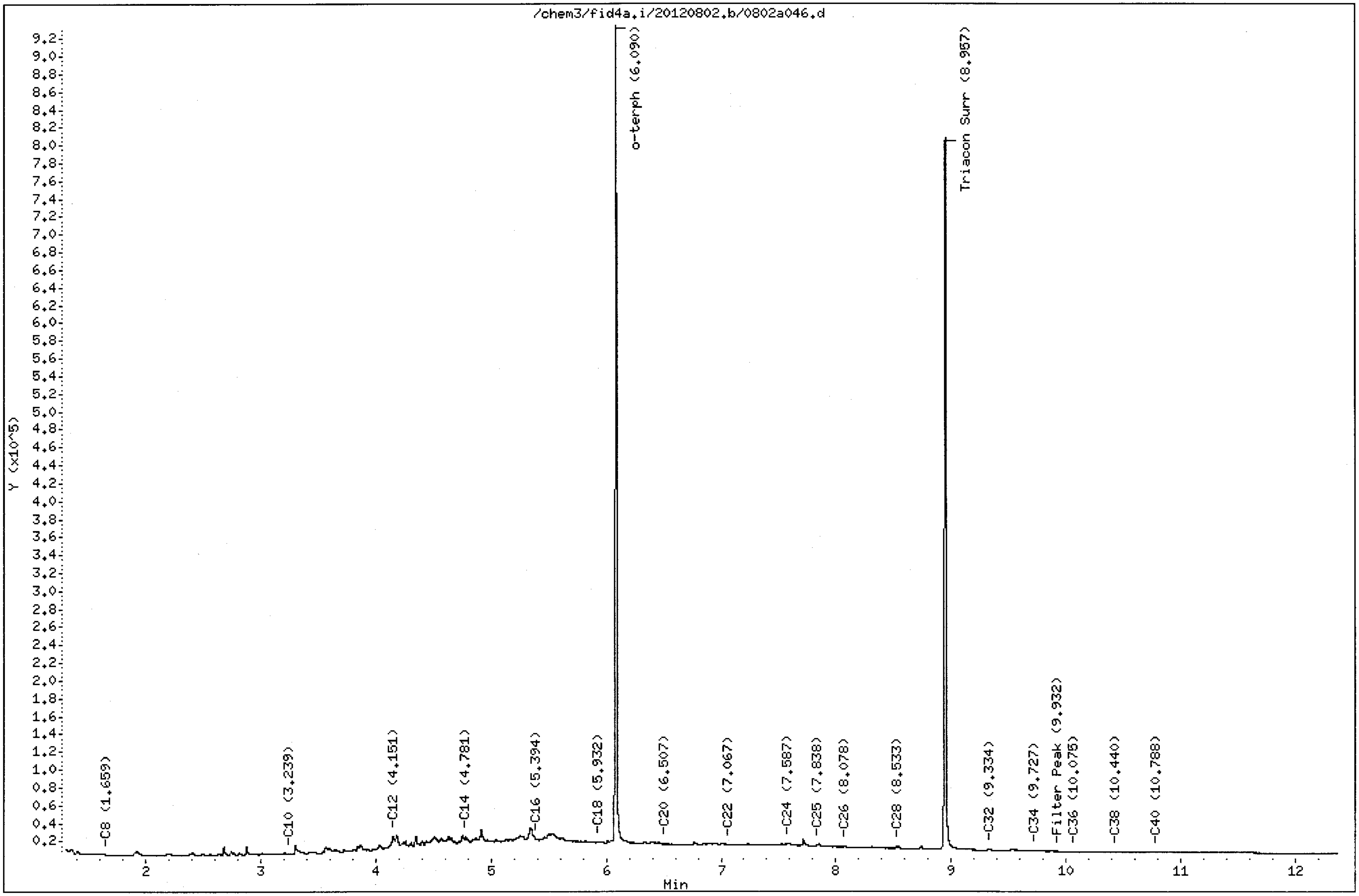
```
Data file: /chem3/fid4a.i/20120802.b/0802a046.d       ARI ID: VE22F
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 03-AUG-2012 00:40
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:    1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                  FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range            Total Area   Conc
=================================================================================
Toluene        1.396   0.009    5043      13001 |   GAS (Tol-C12)         442088     29.39
C8             1.659  -0.005     743       1715 | DIESEL (C12-C24)       2842448    194.02
C10            3.239   0.009    1584       2463 |  M.OIL (C24-C38)       1022782     81.37
C12            4.151   0.028   20847      54311 | AK-102 (C10-C25)       3260654    188.49
C14            4.781  -0.021   19796      55502 | AK-103 (C25-C36)        861607    100.91
C16            5.394   0.011   17349       8547 |
C18            5.932  -0.012   14567      32966 |
C20            6.507  -0.009   11964      10329 |  JET-A (C10-C18)       2014395    162.95
C22            7.067  -0.002   11280      12659 |MIN.OIL (C24-C38)       1022782     76.10
C24            7.587  -0.003   12835      22124 |
C25            7.838  -0.004   10769      11103 |
C26            8.078  -0.007    9650      25506 |
C28            8.533  -0.005    9775      11351 |
C32            9.334  -0.013    6333      18522 |
C34            9.727   0.007    4610       6902 |
Filter Peak    9.932  -0.013    3895       7965 |BUNKERC (C10-C38)       4183440    548.00
C36           10.075  -0.007    3552       3499 |
C38           10.440   0.005    3055       2895 |
C40           10.788   0.008    3372       7043 |
o-terph        6.090   0.002  912820     757542 |
Triacon Surr   8.957  -0.006  794548     740452 |NAS DIES (C10-C24)      3160658    184.47
=================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl     757542      37.2      82.6 M
    Triacontane     740452      38.8      86.2 M

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
     -------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a046.d
Date : 03-AUG-2012 00:40
Client ID:
Sample Info: VE22F

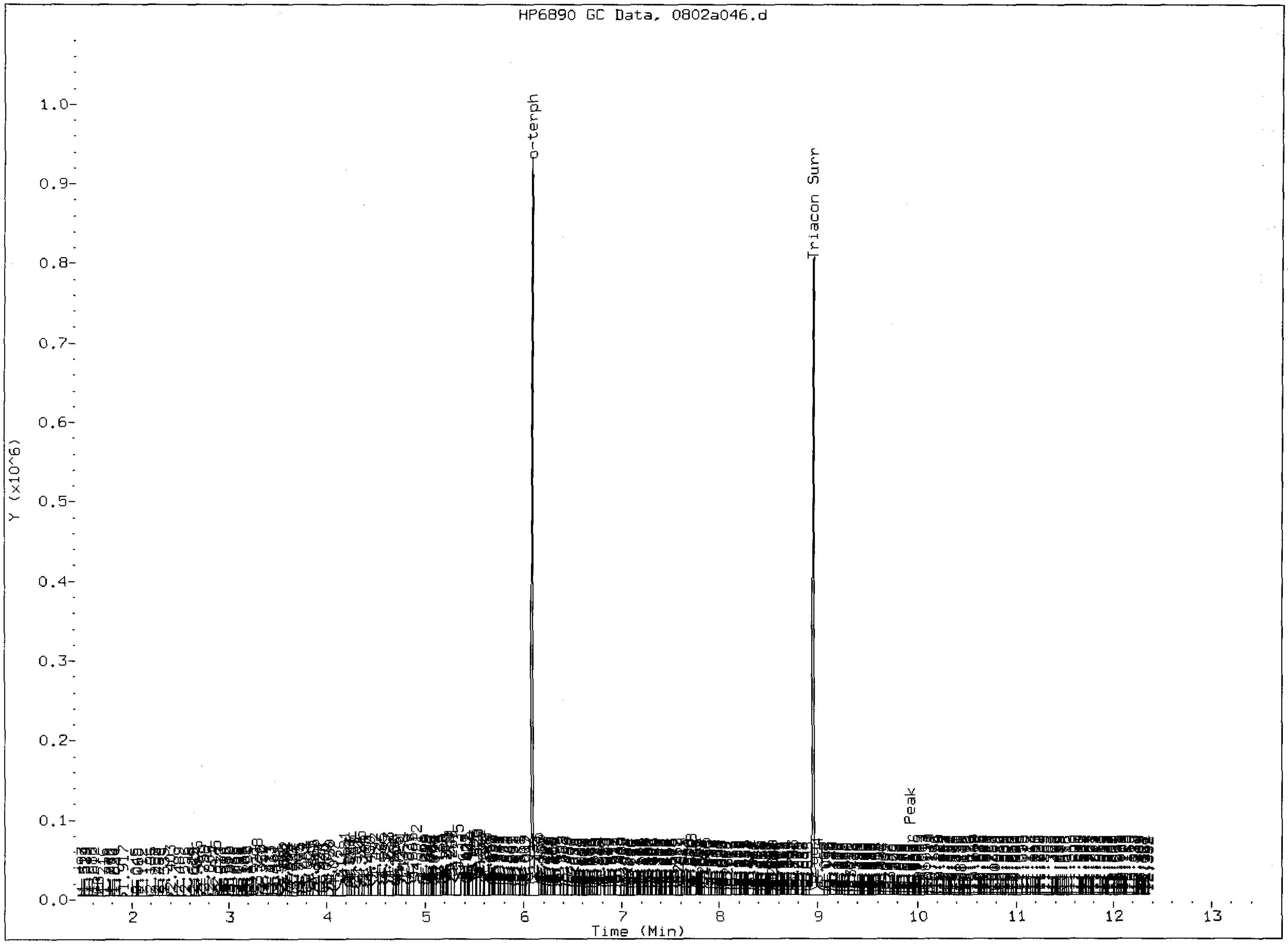
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22F FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
~~3~~. Peak not found
5. Skimmed surrogate

Analyst: AR Date: 8/3/12

```
                          Analytical Resources Inc.
                         407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a047.d       ARI ID: VE22G
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 03-AUG-2012 01:01
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:    1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range           Total Area   Conc
==================================================================================
Toluene        1.395   0.008     6795     13761 |   GAS (Tol-C12)          820946     54.57
C8             1.658  -0.006     1014      1919 | DIESEL (C12-C24)        3492393    238.39
C10            3.244   0.014     4157      4500 |  M.OIL (C24-C38)         923551     73.48
C12            4.101  -0.022    13312     14694 | AK-102 (C10-C25)        4243049    245.28
C14            4.795  -0.008    36187     82537 | AK-103 (C25-C36)         766860     89.82
C16            5.415   0.031    18306     19650 |
C18            5.935  -0.010    14388     27948 |
C20            6.508  -0.008    10659     12986 |  JET-A (C10-C18)        3109067    251.50
C22            7.074   0.005    10256     10265 |MIN.OIL (C24-C38)         923551     68.71
C24            7.583  -0.008    11673     18297 |
C25            7.839  -0.004     9535      9177 |
C26            8.072  -0.013     8330      9026 |
C28            8.536  -0.003     8255      8989 |
C32            9.353   0.006     4995      3351 |
C34            9.721   0.001     5226     14407 |
Filter Peak    9.945   0.000     3619      1930 |BUNKERC (C10-C38)        5070695    664.23
C36           10.092   0.010     3394      3408 |
C38           10.440   0.005     2985      1896 |
C40           10.772  -0.009     3501     13418 |
o-terph        6.091   0.003   845472    745494 |
Triacon Surr   8.956  -0.007   757635    727303 |NAS DIES (C10-C24)       4147145    242.04
==================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


     Surrogate        Area      Amount     %Rec
   ----------------------------------------
     o-Terphenyl     745494      36.6      81.3 M
     Triacontane     727303      38.1      84.7 M

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
      -------------------------------------
       o-Terph Surr    20371.2   10-JUL-2012
       Triacon Surr    19086.0   12-JUN-2012
       Gas             15043.9   10-MAY-2012
       Diesel          14650.0   10-JUL-2012
       Motor Oil       12569.0   12-JUN-2012
       AK102           17299.0   10-JUL-2012
       AK103            8538.0   24-MAY-2012
       JetA            12362.0   31-JUL-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       17134.0   10-JUL-2012
       Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a047.d

Date : 03-AUG-2012 01:01

Client ID:

Sample Info: VE22G

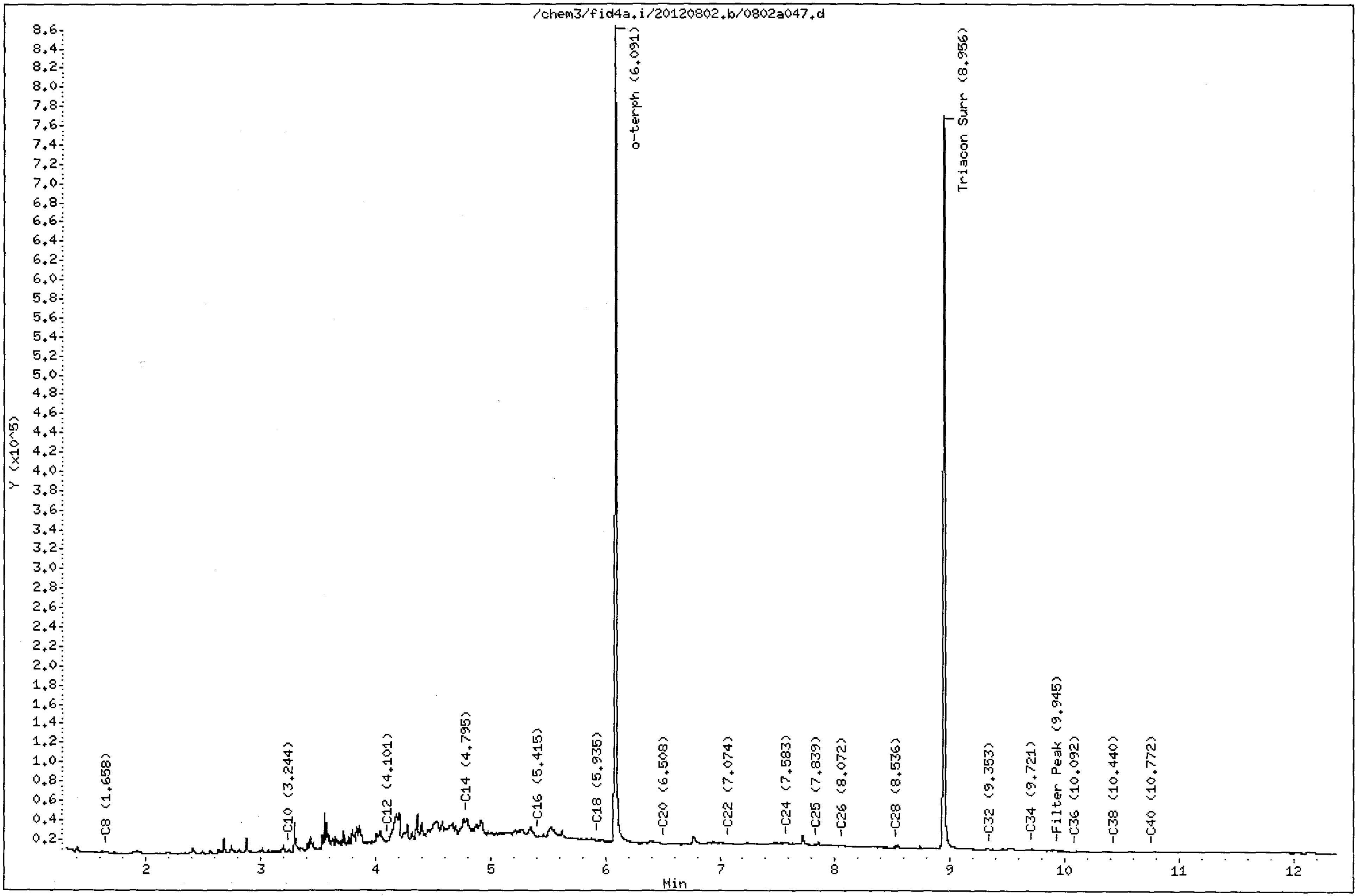
Column phase: RTX-1

Page 1

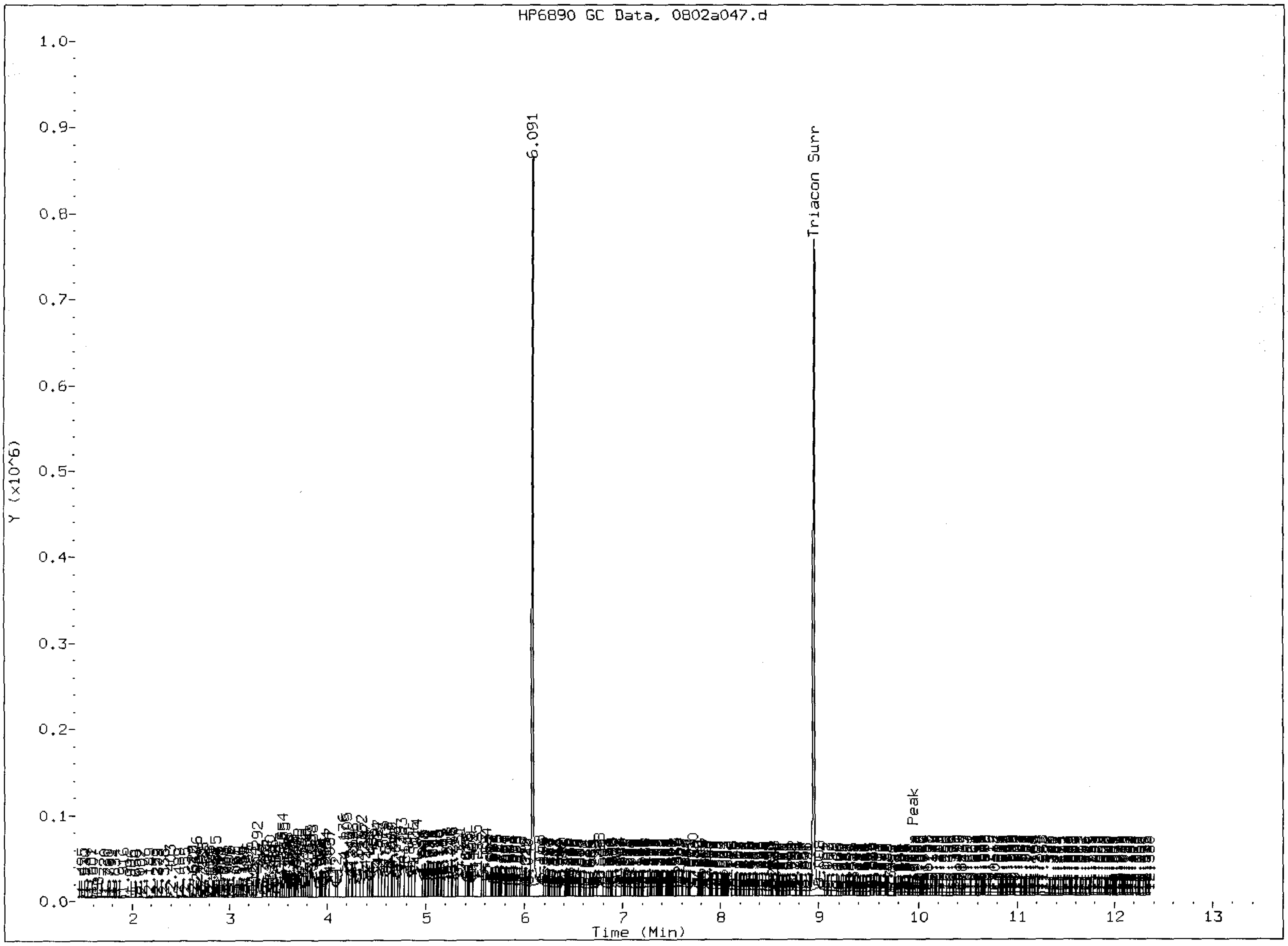
Instrument: fid4a.i

Operator: AR

Column diameter: 0.25



FID:4A-2C/RTX-1 VE22G FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate

Analyst: AL Date: 8/3/12

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                          Analytical Resources Inc.
                         407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a048.d      ARI ID: VE22H
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m        Client ID:
Instrument: fid4a.i                                   Injection: 03-AUG-2012 01:22
Operator: AR
Report Date: 08/03/2012                              Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                  FID:4A RESULTS
Compound         RT    Shift   Height     Area          Range           Total Area    Conc
=============================================================================================
Toluene        1.395   0.007     3596     10875 |   GAS (Tol-C12)          492802     32.76
C8             1.713   0.049      647      1862 | DIESEL (C12-C24)        3064201    209.16
C10            3.249   0.018     1906      4220 |  M.OIL (C24-C38)         990334     78.79
C12            4.155   0.032    23188     63992 | AK-102 (C10-C25)        3515474    203.22
C14            4.782  -0.021    21115     55811 | AK-103 (C25-C36)         835659     97.88
C16            5.404   0.020    18673     26095 |
C18            5.936  -0.009    15413     28529 |
C20            6.505  -0.011    12403     15892 |  JET-A (C10-C18)        2236029    180.88
C22            7.072   0.003    11443     15796 |MIN.OIL (C24-C38)         990334     73.68
C24            7.590   0.000    12861     25142 |
C25            7.842  -0.001    10095      5354 |
C26            8.088   0.003     8596      5222 |
C28            8.534  -0.005     7757      8369 |
C32            9.360   0.013     5324      6967 |
C34            9.708  -0.012     4278      4148 |
Filter Peak    9.952   0.006     3748      3334 |BUNKERC (C10-C38)        4412889    578.06
C36           10.085   0.003     3441      2451 |
C38           10.437   0.002     3008      1788 |
C40           10.771  -0.010     3373     16713 |
o-terph        6.090   0.002   917455    777027 |
Triacon Surr   8.955  -0.008   802049    764547 |NAS DIES (C10-C24)       3422555    199.75
=============================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  ------------------------------------------
    o-Terphenyl     777027      38.1      84.8 M
    Triacontane     764547      40.1      89.0 M

M  Indicates the peak was manually integrated

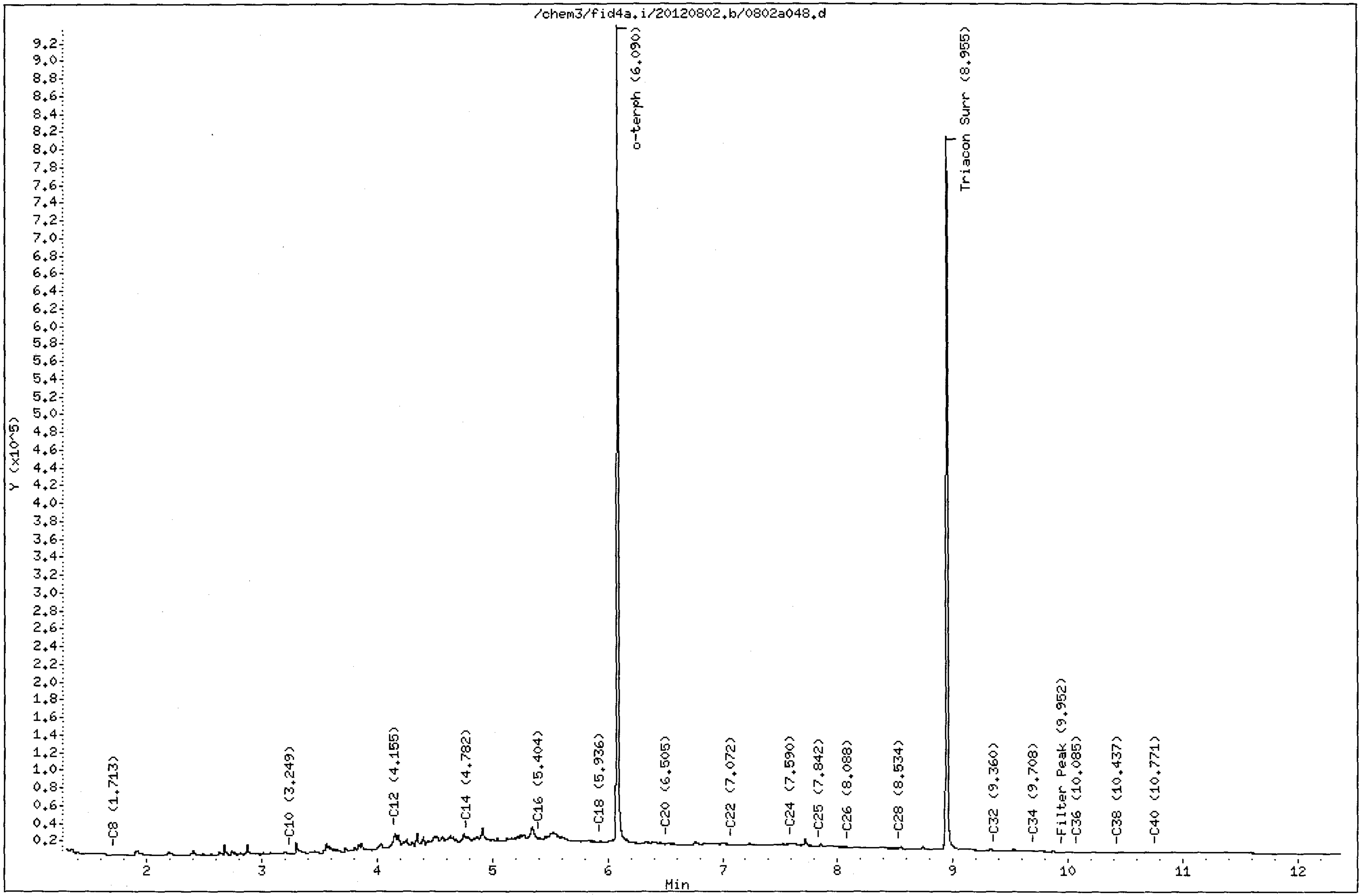

        Analyte          RF      Curve Date
    ---------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

Data File: /chem3/fid4a.i/20120802.b/0802a048.d
Date : 03-AUG-2012 01:22
Client ID:
Sample Info: VE22H

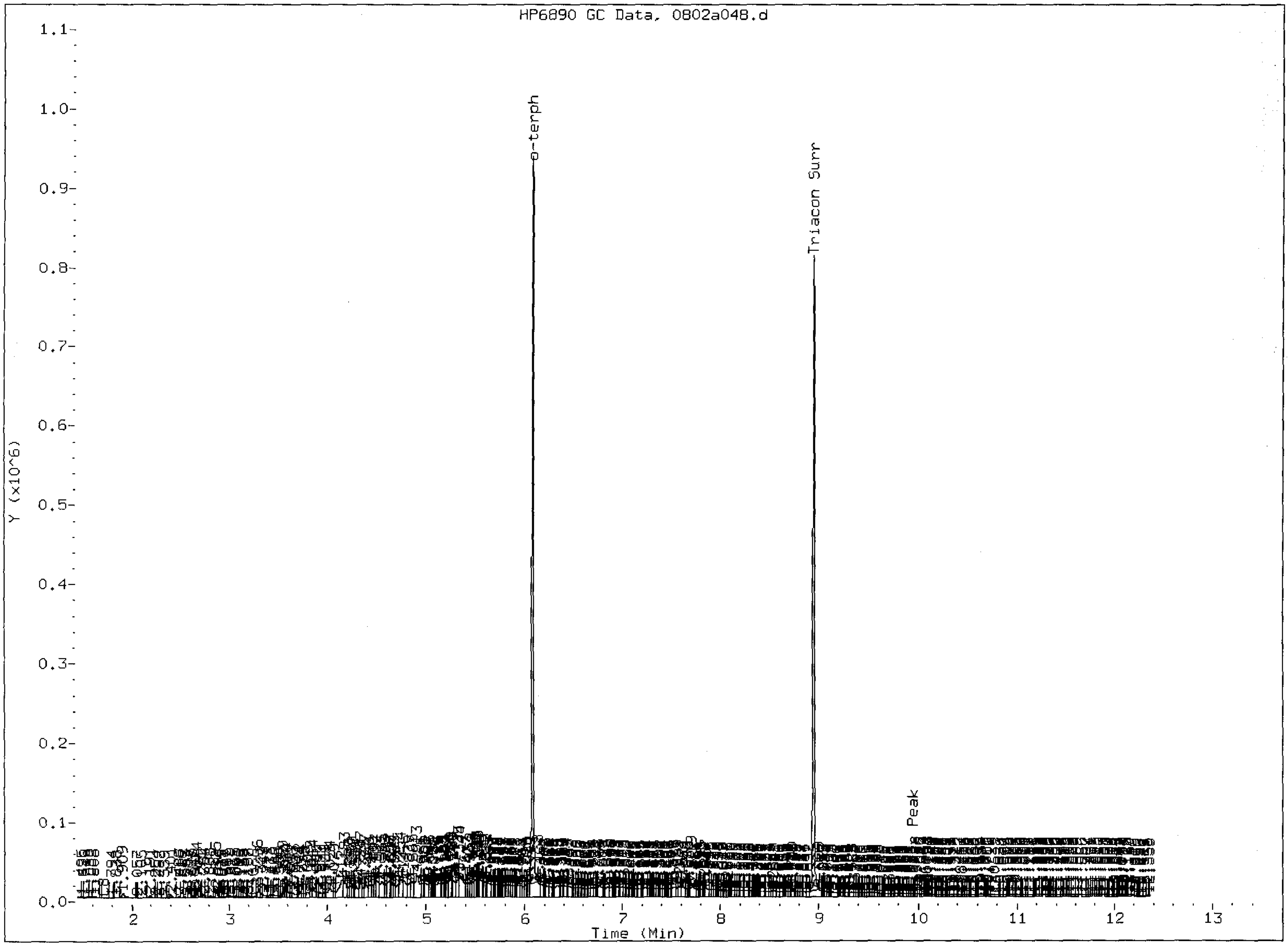
Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22H FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate

Analyst: AR Date: 8/3/12

HCID SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Client ID	O-TER	TOT OUT
MB-080112	87.6%	0
LCS-080112	79.3%	0
LCSD-080112	80.4%	0
MW-15D-073012	83.0%	0
MW-16S-073012	81.0%	0
MW-15S-073012	80.9%	0
MW-14S-073012	82.9%	0
MW-13S-073012	75.8%	0
MW-14D-073012	82.6%	0
MW-13D-073012	81.3%	0
MW-DUP-073012	84.8%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(55-110)	(50-150)

Prep Method: SW3510C
Log Number Range: 12-14520 to 12-14527

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Page 1 of 1

Sample ID: LCS-080112
LCS/LCSD

Lab Sample ID: LCS-080112
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/03/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted LCS/LCSD: 08/01/12

Date Analyzed LCS: 08/02/12 22:11
LCSD: 08/02/12 22:32
Instrument/Analyst LCS: FID/AAR
LCSD: FID/AAR

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Diesel	2.44	3.00	81.3%	2.44	3.00	81.3%	0.0%

HCID Surrogate Recovery

	LCS	**LCSD**
o-Terphenyl	79.3%	80.4%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

Analytical Resources Inc.
407S TPH Quantitation Report

```
Data file: /chem3/fid4a.i/20120802.b/0802a039.d       ARI ID: VE22LCSW1
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-AUG-2012 22:11
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

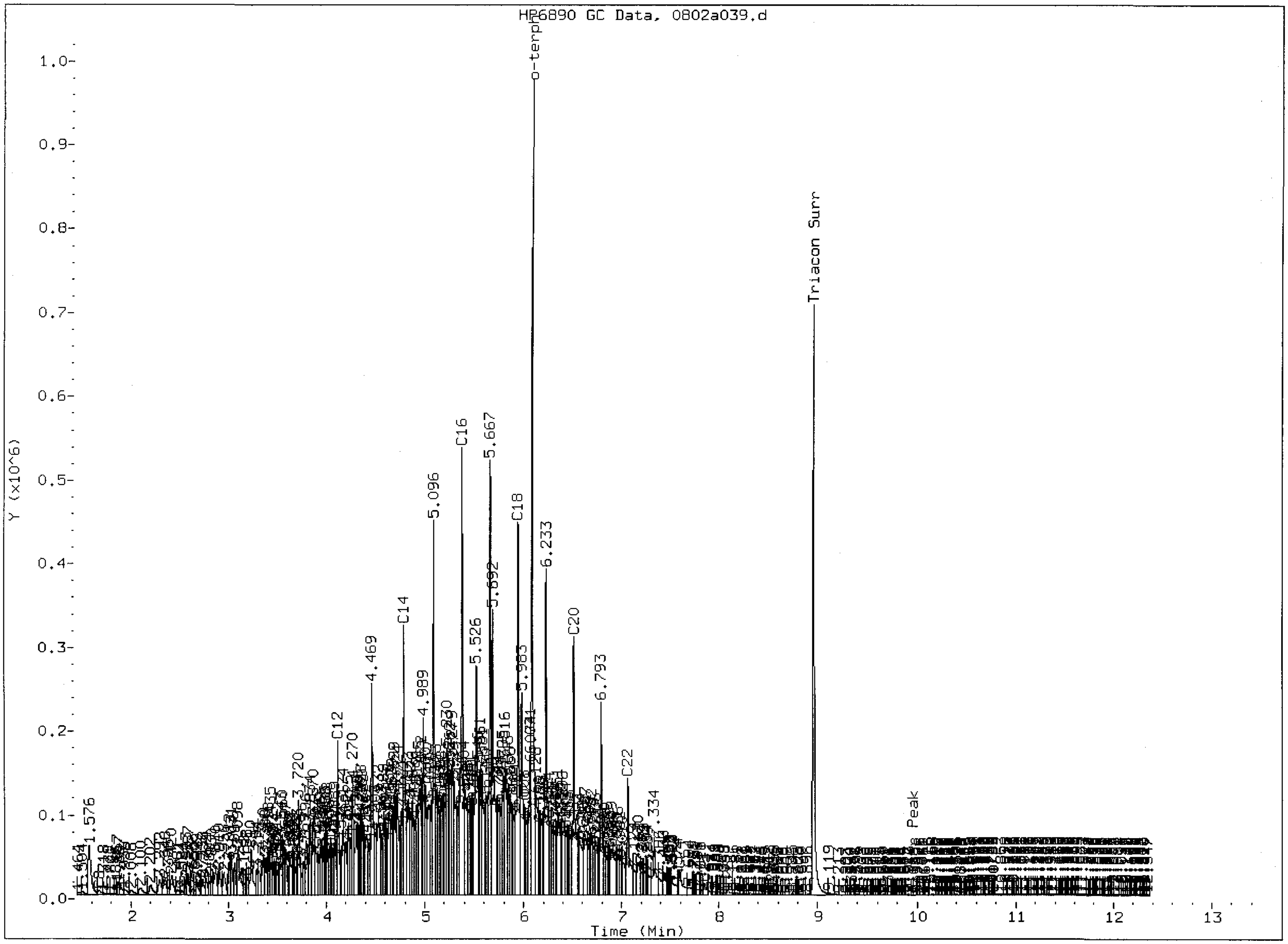
                                   FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range           Total Area    Conc
=======================================================================================
Toluene        1.406   0.018     5353     11351 |   GAS (Tol-C12)         3541175    235.39NS
C8             1.677   0.013     4754     10860 | DIESEL (C12-C24)       17875078   1220.14 /
C10            3.234   0.004    54696    100426 |  M.OIL (C24-C38)         171414     13.64LTRL
C12            4.119  -0.005   183515    164246 | AK-102 (C10-C25)       20387200   1178.52
C14            4.793  -0.010   322220    373297 | AK-103 (C25-C36)         117302     13.74
C16            5.383  -0.001   534997    658135 |
C18            5.949   0.004   444568    580680 |
C20            6.516  -0.001   307647    458602 |  JET-A (C10-C18)       14870021   1202.88
C22            7.065  -0.004   139430    251520 |MIN.OIL (C24-C38)         171414     12.75
C24            7.596   0.006    29282     77393 |
C25            7.850   0.007    13736     27395 |
C26            8.092   0.007     6309     11311 |
C28            8.538  -0.001     1466      1151 |
C32            9.344  -0.003      102       144 |
C34            9.711  -0.009       61        82 |
Filter Peak    9.957   0.011       94        72 |BUNKERC (C10-C38)       20511446   2686.86
C36           10.078  -0.004      222       159 |
C38           10.439   0.004      341       198 |
C40           10.780  -0.001      824       473 |
o-terph        6.096   0.007   866090    726752 |
Triacon Surr   8.963  -0.001   704955    763361 |NAS DIES (C10-C24)      20340032   1187.12
=====================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)   Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area     Amount     %Rec
  ----------------------------------------
    o-Terphenyl     726752     35.7      79.3 M
    Triacontane     763361     40.0      88.9

M  Indicates the peak was manually integrated


      Analyte            RF      Curve Date
    -------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

FID:4A-2C/RTX-1 VE22LCSW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
~~3. Peak not found~~
5. Skimmed surrogate

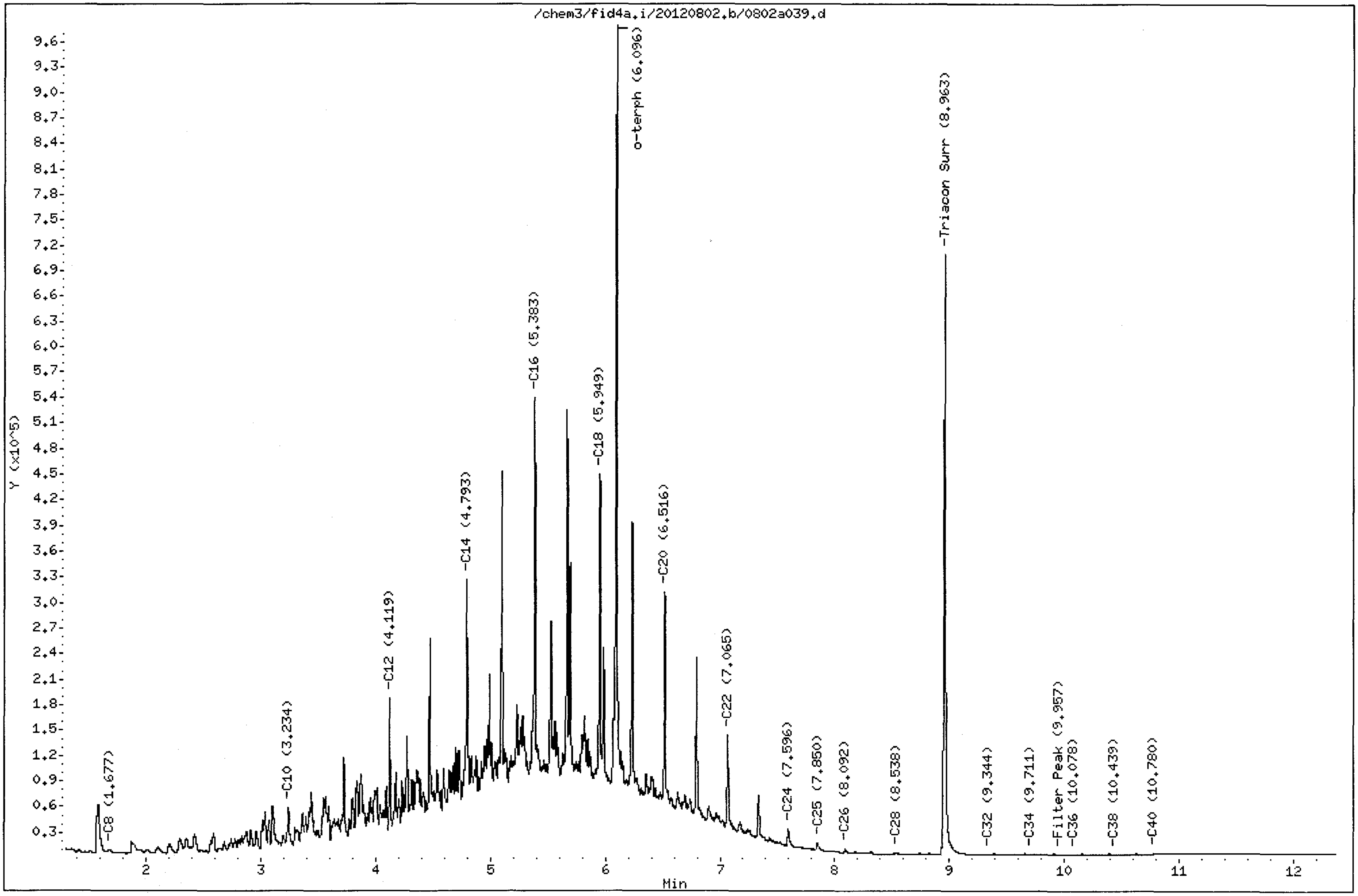
Analyst: AR Date: 8/3/12

Data File: /chem3/fid4a.i/20120802.b/0802a039.d
Date : 02-AUG-2012 22:11
Client ID:
Sample Info: VE22LCSW1

Column phase: RTX-1

Instrument: fid4a.i

Operator: AR
Column diameter: 0.25



```
                         Analytical Resources Inc.
                        407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120802.b/0802a040.d       ARI ID: VE22LCSDW1
Method: /chem3/fid4a.i/20120802.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 02-AUG-2012 22:32
Operator: AR
Report Date: 08/03/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

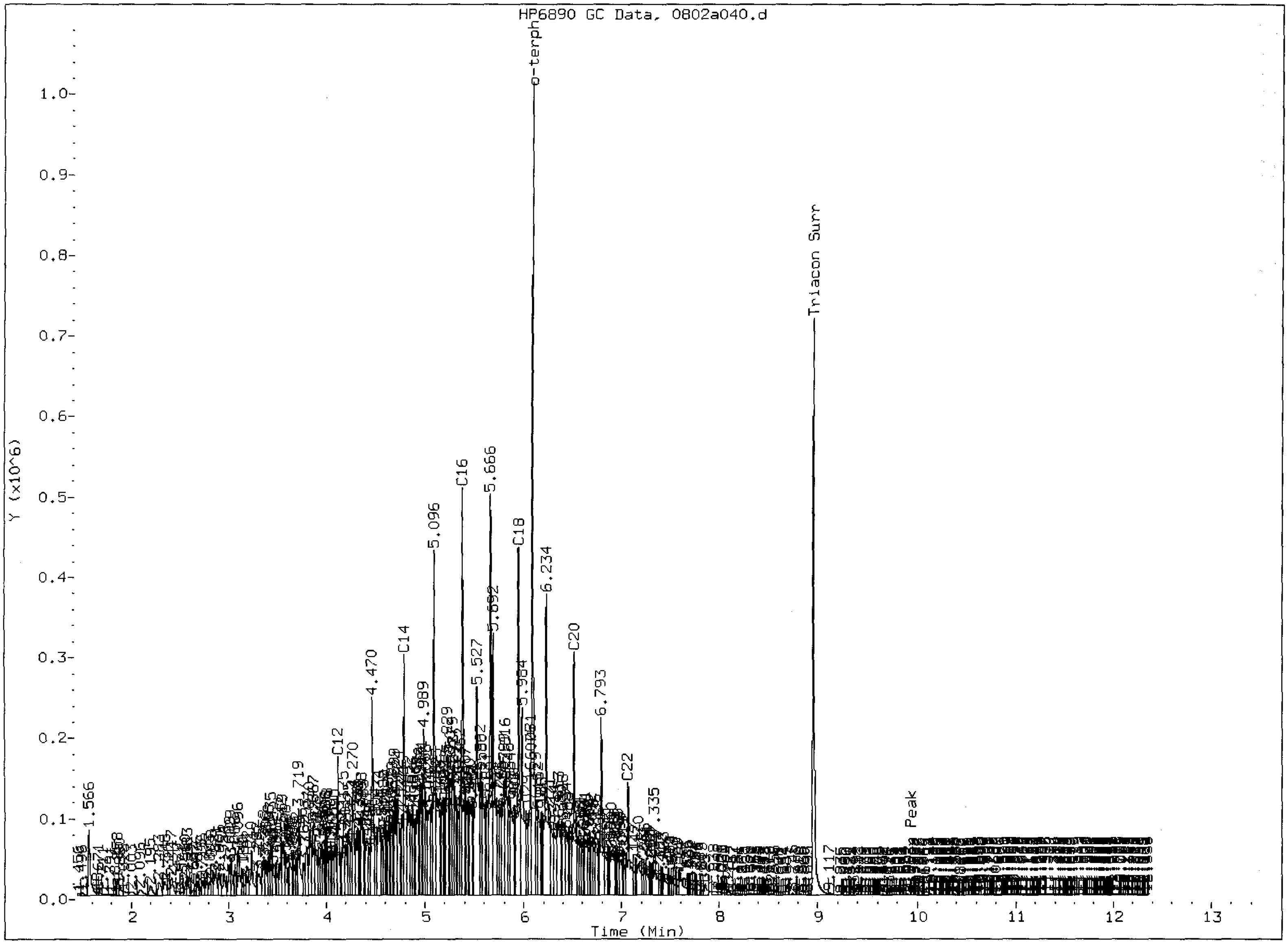
                                   FID:4A RESULTS
Compound         RT     Shift   Height     Area          Range           Total Area   Conc
==========================================================================================
Toluene        1.396    0.009     5843      5471 |   GAS (Tol-C12)         3477075   231.13 NS
C8             1.660   -0.004     4296      3539 | DIESEL (C12-C24)       17892717  1221.35 ✓
C10            3.234    0.004    55682     94943 |  M.OIL (C24-C38)         162145    12.90 ✓
C12            4.119   -0.005   172346    160512 | AK-102 (C10-C25)       20333936  1175.44
C14            4.793   -0.010   299374    371153 | AK-103 (C25-C36)         119173    13.96
C16            5.382   -0.002   506217    530164 |
C18            5.950    0.005   432636    582766 |
C20            6.516   -0.001   301626    404351 |  JET-A (C10-C18)       14753370  1193.45
C22            7.066   -0.003   139478    238211 |MIN.OIL (C24-C38)         162145    12.06
C24            7.598    0.007    29489     77270 |
C25            7.851    0.009    14027     26956 |
C26            8.092    0.007     6223     11791 |
C28            8.539    0.000     1440      1131 |
C32            9.358    0.011       84        30 |
C34            9.722    0.002       72        76 |
Filter Peak    9.940   -0.006      105        63 |BUNKERC (C10-C38)       20460622  2680.20
C36           10.081   -0.001      231       497 |
C38           10.437    0.002      365       263 |
C40           10.792    0.011      906      1301 |
o-terph        6.096    0.008   901833    736634 |
Triacon Surr   8.960   -0.003   716951    772779 |NAS DIES (C10-C24)      20298478  1184.69
==========================================================================================
Range Times:  NW Diesel(4.124 - 7.590)    AK102(3.23 - 7.84)    Jet A(3.23 - 5.94)
               NW M.Oil(7.59 - 10.43)    AK103(7.84 - 10.08)   OR Diesel(3.23 - 8.54)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl    736634      36.2      80.4 M
    Triacontane    772779      40.5      90.0

M  Indicates the peak was manually integrated


       Analyte          RF      Curve Date
    --------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

FID:4A-2C/RTX-1 VE22LCSDW1   FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
5. Skimmed surrogate

Analyst: AR   Date: 6/3/12

Data File: /chem3/fid4a.i/20120802.b/0802a040.d

Date : 02-AUG-2012 22:32

Client ID:

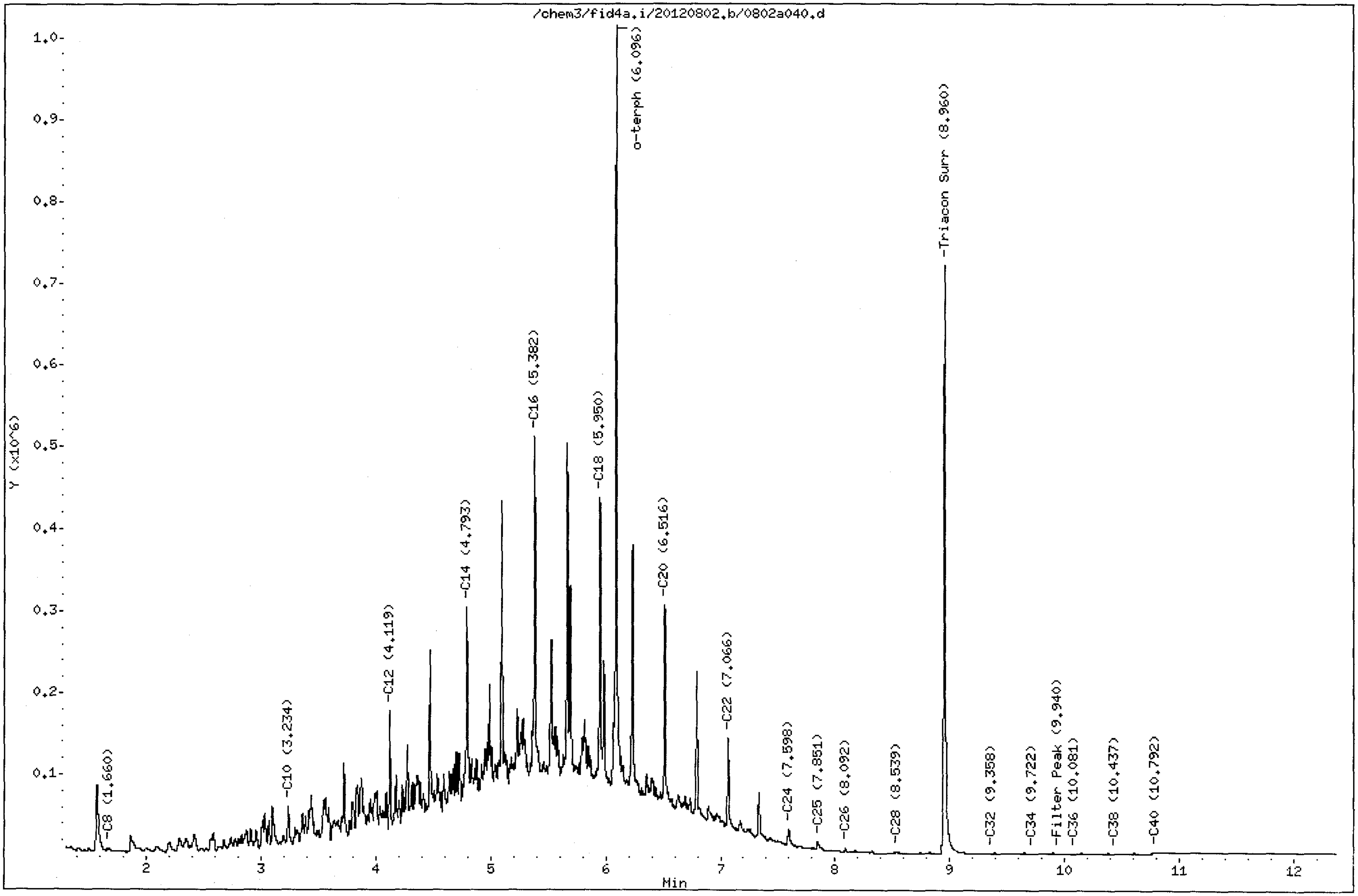
Instrument: fid4a.i

Sample Info: VE22LCSDW1

Operator: AR

Column phase: RTX-1

Column diameter: 0.25



TOTAL HCID RANGE HYDROCARBONS-EXTRACTION REPORT

ARI Job: VE22
Matrix: Water
Project: Cornwall
0001020.400.510
Date Received: 07/31/12

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
12-14520-080112MB	Method Blank	500 mL	1.00 mL	08/01/12
12-14520-080112LCS	Lab Control	500 mL	1.00 mL	08/01/12
12-14520-080112LCSD	Lab Control Dup	500 mL	1.00 mL	08/01/12
12-14520-VE22A	MW-15D-073012	500 mL	1.00 mL	08/01/12
12-14521-VE22B	MW-16S-073012	500 mL	1.00 mL	08/01/12
12-14522-VE22C	MW-15S-073012	500 mL	1.00 mL	08/01/12
12-14523-VE22D	MW-14S-073012	500 mL	1.00 mL	08/01/12
12-14524-VE22E	MW-13S-073012	500 mL	1.00 mL	08/01/12
12-14525-VE22F	MW-14D-073012	500 mL	1.00 mL	08/01/12
12-14526-VE22G	MW-13D-073012	500 mL	1.00 mL	08/01/12
12-14527-VE22H	MW-DUP-073012	500 mL	1.00 mL	08/01/12

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TOTAL DIESEL RANGE HYDROCARBONS
NWTPHD by GC/FID-Silica and Acid Cleaned
Extraction Method:
Page 1 of 1

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Matrix: Water
Data Release Authorized:
Reported: 08/07/12

ARI ID	**Sample ID**	**Extraction Date**	**Analysis Date**	**EFV DL**	**Range/Surrogate**	**RL**	**Result**
MB-080312	Method Blank	08/03/12	08/06/12	1.00	Diesel Range	0.10	< 0.10 U
12-14520	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		76.2%
VE22A	MW-15D-073012	08/03/12	08/06/12	1.00	Diesel Range	0.10	< 0.10 U
12-14520	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		75.2%
VE22B	MW-16S-073012	08/03/12	08/06/12	1.00	Diesel Range	0.10	< 0.10 U
12-14521	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		71.5%
VE22C	MW-15S-073012	08/03/12	08/06/12	1.00	**Diesel Range**	**0.10**	**0.20**
12-14522	HC ID: **DIESEL**		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		67.9%
VE22D	MW-14S-073012	08/03/12	08/06/12	1.00	Diesel Range	0.10	< 0.10 U
12-14523	HC ID: ---		FID4A	1.0	Motor Oil Range	0.20	< 0.20 U
					o-Terphenyl		70.9%

Reported in mg/L (ppm)

EFV-Effective Final Volume in mL.
DL-Dilution of extract prior to analysis.
RL-Reporting limit.

Diesel range quantitation on total peaks in the range from C12 to C24.
Motor Oil range quantitation on total peaks in the range from C24 to C38.
HC ID: DRO/RRO indicate results of organics or additional hydrocarbons in ranges are not identifiable.

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                          Analytical Resources Inc.
                         407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120806.b/0806a025.d       ARI ID: VE22MBW1
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 06-AUG-2012 21:09
Operator: JR
Report Date: 08/07/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                 FID:4A RESULTS
Compound         RT     Shift   Height     Area          Range           Total Area   Conc
==========================================================================================
Toluene         1.387   0.006     2851      6248 |   GAS (Tol-C12)           55060     3.66
C8              1.662   0.002      464       844 | DIESEL (C12-C24)         179672    12.26
C10             3.240   0.006      269       168 |  M.OIL (C24-C38)         337481    26.85
C12             4.137   0.005      319       304 | AK-102 (C10-C25)         205581    11.88
C14             4.822   0.014      331       118 | AK-103 (C25-C36)         310170    36.33
C16             5.400   0.010      885      1490 |
C18             5.952   0.002     1295      2193 |
C20             6.529   0.007     1043      2129 |  JET-A (C10-C18)         136489    11.04
C22             7.083   0.010      957      1870 |MIN.OIL (C24-C38)         337481    25.11
C24             7.590  -0.006      673       225 |
C25             7.847   0.000      468       213 |
C26             8.088  -0.003      708      1056 |
C28             8.542  -0.007     1015      1208 |
C32             9.387  -0.007      702      1096 |
C34             9.779  -0.013      978      1229 |
Filter Peak     9.939  -0.018     1023      1139 |BUNKERC (C10-C38)         537224    70.37
C36            10.222   0.044     1774      3296 |
C38            10.551  -0.003     1298      1826 |
C40            10.930   0.005     1735      2194 |
o-terph         6.094   0.000   530883    698219 |
Triacon Surr    8.962  -0.028   706569    708966 |NAS DIES (C10-C24)        199743    11.66
==========================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)   Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


    Surrogate        Area     Amount     %Rec
  ----------------------------------------
    o-Terphenyl     698219      34.3     76.2
    Triacontane     708966      37.1     82.5

M  Indicates the peak was manually integrated


      Analyte          RF      Curve Date
    -------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

8.7.12

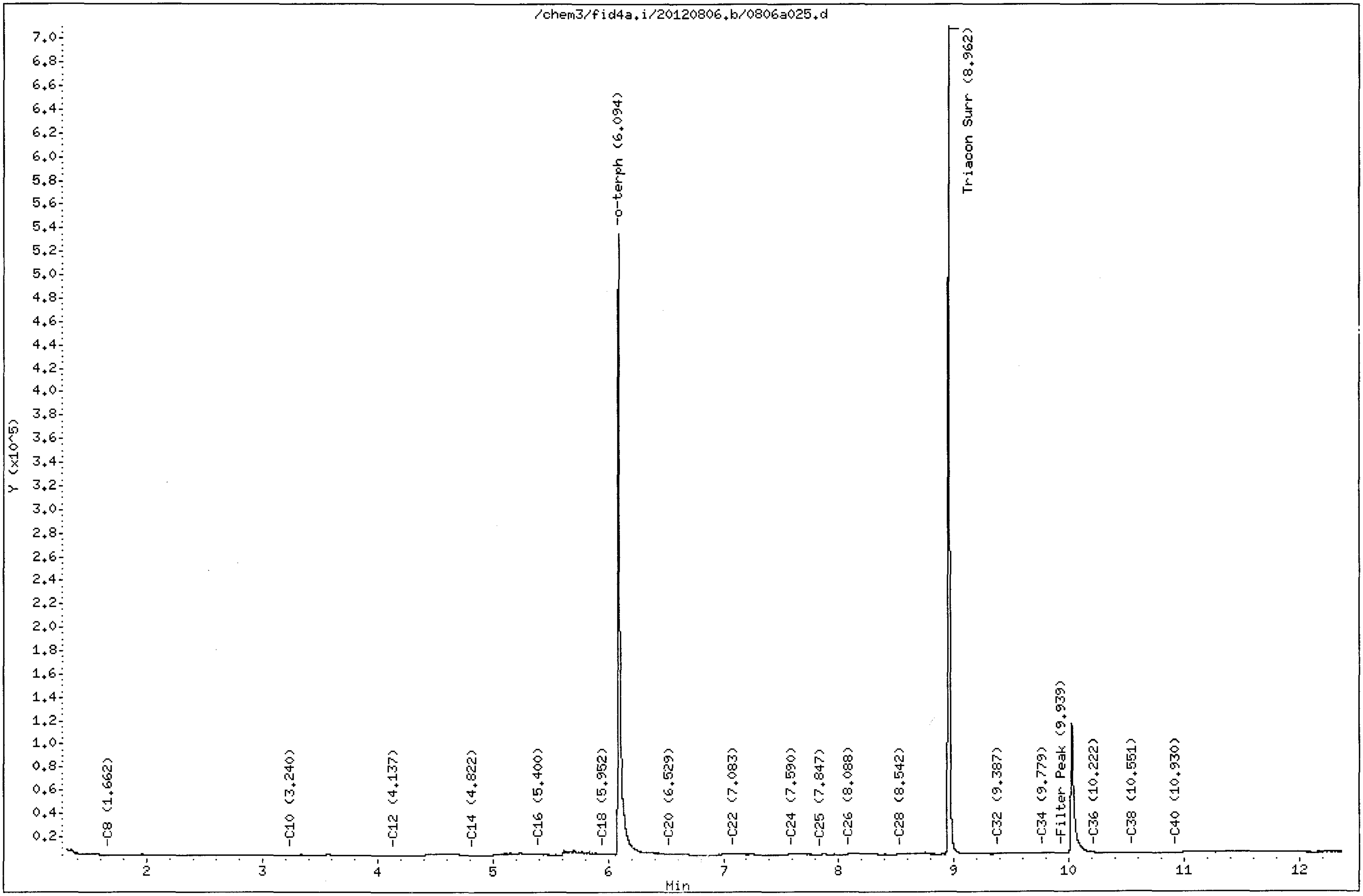
14432

Data File: /chem3/fid4a.i/20120806.b/0806a025.d
Date : 06-AUG-2012 21:09
Client ID:
Sample Info: VE22MBW1

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



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                    Analytical Resources Inc.
                     407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120806.b/0806a028.d       ARI ID: VE22A
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 06-AUG-2012 22:12
Operator: JR
Report Date: 08/07/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                FID:4A RESULTS
Compound        RT    Shift   Height     Area          Range           Total Area   Conc
=====================================================================================
Toluene        1.395  0.014    6838      9781 |  GAS (Tol-C12)          228134     15.16
C8             1.665  0.005     594      1780 | DIESEL (C12-C24)        224779     15.34
C10            3.257  0.024     989      1393 |  M.OIL (C24-C38)        132698     10.56
C12            4.142  0.011    2938      8299 | AK-102 (C10-C25)        397847     23.00
C14            4.811  0.003    1927       839 | AK-103 (C25-C36)        109976     12.88
C16            5.401  0.011    1368       615 |
C18            5.954  0.004     992       924 |
C20            6.527  0.006     900      1048 |  JET-A (C10-C18)        338094     27.35
C22            7.084  0.012     862      1805 |MIN.OIL (C24-C38)        132698      9.87
C24            7.595  0.000     510       352 |
C25            7.822 -0.025     507       860 |
C26            8.084 -0.006     361       275 |
C28            8.545 -0.004     999       816 |
C32            9.388 -0.006    1051      3206 |
C34            9.801  0.009     453       713 |
Filter Peak    9.947 -0.010     511       708 |BUNKERC (C10-C38)        526113     68.92
C36            ----                           |
C38           10.561  0.008     929      1504 |
C40           10.918 -0.006    1342      1547 |
o-terph        6.095  0.001  556217    689566 |
Triacon Surr   8.968 -0.023  631912    670916 |NAS DIES (C10-C24)       393415     22.96
====================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)   Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  -----------------------------------------
    o-Terphenyl    689566       33.9      75.2
    Triacontane    670916       35.2      78.1

M  Indicates the peak was manually integrated


        Analyte          RF      Curve Date
      -------------------------------------
       o-Terph Surr    20371.2   10-JUL-2012
       Triacon Surr    19086.0   12-JUN-2012
       Gas             15043.9   10-MAY-2012
       Diesel          14650.0   10-JUL-2012
       Motor Oil       12569.0   12-JUN-2012
       AK102           17299.0   10-JUL-2012
       AK103            8538.0   24-MAY-2012
       JetA            12362.0   31-JUL-2012
       Min Oil         13440.7   09-MAY-2012
       NAS Diesel       17134.0   10-JUL-2012
       Bunker C         7634.0   13-JUL-2012
```

VD
8.7.12

Data File: /chem3/fid4a.i/20120806.b/0806a028.d

Date : 06-AUG-2012 22:12

Client ID:

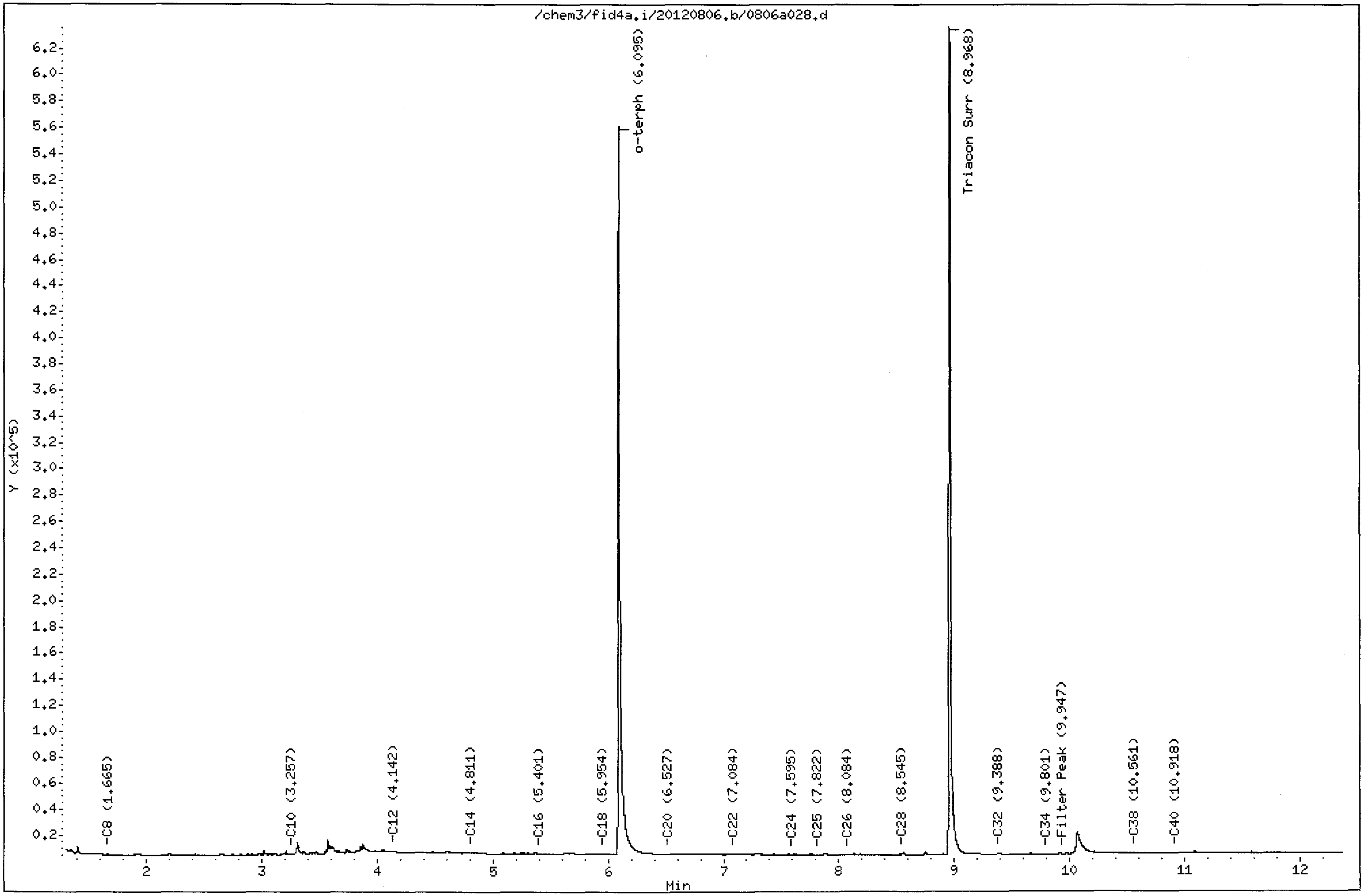
Instrument: fid4a.i

Sample Info: VE22A

Operator: JR

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
407S TPH Quantitation Report

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Data file: /chem3/fid4a.i/20120806.b/0806a029.d      ARI ID: VE22B
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m        Client ID:
Instrument: fid4a.i                                   Injection: 06-AUG-2012 22:34
Operator: JR
Report Date: 08/07/2012                              Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound          RT     Shift   Height     Area          Range            Total Area   Conc
===========================================================================================
Toluene         1.397    0.016     4951     9283 |   GAS (Tol-C12)          72438     4.82
C8              1.663    0.003      470     1303 | DIESEL (C12-C24)        116947     7.98
C10             3.251    0.018      343      663 |  M.OIL (C24-C38)        123492     9.83
C12             4.133    0.002      650      793 | AK-102 (C10-C25)        152055     8.79
C14             4.800   -0.008      500      642 | AK-103 (C25-C36)        104715    12.26
C16             5.403    0.013      695     1136 |
C18             5.952    0.001      798      418 |
C20             6.530    0.008      746     1037 |  JET-A (C10-C18)        107195     8.67
C22             7.068   -0.005      411      191 |MIN.OIL (C24-C38)        123492     9.19
C24             7.624    0.028      607     2050 |
C25             7.867    0.019      737      795 |
C26             8.099    0.009      750     1138 |
C28             8.543   -0.006     1152     1011 |
C32             9.391   -0.003     1186     2958 |
C34             9.794    0.002      411      703 |
Filter Peak     9.965    0.007      477      476 |BUNKERC (C10-C38)        273096    35.77
C36            10.194    0.016     1782     2911 |
C38            10.557    0.003      871      778 |
C40            10.917   -0.007     1283      611 |
o-terph         6.095    0.001   498148   655626 |
Triacon Surr    8.966   -0.025   598244   658532 |NAS DIES (C10-C24)       149604     8.73
===========================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)   Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


    Surrogate        Area     Amount    %Rec
  ----------------------------------------
    o-Terphenyl     655626     32.2     71.5
    Triacontane     658532     34.5     76.7

M  Indicates the peak was manually integrated


        Analyte            RF     Curve Date
     ------------------------------------
      o-Terph Surr    20371.2   10-JUL-2012
      Triacon Surr    19086.0   12-JUN-2012
      Gas             15043.9   10-MAY-2012
      Diesel          14650.0   10-JUL-2012
      Motor Oil       12569.0   12-JUN-2012
      AK102           17299.0   10-JUL-2012
      AK103            8538.0   24-MAY-2012
      JetA            12362.0   31-JUL-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       17134.0   10-JUL-2012
      Bunker C         7634.0   13-JUL-2012
```

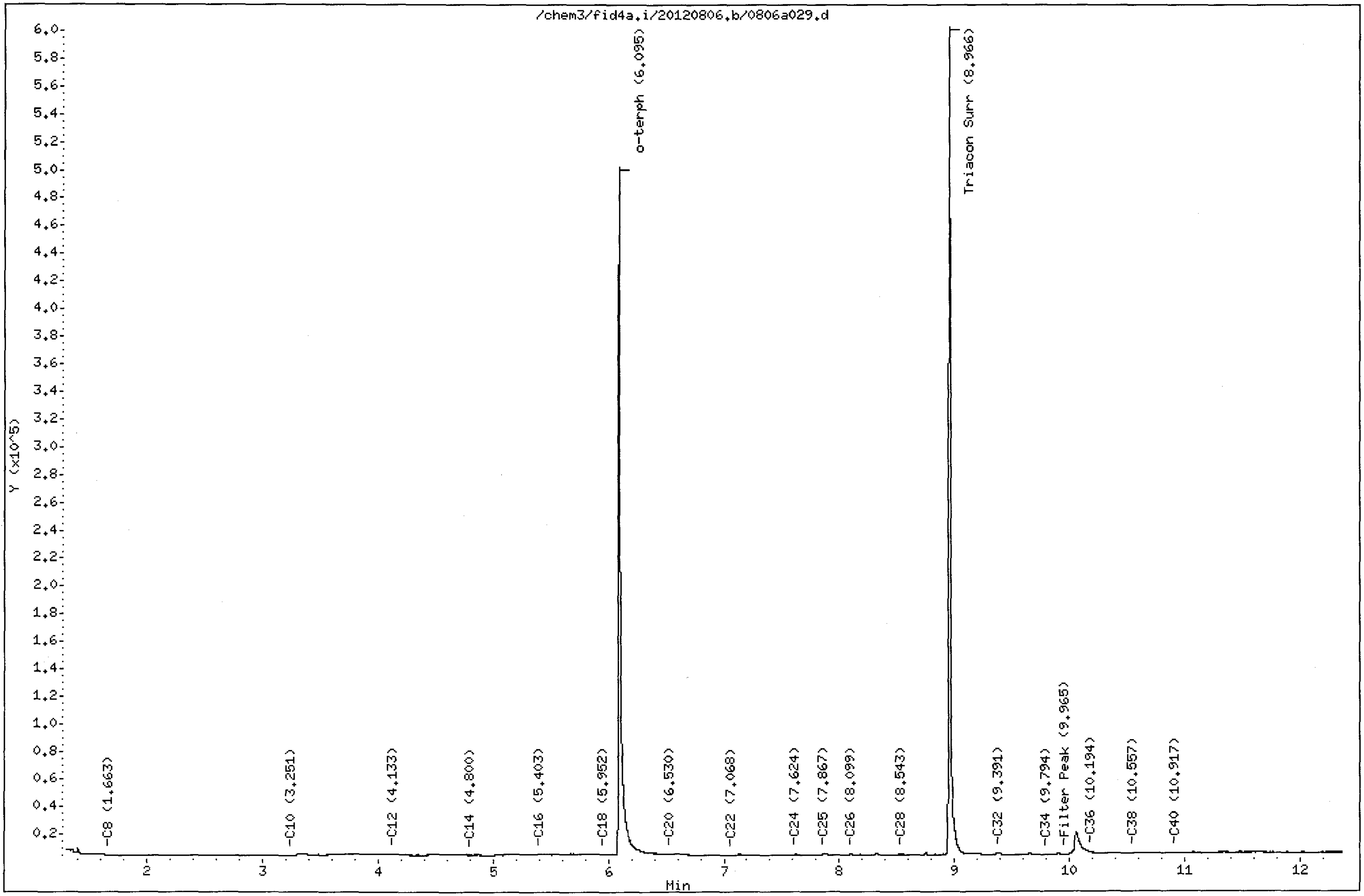
VD
8-7-12

Data File: /chem3/fid4a.i/20120806.b/0806a029.d
Date : 06-AUG-2012 22:34
Client ID:
Sample Info: VE22B

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



```
                         Analytical Resources Inc.
                          407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120806.b/0806a030.d       ARI ID: VE22C
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 06-AUG-2012 22:55
Operator: JR
Report Date: 08/07/2012                               Dilution Factor:    1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                   FID:4A RESULTS
Compound        RT     Shift    Height     Area          Range            Total Area   Conc
==================================================================================================
Toluene        1.385   0.004     3357      5630 |   GAS (Tol-C12)            433570    28.82
C8             1.650  -0.010      497      1170 | DIESEL (C12-C24)          1449730    98.96
C10            3.253   0.020     2271      3769 |  M.OIL (C24-C38)           322118    25.63
C12            4.125  -0.006    10003     14117 | AK-102 (C10-C25)          1810315   104.65
C14            4.792  -0.016    15559     37398 | AK-103 (C25-C36)           278382    32.61
C16            5.421   0.031     9393     24316 |
C18            5.951   0.000     5458      7575 |
C20            6.528   0.006     3986      4197 |  JET-A (C10-C18)          1468341   118.78
C22            7.083   0.011     3268      1817 |MIN.OIL (C24-C38)          322118    23.97
C24            7.592  -0.003     2186      1100 |
C25            7.841  -0.006     1704      1312 |
C26            8.096   0.006     1331      1872 |
C28            8.544  -0.006     1310      1218 |
C32            9.388  -0.006      767      1993 |
C34            9.808   0.016      649       724 |
Filter Peak    9.938  -0.019      859      1661 |BUNKERC (C10-C38)         2108002   276.13
C36           10.220   0.042     1553      3070 |
C38           10.551  -0.003     1146      1247 |
C40           10.933   0.008     1513      1466 |
o-terph        6.095   0.001   638347    622832 |
Triacon Surr   8.963  -0.027   620568    658417 |NAS DIES (C10-C24)        1785883   104.23
==================================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)   Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


     Surrogate         Area      Amount      %Rec
   ----------------------------------------
     o-Terphenyl      622832      30.6       67.9 M
     Triacontane      658417      34.5       76.7

M  Indicates the peak was manually integrated


        Analyte           RF       Curve Date
      -------------------------------------
       o-Terph Surr     20371.2    10-JUL-2012
       Triacon Surr     19086.0    12-JUN-2012
       Gas              15043.9    10-MAY-2012
       Diesel           14650.0    10-JUL-2012
       Motor Oil        12569.0    12-JUN-2012
       AK102            17299.0    10-JUL-2012
       AK103             8538.0    24-MAY-2012
       JetA             12362.0    31-JUL-2012
       Min Oil          13440.7    09-MAY-2012
       NAS Diesel        17134.0    10-JUL-2012
       Bunker C          7634.0    13-JUL-2012
```

Data File: /chem3/fid4a.i/20120806.b/0806a030.d

Date : 06-AUG-2012 22:55

Client ID:

Instrument: fid4a.i

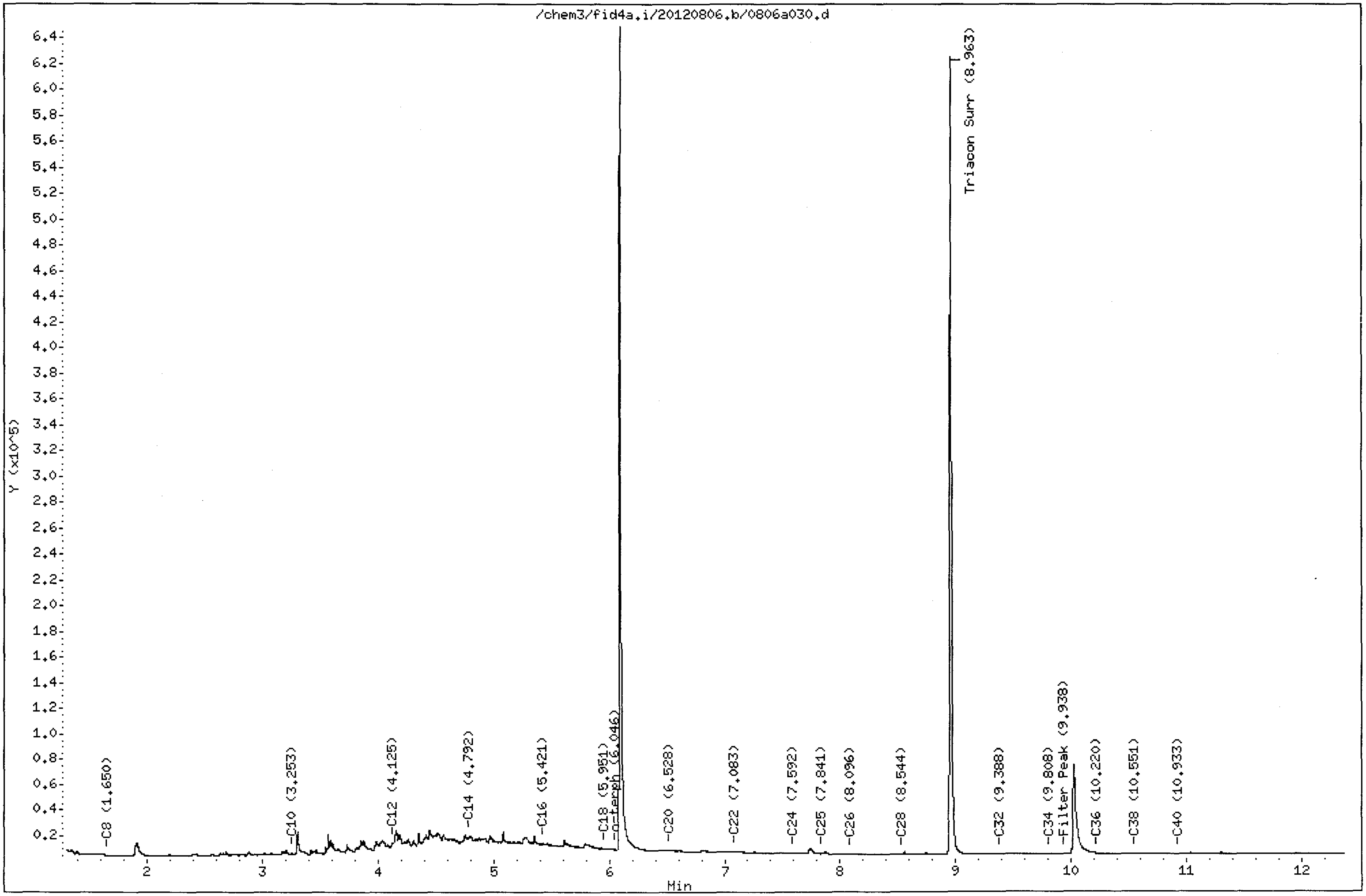
Sample Info: VE22C

Operator: JR

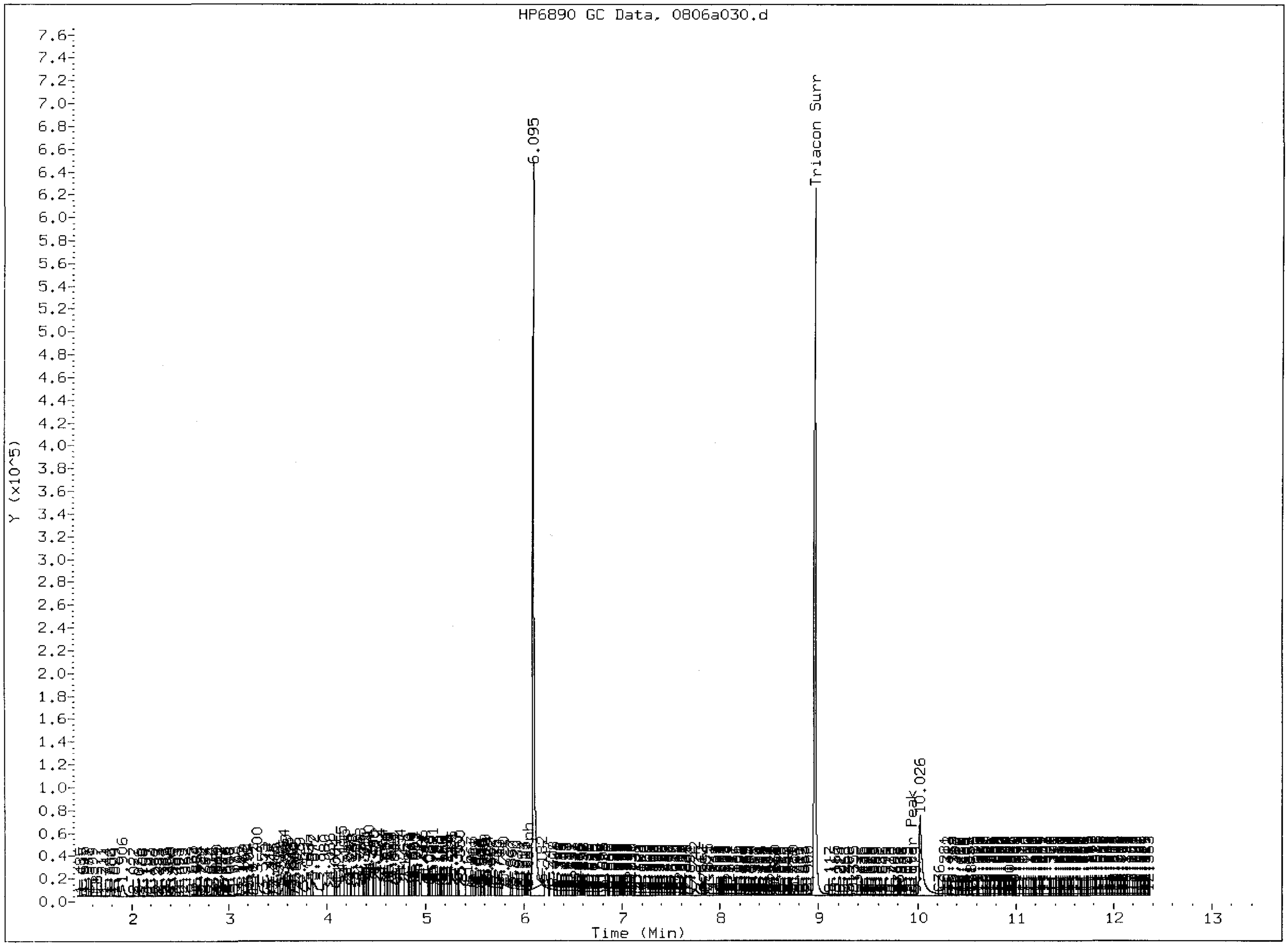
Column phase: RTX-1

Column diameter: 0.25

VD
8.7.12



FID:4A-2C/RTX-1 VE22C FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5. Skimmed surrogate]

Analyst: VD

Date: 8.7.12

```
                              Analytical Resources Inc.
                               407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120806.b/0806a031.d       ARI ID: VE22D
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 06-AUG-2012 23:16
Operator: JR
Report Date: 08/07/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                    FID:4A RESULTS
Compound         RT     Shift   Height     Area          Range            Total Area   Conc
==========================================================================================
Toluene         1.389   0.008     5412       9029 |   GAS (Tol-C12)         298848     19.87
C8              1.655  -0.005      488       1221 | DIESEL (C12-C24)        253605     17.31
C10             3.255   0.021     1416       1869 |  M.OIL (C24-C38)        184401     14.67
C12             4.121  -0.010     3825       5912 | AK-102 (C10-C25)        481210     27.82
C14             4.789  -0.019     1872       1138 | AK-103 (C25-C36)        162089     18.98
C16             5.401   0.011     1399       3486 |
C18             5.957   0.006     1046        951 |
C20             6.523   0.001      965        966 |  JET-A (C10-C18)        414391     33.52
C22             7.066  -0.007      616        899 |MIN.OIL (C24-C38)        184401     13.72
C24             7.586  -0.009      554        598 |
C25             7.823  -0.024      503        840 |
C26             8.082  -0.009      367        437 |
C28             8.546  -0.003      843        643 |
C32             9.386  -0.009      783        900 |
C34             9.826   0.034      451        441 |
Filter Peak     9.938  -0.019      684       1564 |BUNKERC (C10-C38)        662245     86.75
C36            10.171  -0.007     1975       6469 |
C38            10.544  -0.009     1013        743 |
C40            10.921  -0.004     1418       1496 |
o-terph         6.096   0.002   487167     649939 |
Triacon Surr    8.962  -0.028   602254     650438 |NAS DIES (C10-C24)       477844     27.89
==========================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)    Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------------
    o-Terphenyl     649939      31.9      70.9
    Triacontane     650438      34.1      75.7

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
    --------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

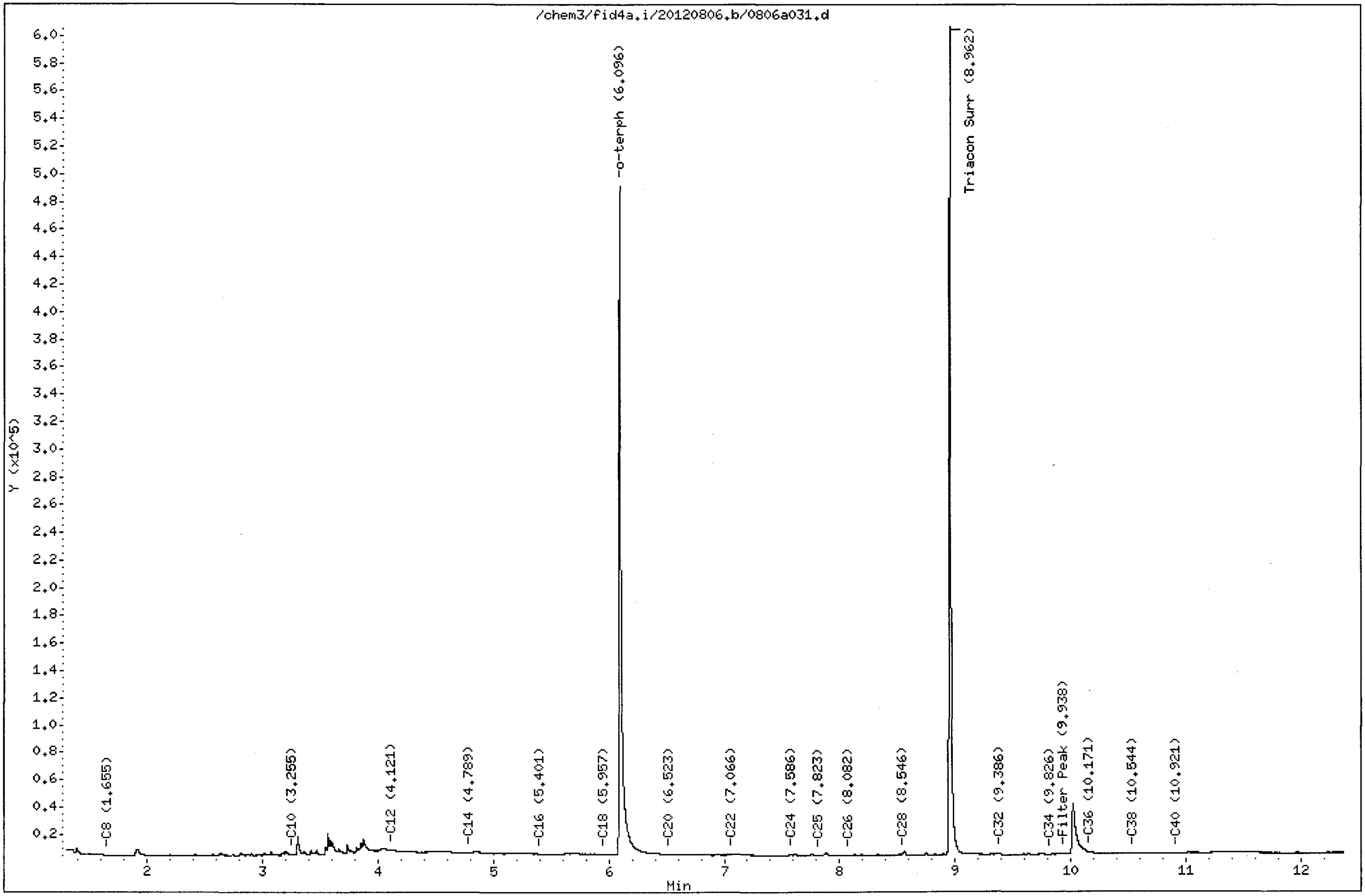
Data File: /chem3/fid4a.i/20120806.b/0806a031.d
Date : 06-AUG-2012 23:16
Client ID:
Sample Info: VE22D

Column phase: RTX-1

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25

VJ
8.7.12



CLEANED TPHD SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510

Client ID	OTER	TOT OUT
MB-080312	76.2%	0
LCS-080312	59.6%	0
LCSD-080312	68.6%	0
MW-15D-073012	75.2%	0
MW-16S-073012	71.5%	0
MW-15S-073012	67.9%	0
MW-14S-073012	70.9%	0

	LCS/MB LIMITS	QC LIMITS
(OTER) = o-Terphenyl	(50-150)	(50-150)

Prep Method: SW3510C
Log Number Range: 12-14520 to 12-14523

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPHD by GC/FID-Silica and Acid Cleaned
Page 1 of 1

Sample ID: LCS-080312
LCS/LCSD

Lab Sample ID: LCS-080312
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Date Extracted LCS/LCSD: 08/03/12

Date Analyzed LCS: 08/06/12 21:30
LCSD: 08/06/12 21:51
Instrument/Analyst LCS: FID/VTS
LCSD: FID/VTS

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Diesel	1.97	3.00	65.7%	1.98	3.00	66.0%	0.5%

TPHD Surrogate Recovery

	LCS	**LCSD**
o-Terphenyl	59.6%	68.6%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

```
                         Analytical Resources Inc.
                          407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120806.b/0806a026.d       ARI ID: VE22LCSW1
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 06-AUG-2012 21:30
Operator: JR
Report Date: 08/07/2012                               Dilution Factor:    1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                      FID:4A RESULTS
Compound        RT     Shift   Height     Area          Range           Total Area   Conc
=====================================================================================
Toluene        1.381   0.000     4348     3480 |  GAS (Tol-C12)          2664675   177.13
C8             1.661   0.001     2593     3539 | DIESEL (C12-C24)       14451591   986.46
C10            3.238   0.005    39724    61184 |  M.OIL (C24-C38)         272925    21.71
C12            4.125  -0.006   147334   135831 | AK-102 (C10-C25)       16483912   952.88
C14            4.799  -0.009   261365   286442 | AK-103 (C25-C36)         220409    25.82
C16            5.388  -0.002   427159   415601 |
C18            5.956   0.005   381737   392717 |
C20            6.521   0.000   259614   360564 |  JET-A (C10-C18)       11906073   963.12
C22            7.072   0.000   112765   223247 |MIN.OIL (C24-C38)        272925    20.31
C24            7.607   0.012    22689    57823 |
C25            7.859   0.012    11721    25529 |
C26            8.099   0.008     5461    10007 |
C28            8.545  -0.004     1194     1749 |
C32            9.381  -0.013      852     1172 |
C34            9.803   0.012       98       71 |
Filter Peak    9.960   0.003      198      213 |BUNKERC (C10-C38)      16714281  2189.45
C36             ----                           |
C38           10.544  -0.010      564      344 |
C40           10.921  -0.003     1044      970 |
o-terph        6.101   0.006   714727   546368 |
Triacon Surr   8.973  -0.018   590217   649441 |NAS DIES (C10-C24)     16441356   959.57
=====================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)    Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  ----------------------------------------
    o-Terphenyl    546368      26.8      59.6 M
    Triacontane    649441      34.0      75.6

M  Indicates the peak was manually integrated


        Analyte           RF      Curve Date
     ------------------------------------
      o-Terph Surr    20371.2   10-JUL-2012
      Triacon Surr    19086.0   12-JUN-2012
      Gas             15043.9   10-MAY-2012
      Diesel          14650.0   10-JUL-2012
      Motor Oil       12569.0   12-JUN-2012
      AK102           17299.0   10-JUL-2012
      AK103            8538.0   24-MAY-2012
      JetA            12362.0   31-JUL-2012
      Min Oil         13440.7   09-MAY-2012
      NAS Diesel       17134.0   10-JUL-2012
      Bunker C         7634.0   13-JUL-2012
```

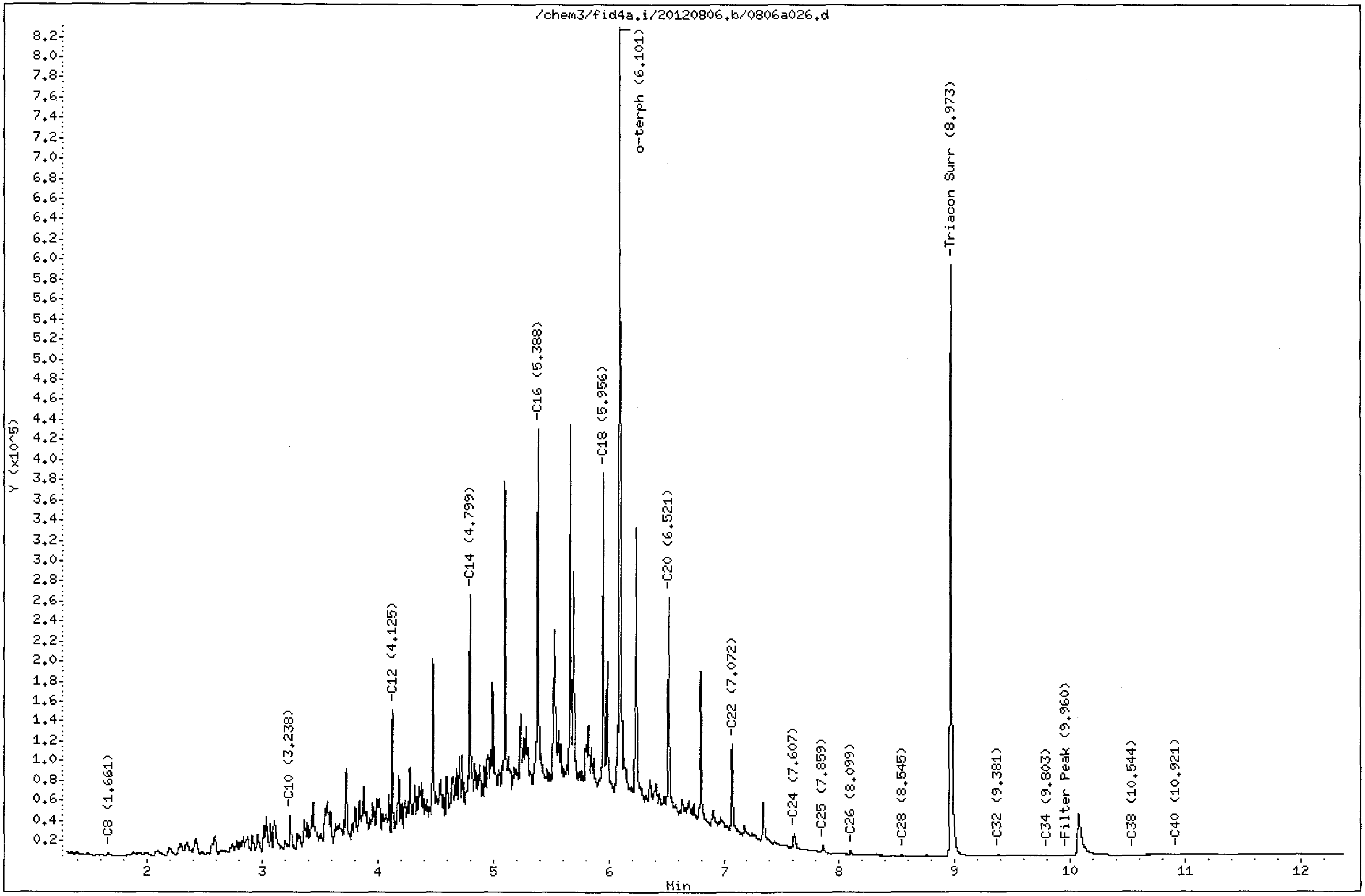
Data File: /chem3/fid4a.i/20120806.b/0806a026.d
Date : 06-AUG-2012 21:30
Client ID:
Sample Info: VE22LCSW1

Column phase: RTX-1

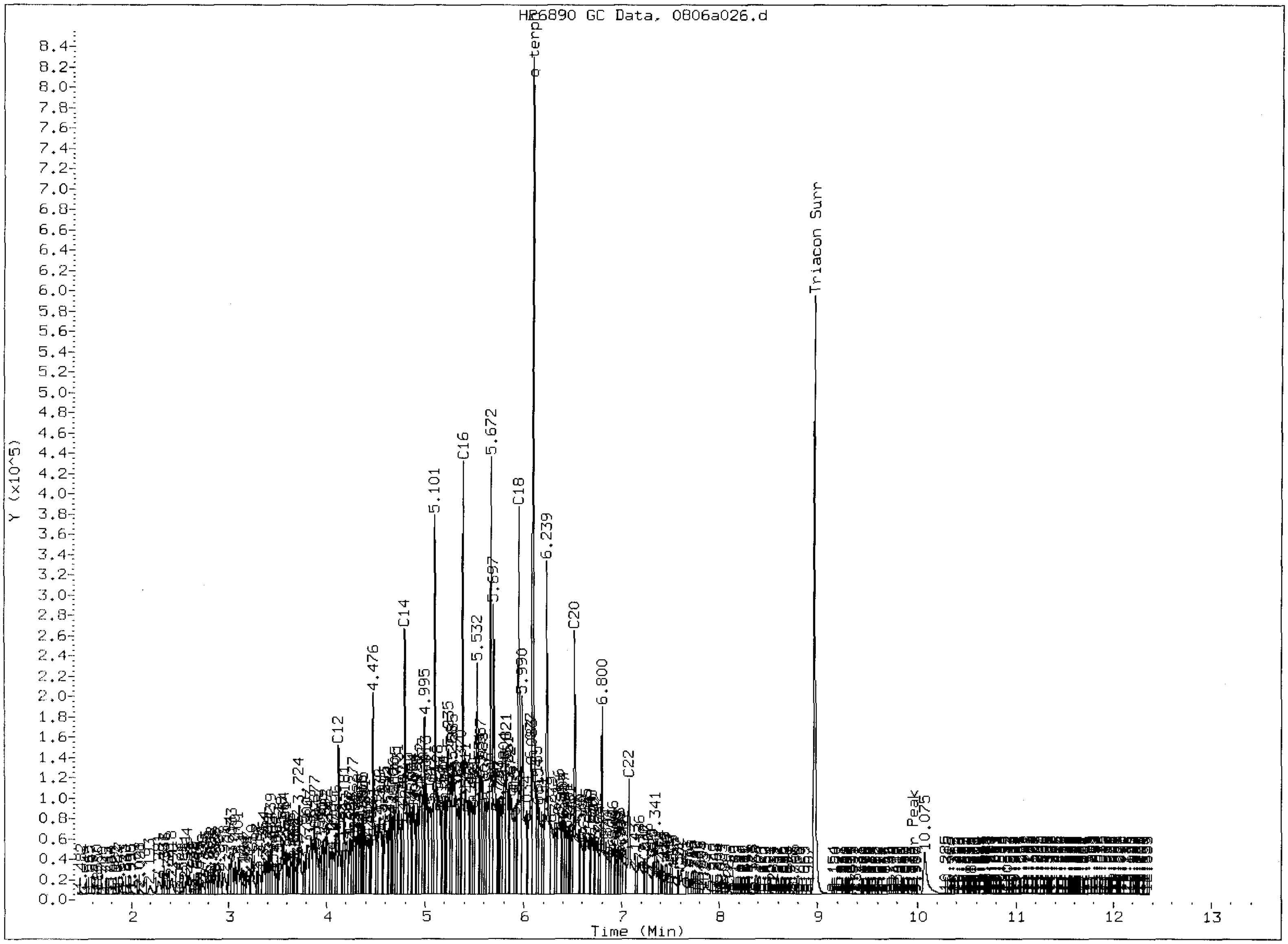
VJ
8.7.12

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22LCSW1 FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: VD

Date: 8.7.12

```
                         Analytical Resources Inc.
                        407S TPH Quantitation Report

Data file: /chem3/fid4a.i/20120806.b/0806a027.d       ARI ID: VE22LCSDW1
Method: /chem3/fid4a.i/20120806.b/ftphfid4a.m         Client ID:
Instrument: fid4a.i                                    Injection: 06-AUG-2012 21:51
Operator: JR
Report Date: 08/07/2012                               Dilution Factor:   1
Macro: 13-JUL-2012
Calibration Dates: Gas:10-MAY-2012  Diesel:10-JUL-2012  M.Oil:12-JUN-2012

                                      FID:4A RESULTS
Compound         RT    Shift   Height     Area          Range            Total Area   Conc
==============================================================================================
Toluene        1.388   0.007     6940      4823 |   GAS (Tol-C12)         2709770   180.12
C8             1.667   0.007     2903      5475 | DIESEL (C12-C24)       14475822   988.11
C10            3.239   0.006    44417     50962 |  M.OIL (C24-C38)         307529    24.47
C12            4.124  -0.007   158033    137523 | AK-102 (C10-C25)       16538700   956.05
C14            4.798  -0.010   276561    298496 | AK-103 (C25-C36)         258739    30.30
C16            5.387  -0.003   441814    499765 |
C18            5.955   0.005   392564    473421 |
C20            6.522   0.001   263537    338865 |  JET-A (C10-C18)       12004956   971.12
C22            7.072   0.000   117874    211506 |MIN.OIL (C24-C38)         307529    22.88
C24            7.605   0.010    23456     70730 |
C25            7.858   0.011    12133     27712 |
C26            8.097   0.007     5478      9977 |
C28            8.543  -0.006     1372      1270 |
C32            9.395   0.001      166       163 |
C34            9.781  -0.011      133       282 |
Filter Peak    9.953  -0.004      210       283 |BUNKERC (C10-C38)      16809854  2201.97
C36             ----                            |
C38           10.552  -0.001      621       607 |
C40           10.916  -0.008     1072      1062 |
o-terph        6.100   0.006   770393    629188 |
Triacon Surr   8.966  -0.024   638682    680351 |NAS DIES (C10-C24)     16502325   963.13
=============================================================================================
Range Times:  NW Diesel(4.131 - 7.595)    AK102(3.23 - 7.85)   Jet A(3.23 - 5.95)
               NW M.Oil(7.60 - 10.55)    AK103(7.85 - 10.18)   OR Diesel(3.23 - 8.55)


    Surrogate        Area      Amount     %Rec
  ---------------------------------------------
    o-Terphenyl    629188      30.9      68.6 M
    Triacontane    680351      35.6      79.2

M  Indicates the peak was manually integrated


       Analyte           RF      Curve Date
    --------------------------------------
     o-Terph Surr    20371.2   10-JUL-2012
     Triacon Surr    19086.0   12-JUN-2012
     Gas             15043.9   10-MAY-2012
     Diesel          14650.0   10-JUL-2012
     Motor Oil       12569.0   12-JUN-2012
     AK102           17299.0   10-JUL-2012
     AK103            8538.0   24-MAY-2012
     JetA            12362.0   31-JUL-2012
     Min Oil         13440.7   09-MAY-2012
     NAS Diesel       17134.0   10-JUL-2012
     Bunker C         7634.0   13-JUL-2012
```

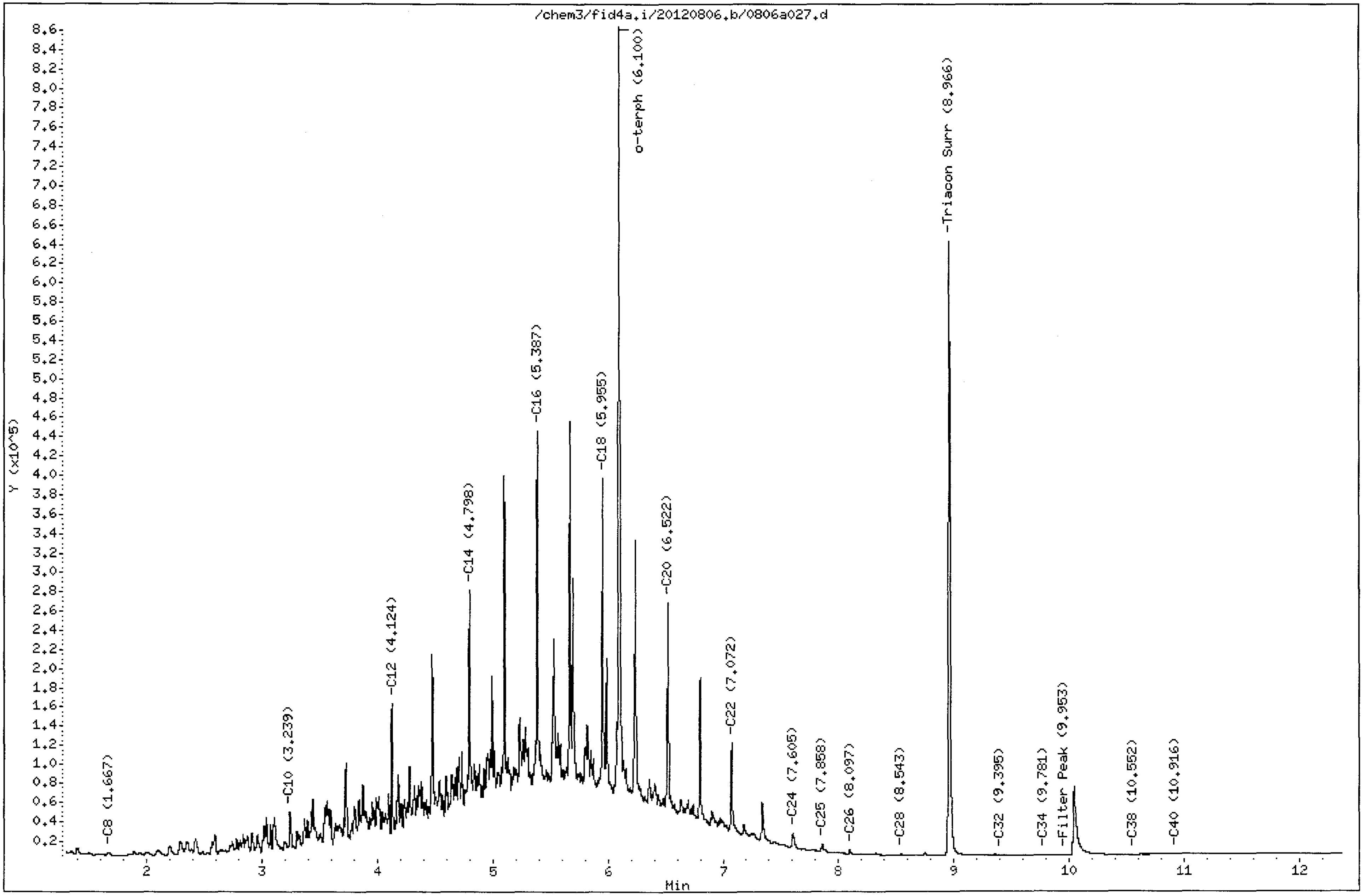
Data File: /chem3/fid4a.i/20120806.b/0806a027.d
Date : 06-AUG-2012 21:51
Client ID:
Sample Info: VE22LCSDW1

Column phase: RTX-1

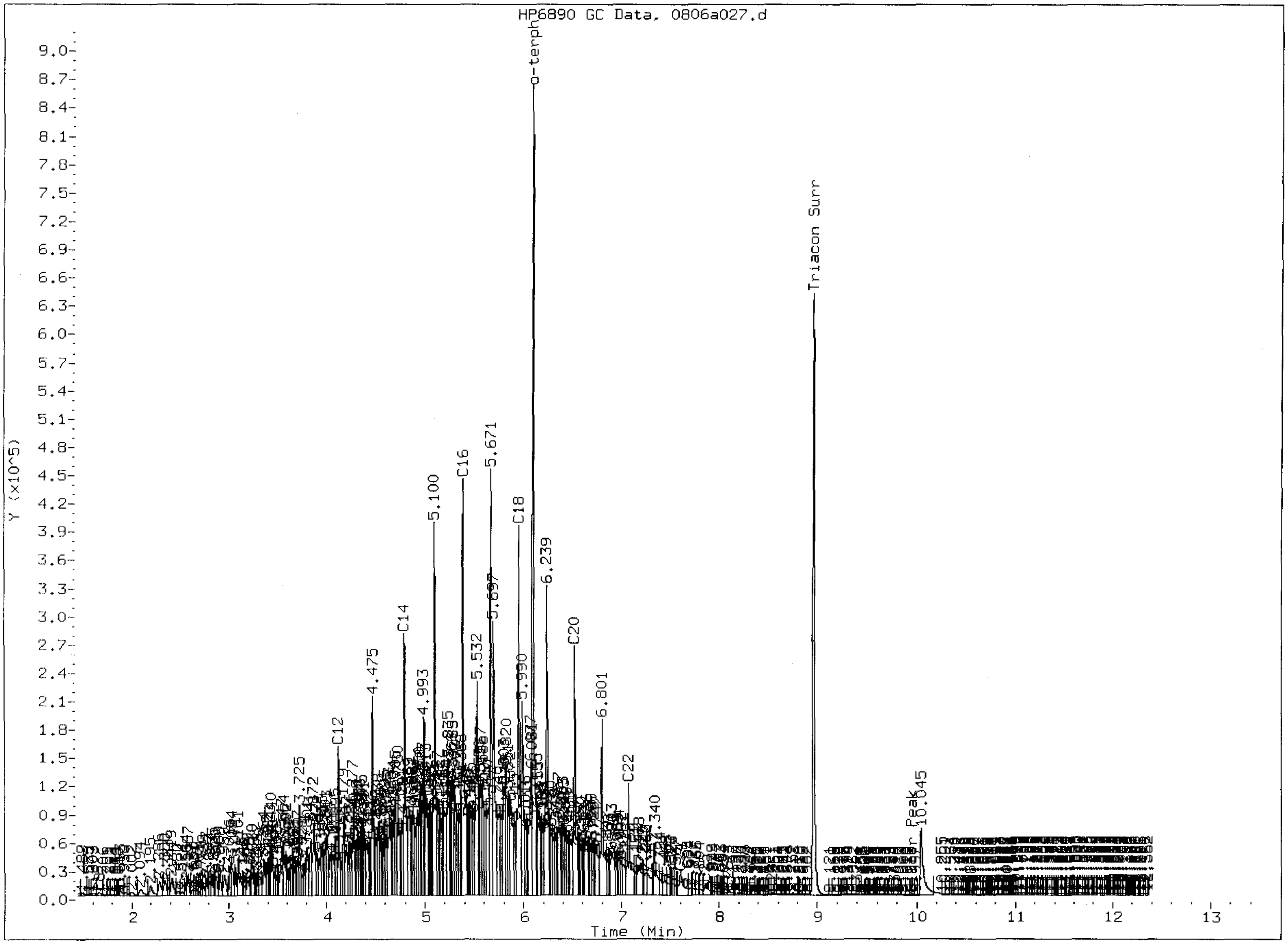
8.7.12

Instrument: fid4a.i

Operator: JR
Column diameter: 0.25



FID:4A-2C/RTX-1 VE22LCSDW1   FID:4A SIGNAL



MANUAL INTEGRATION

1. Baseline correction
3. Peak not found
[✓ 5.] Skimmed surrogate

Analyst: VD

Date: 8.7.12

TOTAL DIESEL RANGE HYDROCARBONS-EXTRACTION REPORT

ARI Job: VE22
Project: Cornwall
0001020.400.510

Matrix: Water
Date Received: 07/31/12

ARI ID	Client ID	Samp Amt	Final Vol	Prep Date
12-14520-080312MB1	Method Blank	500 mL	1.00 mL	08/03/12
12-14520-080312LCS1	Lab Control	500 mL	1.00 mL	08/03/12
12-14520-080312LCSD1	Lab Control Dup	500 mL	1.00 mL	08/03/12
12-14520-VE22A	MW-15D-073012	500 mL	1.00 mL	08/03/12
12-14521-VE22B	MW-16S-073012	500 mL	1.00 mL	08/03/12
12-14522-VE22C	MW-15S-073012	500 mL	1.00 mL	08/03/12
12-14523-VE22D	MW-14S-073012	500 mL	1.00 mL	08/03/12

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Page 1 of 1

Sample ID: MW-15D-073012
SAMPLE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.8**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/03/12	**7439-96-5**	**Manganese**	1	**182**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-16S-073012
SAMPLE

Lab Sample ID: VE22B
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.8**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/03/12	**7439-96-5**	**Manganese**	1	**380**	
200.8	08/01/12	200.8	08/03/12	**7440-66-6**	**Zinc**	4	**5**	

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15S-073012
SAMPLE

Lab Sample ID: VE22C
LIMS ID: 12-14522
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.7**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	**7439-92-1**	**Lead**	0.1	**0.1**	
200.8	08/01/12	200.8	08/03/12	**7439-96-5**	**Manganese**	1	**529**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-14S-073012
SAMPLE

Lab Sample ID: VE22D
LIMS ID: 12-14523
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.8**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/03/12	**7439-96-5**	**Manganese**	1	**584**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Page 1 of 1

Sample ID: MW-13S-073012
SAMPLE

Lab Sample ID: VE22E
LIMS ID: 12-14524
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.6**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/03/12	**7439-96-5**	**Manganese**	1	**704**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-14D-073012
SAMPLE

Lab Sample ID: VE22F
LIMS ID: 12-14525
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.7**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/06/12	**7439-96-5**	**Manganese**	5	**1,440**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-13D-073012
SAMPLE

Lab Sample ID: VE22G
LIMS ID: 12-14526
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	**7440-38-2**	**Arsenic**	0.5	**0.9**	
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/03/12	**7439-96-5**	**Manganese**	0.5	**257**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-DUP-073012
SAMPLE

Lab Sample ID: VE22H
LIMS ID: 12-14527
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	7440-38-2	Arsenic	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/06/12	**7439-96-5**	**Manganese**	5	**1,430**	
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-073012
MATRIX SPIKE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Arsenic	200.8	0.8	24.9	25.0	96.4%	
Copper	200.8	0.5 U	23.2	25.0	92.8%	
Lead	200.8	0.1 U	27.7	25.0	111%	
Manganese	200.8	182	204	25	88.0%	H
Zinc	200.8	4 U	64	80	80.0%	

Reported in µg/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-073012
DUPLICATE

Lab Sample ID: VE22A
LIMS ID: 12-14520
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Arsenic	200.8	0.8	0.7	13.3%	+/- 0.5	L
Copper	200.8	0.5 U	0.5 U	0.0%	+/- 0.5	L
Lead	200.8	0.1 U	0.1 U	0.0%	+/- 0.1	L
Manganese	200.8	182	184	1.1%	+/- 20%	
Zinc	200.8	4 U	4 U	0.0%	+/- 4	L

Reported in µg/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: VE22MB
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	08/01/12	200.8	08/03/12	7440-38-2	Arsenic	0.2	0.2	U
200.8	08/01/12	200.8	08/03/12	7440-50-8	Copper	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7439-92-1	Lead	0.1	0.1	U
200.8	08/01/12	200.8	08/03/12	7439-96-5	Manganese	0.5	0.5	U
200.8	08/01/12	200.8	08/03/12	7440-66-6	Zinc	4	4	U

U-Analyte undetected at given RL
RL-Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: VE22LCS
LIMS ID: 12-14521
Matrix: Water
Data Release Authorized:
Reported: 08/07/12

QC Report No: VE22-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Arsenic	200.8	25.1	25.0	100%	
Copper	200.8	26.6	25.0	106%	
Lead	200.8	25.6	25.0	102%	
Manganese	200.8	25.8	25.0	103%	
Zinc	200.8	78	80	97.5%	

Reported in µg/L

N-Control limit not met
Control Limits: 80-120%

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
Dissolved Mercury by Method SW7470A

Data Release Authorized:
Reported: 08/10/12
Date Received: 07/31/12
Page 1 of 1

QC Report No238: VE24-Landau Associates
Project: Cornwall
0001020.400.510

Client/ ARI ID	**Date Sampled**	**Matrix**	**Prep Date Anal Date**	**RL**	**Result**
MW-15D-073012 VE24A 12-14529	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-16S-073012 VE24B 12-14530	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-15S-073012 VE24C 12-14531	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-14S-073012 VE24D 12-14532	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-13S-073012 VE24E 12-14533	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-14D-073012 VE24F 12-14534	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-13D-073012 VE24G 12-14535	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MW-DUP-073012 VE24H 12-14536	07/30/12	Water	08/01/12 08/10/12	20.0	20.0 U
MB-080112 Method Blank	NA	Water	08/01/12 08/10/12	20.0	20.0 U

Reported in ng/L

RL-Analytical reporting limit
U-Undetected at reported detection limit

ANALYTICAL
RESOURCES
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INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: **MW-15D-073012**
MATRIX SPIKE

Lab Sample ID: VE24A
LIMS ID: 12-14529
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE24-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Mercury	7470A	20.0 U	115	100	115%	

Reported in ng/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-15D-073012
DUPLICATE

Lab Sample ID: VE24A
LIMS ID: 12-14529
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE24-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Mercury	7470A	20.0 U	20.0 U	0.0%	+/- 20.0	L

Reported in ng/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: VE24LCS
LIMS ID: 12-14530
Matrix: Water
Data Release Authorized:
Reported: 08/10/12

QC Report No: VE24-Landau Associates
Project: Cornwall
0001020.400.510
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Mercury	7470A	225	200	112%	

Reported in ng/L

N-Control limit not met
Control Limits: 80-120%

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-15D-073012
ARI ID: 12-14520 VE22A

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/09/12 080912#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	1.00	29.7
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	2.0
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.153
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	42.4
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	6.0	19.5
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	13.8

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-16S-073012
ARI ID: 12-14521 VE22B

Analyte	**Date Batch**	**Method**	**Units**	**RL**	**Sample**
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/09/12 080912#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.500	16.9
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	3.2
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.076
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	59.0
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	4.0	12.9
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	20.9

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-15S-073012
ARI ID: 12-14522 VE22C

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/09/12 080912#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.500	22.2
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	1.1
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.091
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	50.5
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	4.0	14.9
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	16.2

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-14S-073012
ARI ID: 12-14523 VE22D

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/09/12 080912#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.500	21.3
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	1.6
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.084
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	10.0	183
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	6.0	19.6
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	16.1

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-13S-073012
ARI ID: 12-14524 VE22E

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/09/12 080912#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.500	17.6
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	0.8
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.118
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	31.6
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	4.0	18.7
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	11.2

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-14D-073012
ARI ID: 12-14525 VE22F

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/09/12 080912#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/09/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.200	13.4
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	0.8
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.132
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	42.7
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	6.0	17.9
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	13.2

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-13D-073012
ARI ID: 12-14526 VE22G

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.500	19.7
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	1.2
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.201
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	33.2
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	4.0	13.9
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	11.8

RL	Analytical reporting limit
U	Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Client ID: MW-DUP-073012
ARI ID: 12-14527 VE22H

Analyte	Date Batch	Method	Units	RL	Sample
N-Nitrate	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
N-Nitrite	07/31/12 073112#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Total Cyanide	08/10/12 081012#1	EPA 335.4	mg/L	0.005	< 0.005 U
Post Chlorination Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
Amenable Cyanide	08/10/12	EPA 335.1	mg/L	0.005	< 0.005 U
N-Ammonia	08/03/12 080312#1	EPA 350.1M	mg-N/L	0.200	14.2
Sulfate	07/31/12 073112#1	EPA 300.0	mg/L	0.1	1.2
Sulfide	08/02/12 080212#1	EPA 376.2	mg/L	0.050	0.123
Chemical Oxygen Demand	08/13/12 081312#1	EPA 410.4	mg/L	5.00	43.7
Biological Oxygen Demand	08/01/12 080112#1	EPA 405.1	mg/L	4.0	15.2
Total Organic Carbon	08/07/12 080712#1	EPA 9060	mg/L	1.50	12.3

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
VE22-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
N-Nitrate	EPA 300.0	07/31/12	mg-N/L	< 0.1 U	
N-Nitrite	EPA 300.0	07/31/12	mg-N/L	< 0.1 U	
Total Cyanide	EPA 335.4	08/09/12	mg/L	< 0.005 U	
		08/10/12		< 0.005 U	
N-Ammonia	EPA 350.1M	08/03/12	mg-N/L	< 0.010 U	FB
		08/03/12		< 0.010 U	FB
Sulfate	EPA 300.0	07/31/12	mg/L	< 0.1 U	
Sulfide	EPA 376.2	08/02/12	mg/L	< 0.050 U	
Chemical Oxygen Demand	EPA 410.4	08/13/12	mg/L	< 5.00 U	
Biological Oxygen Demand	EPA 405.1	08/01/12	mg/L	< 1.0 U	
Total Organic Carbon	EPA 9060	08/07/12	mg/L	< 1.50 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
VE22-Landau Associates

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: NA
Date Received: NA

Analyte/Method	**QC ID**	**Date**	**Units**	**LCS**	**Spike Added**	**Recovery**
Sulfide EPA 376.2	ICVL	08/02/12	mg/L	0.496	0.501	99.0%
Biological Oxygen Demand EPA 405.1	ICVL	08/01/12	mg/L	101	198	51.0%

STANDARD REFERENCE RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
N-Nitrate ERA #230511	EPA 300.0	07/31/12	mg-N/L	2.8	3.0	93.3%
N-Nitrite ERA #401010	EPA 300.0	07/31/12	mg-N/L	2.9	3.0	96.7%
Total Cyanide ERA 11107	EPA 335.4	08/09/12 08/10/12	mg/L	0.376 0.386	0.400 0.400	94.0% 96.5%
N-Ammonia ERA #15125	EPA 350.1M	08/03/12 08/03/12	mg-N/L	0.484 0.498	0.500 0.500	96.8% 99.6%
Sulfate ERA #070811	EPA 300.0	07/31/12	mg/L	3.0	3.0	100.0%
Chemical Oxygen Demand Thermo Orion #I01	EPA 410.4	08/13/12	mg/L	84.8	90.0	94.2%
Total Organic Carbon ERA 0409-12-01	EPA 9060	08/07/12	mg/L	20.4	20.0	102.0%

REPLICATE RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: VE22A Client ID: MW-15D-073012						
N-Nitrate	EPA 300.0	07/31/12	mg-N/L	< 0.1	< 0.1	NA
N-Nitrite	EPA 300.0	07/31/12	mg-N/L	< 0.1	< 0.1	NA
Total Cyanide	EPA 335.4	08/09/12	mg/L	< 0.005	< 0.005	NA
N-Ammonia	EPA 350.1M	08/03/12	mg-N/L	29.7	29.5	0.7%
Sulfate	EPA 300.0	07/31/12	mg/L	2.0	2.0	0.0%
Sulfide	EPA 376.2	08/02/12	mg/L	0.153	0.169	9.9%
Chemical Oxygen Demand	EPA 410.4	08/13/12	mg/L	42.4	37.8	11.5%
Total Organic Carbon	EPA 9060	08/07/12	mg/L	13.8	15.0	8.3%
ARI ID: VE22F Client ID: MW-14D-073012						
N-Ammonia	EPA 350.1M	08/03/12	mg-N/L	13.4	13.4	0.0%

MS/MSD RESULTS-CONVENTIONALS
VE22-Landau Associates

Matrix: Water
Data Release Authorized:
Reported: 08/15/12

Project: Cornwall
Event: 0001020.400.510
Date Sampled: 07/30/12
Date Received: 07/31/12

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: VE22A Client ID: MW-15D-073012							
N-Nitrate	EPA 300.0	07/31/12	mg-N/L	< 0.1	1.9	2.0	95.0%
N-Nitrite	EPA 300.0	07/31/12	mg-N/L	< 0.1	2.2	2.0	110.0%
Total Cyanide	EPA 335.4	08/09/12	mg/L	< 0.005	0.160	0.200	80.0%
Sulfate	EPA 300.0	07/31/12	mg/L	2.0	4.1	2.0	105.0%
Sulfide	EPA 376.2	08/02/12	mg/L	0.153	0.693	0.500	108.0%
Chemical Oxygen Demand	EPA 410.4	08/13/12	mg/L	42.4	128	100	85.6%
Total Organic Carbon	EPA 9060	08/07/12	mg/L	13.8	34.4	20.0	103.0%
ARI ID: VE22F Client ID: MW-14D-073012							
N-Ammonia	EPA 350.1M	08/03/12	mg-N/L	13.4	41.4	25.0	112.0%

Table of Contents: ARI Job UK00, UK01, UK02

Client: Landau Associates, Inc.

Project: 1020.400.480 Port Of Bellingham

Dioxin Analysis

General Chemistry Analysis

Total Solids

Dioxin Raw Data

General Chemistry Raw Data

Signature

March-21-2012
Date

Analytical Resources, Incorporated
Analytical Chemists and Consultants

March 21, 2012

Jeremy Davis
Landau Associates, Inc.
130 2nd Avenue S.
Edmonds, WA 98020

RE: Project: Cornwall Avenue
ARI Job No: UK00, UK01, UK02

Dear Jeremy:

Please find enclosed the original and revised Chain of Custody documentation, e-mail documentation and the analytical results for the samples from the projects referenced above. Analytical Resources, Inc. (ARI) accepted several sediment samples between February 2, 2012 and February 27, 2012. There were no discrepancies between the sample containers' labels and the COCs.

Please reference the Case Narrative for analytical details associated with this project.

An electronic copy of these reports and the supporting data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
kellyb@arilabs.com
206/695-6211

Enclosures

cc: files UK00, UK01 and UK02

page 1 of 465

Chain of Custody Documentation

ARI Job ID: UK00, UK01, UK02

LANDAU ASSOCIATES

☒ Seattle/[✓ Edmonds] (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ______

Chain-of-Custody Record

UG98

Date 2/1/2012
Page 1 of 1

Project Name Cornwall Avenue LF/ Interim Action
Project No. 001020.400.470
Project Location/Event Interim Placement Area #1
Sampler's Name Brian Christiansen
Project Contact Jeremy Davis 425-778-0907
Send Results To Jeremy Davis - Edmonds

Turnaround Time
☐ Standard
☐ Accelerated
☒ HOLD

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	Dioxins (EPA 1613B)	pH
CA-LF-IPA1-020112A	2/1/12	1310	Soil	1		

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash/silica gel cleanup

___ run samples standardized to ______ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt

___ Dissolved metal water samples field filtered

Other ______

Special Shipment/Handling or Storage Requirements: Keep Cool / Hold Sample for Analysis

Method of Shipment: Federal Express Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name Brian E Christiansen	Printed Name Taylor Streeter	Printed Name	Printed Name
Company Landau Associates	Company ARI	Company	Company
Date 2/1/12 Time 1445	Date 2-2-12 Time 955	Date Time	Date Time

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau

Project Name: Cornwall Ave LF

COC No(s): ______ NA

Delivered by: [✓ Fed-Ex] UPS Courier Hand Delivered Other: ______

Assigned ARI Job No: UK98

Tracking No: 804779687873C NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	[✓ YES]	NO
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry): 4.8 ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90941619

Cooler Accepted by: AV Date: 2/2/12 Time: 955

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES [✓ NO]

What kind of packing material was used? [✓ Bubble Wrap] [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: ______

Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		YES	[✓ NO]
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		[✓ YES]	NO
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	[✓ NA]	YES	NO
Were all VOC vials free of air bubbles?	[✓ NA]	YES	NO
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	[✓ NA]	______	

Was Sample Split by ARI: [✓ NA] YES Date/Time ______ Equipment: ______ Split by: ______

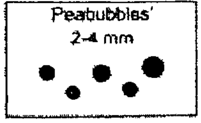
Samples Logged by: ______ Date: 2-2-12 Time: 1124

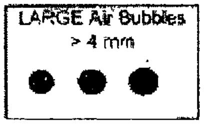
***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By Date





Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

LANDAU ASSOCIATES

☒ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ______

Chain-of-Custody Record

VJ34

Date 2/15/12
Page 1 of 1

Project Name POB-Cornwall LF Interim Action Project No. [illegible]7020.400.480
Project Location/Event IPA1 stockpile sample
Sampler's Name Brian Christianson
Project Contact Jeremy Davis
Send Results To Jeremy Davis

Turnaround Time
☐ Standard
☐ Accelerated
X HOLD

Sample I.D.	Date	Time	Matrix	No. of Containers	EPA-1613B Dioxin
CA-LF-IPA1-021512B	2/15/12	0830	Soil	2	
CA-LF-IPA1-021512C	2/15/12	0845	Soil	2	

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion
X NWTPH-Dx - run acid wash/silica gel cleanup
___ run samples standardized to ______ product
___ Analyze for EPH if no specific product identified
VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt
___ Dissolved metal water samples field filtered
Other HOLD FOR TESTING!!

Special Shipment/Handling or Storage Requirements Keep Cool

Method of Shipment ARI Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name Brian E Christianson	Printed Name Chris Atwell	Printed Name	Printed Name
Company Landau Associates	Company ARI	Company	Company
Date 2/15/12 Time 12:50 PM	Date 2/15/12 Time 15:14	Date Time	Date Time

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau

Project Name: POB - Cornwall

COC No(s). ______ NA

Delivered by: Fed-Ex UPS [✓ Courier] Hand Delivered Other: ______

Assigned ARI Job No. UI34

Tracking No ______ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	[✓ YES]	NO
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 11.4 ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90941619

Cooler Accepted by: CA Date: 2/15/12 Time: 15:14

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	[✓ NO]

What kind of packing material was used? [✓ Bubble Wrap] [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: ______

Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		YES	[✓ NO]
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		[✓ YES]	NO
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	[✓ NA]	YES	NO
Were all VOC vials free of air bubbles?	[✓ NA]	YES	NO
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	[✓ NA]	______	

Was Sample Split by ARI: [✓ NA] YES Date/Time ______ Equipment: ______ Split by: ______

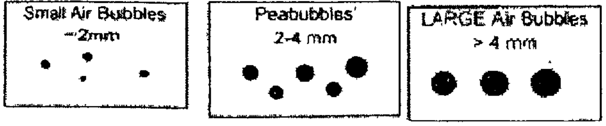
Samples Logged by TS Date 2-15-12 Time 1702

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By ______ Date ______



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

0016F
3/2/10

Cooler Receipt Form

Revision 014

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Temperature Compliance Form

Cooler#: 1 **Temperature(°C):** 11.4

Sample ID	Bottle Count	Bottle Type
Samples received		
above		
6°C		

Cooler#: **Temperature(°C):**

Sample ID	Bottle Count	Bottle Type

Cooler#: **Temperature(°C):**

Sample ID	Bottle Count	Bottle Type

Cooler#: **Temperature(°C):**

Sample ID	Bottle Count	Bottle Type

Completed by: TS Date: 2-12-12 Time: 1704

LANDAU ASSOCIATES

☐ **Seattle/Edmonds** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐ ______

Date 2/21/12
Page 1 of 1

Chain-of-Custody Record

UJ76

Project Name Port of Bellingham
Project No. 1020.400.480
Project Location/Event Cornwall/Interim Action
Sampler's Name Brian Christianson
Project Contact Jeremy Davis
Send Results To Jeremy Davis

Turnaround Time
☐ Standard
☐ Accelerated
☐ HOLD

Sample I.D.	Date	Time	Matrix	No. of Containers	Testing Parameters: DIOXINS EPA1613B OH
CA-LF-IPA2-022412D	2/24/12	1535	Soil	2	
CA-LF-IPA2-022412E	2/24/12	1545	Soil	2	

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash/silica gel cleanup

___ run samples standardized to ______ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freeze upon receipt

___ Dissolved metal water samples field filtered

Other X Hold to Run all samples

Special Shipment/Handling or Storage Requirements 4

Method of Shipment Handcarried Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature (opened to re-ice)	Signature	Signature
Printed Name Brian E Christianson	Printed Name Jeremy Davis	Printed Name Jeremy Davis	Printed Name Chris Atwell
Company Landau Associates	Company LAI	Company LAI	Company ARI
Date 2/24/12 Time 6:10 PM	Date 2/27/12 Time 0830	Date 2/27/12 Time 0840	Date 2/27/12 Time 1315

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 8/09

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Port of Bellingham
COC No(s): ______________ NA
Assigned ARI Job No: UJ76
Project Name: Port of Bellingham
Delivered by: Fed-Ex UPS [✓ Courier] Hand Delivered Other: ______
Tracking No: ______________ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	[✓ YES]	NO
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2 0-6 0 °C for chemistry) 5.1 ____ ____ ____ ____ ____
If cooler temperature is out of compliance fill out form 00070F
Temp Gun ID#: 9894/609
Cooler Accepted by ______ Date 2/27/12 Time 1315

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	[✓ NO]
What kind of packing material was used? Bubble Wrap [✓ Wet Ice] Gel Packs [✓ Baggies] Foam Block Paper Other: ______			
Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		[✓ YES]	NO
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		[✓ YES]	NO
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	[✓ NA]	YES	NO
Were all VOC vials free of air bubbles?	[✓ NA]	YES	NO
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	[✓ NA]	______	

Was Sample Split by ARI: [✓ NA] YES Date/Time: ______ Equipment: ______ Split by: ______

Samples Logged by TS Date: 2-27-12 Time ~~50~~ TS 1701

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By ______ Date ______

Small Air Bubbles ~2mm ● ● ● ●	Peabubbles 2-4 mm ● ● ● ● ●	LARGE Air Bubbles > 4 mm ● ● ●	Small → "sm" Peabubbles → "pb" Large → "lg" Headspace → "hs"

Case Narrative, Data Qualifiers, Control Limits

ARI Job ID: UK00, UK01, UK02

ANALYTICAL
RESOURCES
INCORPORATED

Case Narrative

Landau Associates, Inc.
Cornwall Avenue
ARI Job:UK00, UK01 and UK02
March 21, 2012

Sample Receipt:

Please find enclosed the original chain of custody and a revised (COC) record, e-mail documentation and analytical results for the project referenced above. Analytical Resources, Inc. originally accepted several sediment samples in good condition between February 2, 2012 and February 27, 2012. The samples were received at cooler temperatures between 4.8 and 11.4°C. Please see the Cooler Receipt Form for further details.

Dioxin/Furans by Method 1613B:

The samples were extracted on 3/7/12. The extracts were analyzed between 3/14/12 and 3/15/12 - within the method recommended holding times.

Analysis was performed using the application specific RTX-Dioxin 2 column, which has a unique elution order and selectivity for the target compounds, as well as a unique isomer separation for the 2378-TCDF. A resolution test mixture was designed specifically for this column, consisting of 2348-TCDF, 2378-TCDF and 3467-TCDF to evaluate the method required minimum valley between isomer of 25%. Use of the RTX-Dioxin2 column eliminates the need for second column confirmation.

Initial and continuing calibration results were within method requirements.

The percent recoveries for all preparation and cleanup surrogates were within established QC limits.

The method blank contained reportable responses below the reporting limit for all compounds. "B" qualifiers were applied to associated results that were less than ten times the levels found in the method blank. No qualifiers were applied to sample results that were greater than ten times the levels found in the method blank.

The OPR (Ongoing Precision and Accuracy or LCS) sample percent recoveries were within control limits.

The TEQ was calculated with WHO2005 with both ND=0 for undetects (flagged "U") and ND= ½ EDL. The TEC includes EMPC values in the calculation.

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Case Narrative

Landau Associates, Inc.
Cornwall Avenue
ARI Job:UK00, UK01 and UK02
March 21, 2012

pH Analysis:

The samples were analyzed on 3/1/12 – The ph analysis for ARI associated job UK00 was analyzed outside of the method recommended holding time per the client request.

Initial calibration (s): All analytes were within method acceptance criteria.

Continuing calibration (s): All analytes of interest were within method acceptance criteria.

Sample Duplicates: Are in control.

Samples: There were no anomalies associated with this analysis.

LCS: The LCS is in control.

Sample ID Cross Reference Report

ANALYTICAL
RESOURCES
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ARI Job No: UK00
Client: Landau Associates, Inc.
Project Event: 001020.400.470
Project Name: Cornwall Avenue LF/Interim Action

	Sample ID	**ARI Lab ID**	**ARI LIMS ID**	**Matrix**	**Sample Date/Time**	**VTSR**
1.	CA-LF-IPA1-0201112A	UK00A	12-3457	Soil	02/01/12 13:10	02/02/12 09:55

Printed 02/29/12 Page 1 of 1

Sample ID Cross Reference Report

ARI Job No: UK01
Client: Landau Associates, Inc.
Project Event: 07020.400.480
Project Name: POB-Cornwall LF Interim

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	CA-LF-IPA1-021512B	UK01A	12-3474	Soil	02/15/12 08:30	02/15/12 15:14
2.	CA-LF-IPA1-021512C	UK01B	12-3475	Soil	02/15/12 08:45	02/15/12 15:14

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: UK02
Client: Landau Associates, Inc.
Project Event: 1020.400.480
Project Name: Port Of Bellingham

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	CA-LF-IPA2-022412D	UK02A	12-3476	Soil	02/24/12 15:35	02/27/12 13:15
2.	CA-LF-IPA2-022412E	UK02B	12-3477	Soil	02/24/12 15:45	02/27/12 13:15

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Data Reporting Qualifiers

Effective 2/14/2011

Inorganic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Duplicate RPD is not within established control limits
B	Reported value is less than the CRDL but ≥ the Reporting Limit
N	Matrix Spike recovery not within established control limits
NA	Not Applicable, analyte not spiked
H	The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
L	Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Flagged value is not within established control limits
B	Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J	Estimated concentration when the value is less than ARI's established reporting limits
D	The spiked compound was not detected due to sample extract dilution
E	Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

S	Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte
NA	The flagged analyte was not analyzed for
NR	Spiked compound recovery is not reported due to chromatographic interference
NS	The flagged analyte was not spiked into the sample
M	Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
M2	The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
Y	The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
EMPC	Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria" **(Dioxin/Furan analysis only)**
C	The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
P	The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference
X	Analyte signal includes interference from polychlorinated diphenyl ethers. **(Dioxin/Furan analysis only)**
Z	Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**

Geotechnical Data

A	The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
F	Samples were frozen prior to particle size determination
SM	Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
SS	Sample did not contain the proportion of “fines” required to perform the pipette portion of the grain size analysis
W	Weight of sample in some pipette aliquots was below the level required for accurate weighting

Analytical Resources,Incorporated
Analytical Chemists and Consultants

Spike Recovery Control Limits for Conventional Wet Chemistry

Effective 5/1/09

Control limits are updated periodically. Assure that you have ARI's current control limits by downloading the files at the time of use. http://www.arilabs.com/portal/downloads/ARI-CLs.zip

	ARI's Control Limits	
Sample Matrix:	Water	Soil / Sediment
Matrix Spike Recoveries	% Recovery	% Recovery
Ammonia	75 - 125	75 - 125
Bromide	75 125	75 - 125
Chloride	75 125	75 - 125
Cyanide	75 - 125	75 - 125
Ferrous Iron	75 - 125	75 - 125
Fluoride	75 - 125	75 - 125
Formaldehyde	75 - 125	75 - 125
Hexane Extractable Material	-- - --	78 - 114
Hexavalent Chromium	75 - 125	75 - 125
Nitrate/Nitrite	75 - 125	75 - 125
Oil and Grease	75 - 125	75 - 125
Phenol	75 - 125	75 - 125
Phosphorous	75 - 125	75 - 125
Sulfate	75 - 125	75 - 125
Sulfide	75 - 125	75 - 125
Total Kjeldahl Nitrogen	75 - 125	75 - 125
Total Organic Carbon	75 - 125	75 - 125
Duplicate RPDs		
Acidity	±20%	±20%
Alkalinity	±20%	±20%
BOD	±20%	±20%
Cation Exchange	±20%	±20%
COD	±20%	±20%
Conductivity	±20%	±20%
Salinity	±20%	±20%
Solids	±20%	±20%
Turbidity	±20%	±20%

Dioxin Analysis
Report and Summary QC Forms

ARI Job ID: UK00, UK01, UK02

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ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
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Sample ID: CA-LF-IPA1-0201112A

Lab Sample ID: UK00A
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: 02/01/12
Date Received: 02/02/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 16:40
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	EDL	RL	Result	
2,3,7,8-TCDF	0.75	0.65-0.89		0.998	1.51	
2,3,7,8-TCDD	0.50	0.65-0.89		0.998	0.269	JEMPC
1,2,3,7,8-PeCDF	1.29	1.32-1.78		2.00	0.828	JEMPC
2,3,4,7,8-PeCDF	1.71	1.32-1.78		0.998	1.08	
1,2,3,7,8-PeCDD	1.48	1.32-1.78		0.998	1.83	
1,2,3,4,7,8-HxCDF	1.24	1.05-1.43		2.00	3.32	
1,2,3,6,7,8-HxCDF	1.25	1.05-1.43		2.00	1.42	J
2,3,4,6,7,8-HxCDF	1.14	1.05-1.43		2.00	2.19	
1,2,3,7,8,9-HxCDF	1.01	1.05-1.43		2.00	1.23	JEMPC
1,2,3,4,7,8-HxCDD	1.29	1.05-1.43		2.00	3.24	
1,2,3,6,7,8-HxCDD	1.26	1.05-1.43		2.00	13.2	
1,2,3,7,8,9-HxCDD	1.31	1.05-1.43		2.00	7.23	
1,2,3,4,6,7,8-HpCDF	1.00	0.88-1.20		2.00	35.7	
1,2,3,4,7,8,9-HpCDF	0.83	0.88-1.20		2.00	2.12	EMPC
1,2,3,4,6,7,8-HpCDD	1.02	0.88-1.20		2.00	355	
OCDF	0.87	0.76-1.02		4.99	83.9	
OCDD	0.88	0.76-1.02		4.99	3,220	

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC
Total TCDF		0.998	6.31	8.53
Total TCDD		0.998	22.5	23.9
Total PeCDF		2.00	21.8	24.7
Total PeCDD		0.998	27.9	28.7
Total HxCDF		2.00	68.0	69.3
Total HxCDD		2.00	120	122
Total HpCDF		2.00	118	120
Total HpCDD		2.00	836	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC): 10.7

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC): 10.7

Reported in pg/g

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
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Sample ID: CA-LF-IPA1-0201112A

Lab Sample ID: UK00A
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized: MW
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: 02/01/12
Date Received: 02/02/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 16:40
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.77	0.65-0.89	85.7	24-169
13C-2,3,7,8-TCDD	0.78	0.65-0.89	83.0	25-164
13C-1,2,3,7,8-PeCDF	1.54	1.32-1.78	72.3	24-185
13C-2,3,4,7,8-PeCDF	1.54	1.32-1.78	70.6	21-178
13C-1,2,3,7,8-PeCDD	1.60	1.32-1.78	73.0	25-181
13C-1,2,3,4,7,8-HxCDF	0.52	0.43-0.59	84.5	26-152
13C-1,2,3,6,7,8-HxCDF	0.52	0.43-0.59	79.9	26-123
13C-2,3,4,6,7,8-HxCDF	0.53	0.43-0.59	83.0	28-136
13C-1,2,3,7,8,9-HxCDF	0.52	0.43-0.59	90.5	29-147
13C-1,2,3,4,7,8-HxCDD	1.25	1.05-1.43	86.3	32-141
13C-1,2,3,6,7,8-HxCDD	1.25	1.05-1.43	83.7	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.45	0.37-0.51	72.6	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.45	0.37-0.51	73.9	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.06	0.88-1.20	80.7	23-140
13C-OCDD	0.91	0.76-1.02	69.5	17-157
37Cl4-2,3,7,8-TCDD			86.4	35-197

Reported in Percent Recovery

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
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Sample ID: CA-LF-IPA1-021512B

Lab Sample ID: UK01A
LIMS ID: 12-3474
Matrix: Soil
Data Release Authorized: MW
Reported: 03/21/12

QC Report No: UK01-Landau Associates, Inc.
Project: POB-Cornwall LF Interim
07020.400.480
Date Sampled: 02/15/12
Date Received: 02/15/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 17:33
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	EDL	RL	Result	
2,3,7,8-TCDF	0.82	0.65-0.89		1.00	2.17	
2,3,7,8-TCDD	0.54	0.65-0.89		1.00	0.312	JEMPC
1,2,3,7,8-PeCDF	1.52	1.32-1.78		2.00	2.36	
2,3,4,7,8-PeCDF	1.68	1.32-1.78		1.00	2.24	
1,2,3,7,8-PeCDD	1.61	1.32-1.78		1.00	3.87	
1,2,3,4,7,8-HxCDF	1.18	1.05-1.43		2.00	6.31	
1,2,3,6,7,8-HxCDF	1.14	1.05-1.43		2.00	2.85	
2,3,4,6,7,8-HxCDF	1.23	1.05-1.43		2.00	4.40	
1,2,3,7,8,9-HxCDF	1.18	1.05-1.43		2.00	3.21	
1,2,3,4,7,8-HxCDD	1.21	1.05-1.43		2.00	5.72	
1,2,3,6,7,8-HxCDD	1.23	1.05-1.43		2.00	31.7	
1,2,3,7,8,9-HxCDD	1.22	1.05-1.43		2.00	15.3	
1,2,3,4,6,7,8-HpCDF	1.01	0.88-1.20		2.00	76.4	
1,2,3,4,7,8,9-HpCDF	1.05	0.88-1.20		2.00	3.68	
1,2,3,4,6,7,8-HpCDD	1.05	0.88-1.20		2.00	735	
OCDF	0.85	0.76-1.02		5.00	142	
OCDD	0.89	0.76-1.02		25.0	6,330	#

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC
Total TCDF		1.00	9.23	12.3
Total TCDD		1.00	22.8	23.7
Total PeCDF		2.00	58.8	60.2
Total PeCDD		1.00	34.6	36.1
Total HxCDF		2.00	173	
Total HxCDD		2.00	223	
Total HpCDF		2.00	256	258
Total HpCDD		2.00	1,660	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC): 22.2

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC): 22.2

#-Result from diluted secondary analysis.

Reported in pg/g

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
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Sample ID: CA-LF-IPA1-021512B

Lab Sample ID: UK01A
LIMS ID: 12-3474
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK01-Landau Associates, Inc.
Project: POB-Cornwall LF Interim
07020.400.480
Date Sampled: 02/15/12
Date Received: 02/15/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 17:33
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.78	0.65-0.89	81.6	24-169
13C-2,3,7,8-TCDD	0.77	0.65-0.89	84.2	25-164
13C-1,2,3,7,8-PeCDF	1.56	1.32-1.78	76.4	24-185
13C-2,3,4,7,8-PeCDF	1.56	1.32-1.78	77.1	21-178
13C-1,2,3,7,8-PeCDD	1.58	1.32-1.78	77.6	25-181
13C-1,2,3,4,7,8-HxCDF	0.51	0.43-0.59	78.5	26-152
13C-1,2,3,6,7,8-HxCDF	0.52	0.43-0.59	73.3	26-123
13C-2,3,4,6,7,8-HxCDF	0.52	0.43-0.59	78.0	28-136
13C-1,2,3,7,8,9-HxCDF	0.52	0.43-0.59	94.0	29-147
13C-1,2,3,4,7,8-HxCDD	1.26	1.05-1.43	83.6	32-141
13C-1,2,3,6,7,8-HxCDD	1.26	1.05-1.43	78.5	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.45	0.37-0.51	70.2	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.45	0.37-0.51	75.2	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.04	0.88-1.20	81.3	23-140
13C-OCDD	0.90	0.76-1.02	75.7	17-157
37Cl4-2,3,7,8-TCDD			89.6	35-197

Reported in Percent Recovery

ANALYTICAL
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ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
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Sample ID: CA-LF-IPA1-021512B
DILUTION

Lab Sample ID: UK01A
LIMS ID: 12-3474
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK01-Landau Associates, Inc.
Project: POB-Cornwall LF Interim
07020.400.480
Date Sampled: 02/15/12
Date Received: 02/15/12

Date Extracted: 03/07/12
Date Analyzed: 03/15/12 11:37
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 5.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-OCDD	0.88	0.76-1.02	98.8	17-157
37Cl4-2,3,7,8-TCDD			99.2	35-197

Reported in Percent Recovery

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
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Sample ID: CA-LF-IPA1-021512C

Lab Sample ID: UK01B
LIMS ID: 12-3475
Matrix: Soil
Data Release Authorized: MW
Reported: 03/21/12

QC Report No: UK01-Landau Associates, Inc.
Project: POB-Cornwall LF Interim
07020.400.480
Date Sampled: 02/15/12
Date Received: 02/15/12

Date Extracted: 03/07/12
Date Analyzed: 03/15/12 12:27
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 5.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	EDL	RL	Result	
2,3,7,8-TCDF	0.76	0.65-0.89		4.99	1.70	
2,3,7,8-TCDD	0.59	0.65-0.89		4.99	0.405	JEMPC
1,2,3,7,8-PeCDF	1.34	1.32-1.78		9.98	1.07	J
2,3,4,7,8-PeCDF	1.29	1.32-1.78		4.99	1.04	JEMPC
1,2,3,7,8-PeCDD	1.83	1.32-1.78		4.99	3.43	JEMPC
1,2,3,4,7,8-HxCDF	1.21	1.05-1.43		9.98	4.75	J
1,2,3,6,7,8-HxCDF	0.98	1.05-1.43		9.98	1.95	JEMPC
2,3,4,6,7,8-HxCDF	1.03	1.05-1.43		9.98	3.33	JEMPC
1,2,3,7,8,9-HxCDF	1.32	1.05-1.43		9.98	1.70	J
1,2,3,4,7,8-HxCDD	1.19	1.05-1.43		9.98	6.24	J
1,2,3,6,7,8-HxCDD	1.17	1.05-1.43		9.98	24.6	
1,2,3,7,8,9-HxCDD	1.22	1.05-1.43		9.98	15.6	
1,2,3,4,6,7,8-HpCDF	1.00	0.88-1.20		9.98	80.4	
1,2,3,4,7,8,9-HpCDF	1.21	0.88-1.20		9.98	3.63	JEMPC
1,2,3,4,6,7,8-HpCDD	1.02	0.88-1.20		9.98	695	
OCDF	0.88	0.76-1.02		25.0	230	
OCDD	0.88	0.76-1.02		25.0	6,550	

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC
Total TCDF		4.99	6.37	9.51
Total TCDD		4.99	24.9	28.3
Total PeCDF		9.98	30.4	36.6
Total PeCDD		4.99	38.8	45.5
Total HxCDF		9.98	114	121
Total HxCDD		9.98	258	261
Total HpCDF		9.98	260	265
Total HpCDD		9.98	1,810	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC): 20.0

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC): 20.0

Reported in pg/g

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: CA-LF-IPA1-021512C

Lab Sample ID: UK01B
LIMS ID: 12-3475
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK01-Landau Associates, Inc.
Project: POB-Cornwall LF Interim
07020.400.480
Date Sampled: 02/15/12
Date Received: 02/15/12

Date Extracted: 03/07/12
Date Analyzed: 03/15/12 12:27
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 5.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.76	0.65-0.89	91.6	24-169
13C-2,3,7,8-TCDD	0.79	0.65-0.89	96.3	25-164
13C-1,2,3,7,8-PeCDF	1.58	1.32-1.78	89.6	24-185
13C-2,3,4,7,8-PeCDF	1.54	1.32-1.78	89.8	21-178
13C-1,2,3,7,8-PeCDD	1.58	1.32-1.78	91.1	25-181
13C-1,2,3,4,7,8-HxCDF	0.52	0.43-0.59	92.3	26-152
13C-1,2,3,6,7,8-HxCDF	0.52	0.43-0.59	92.5	26-123
13C-2,3,4,6,7,8-HxCDF	0.52	0.43-0.59	94.4	28-136
13C-1,2,3,7,8,9-HxCDF	0.52	0.43-0.59	105	29-147
13C-1,2,3,4,7,8-HxCDD	1.29	1.05-1.43	99.2	32-141
13C-1,2,3,6,7,8-HxCDD	1.22	1.05-1.43	97.2	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.45	0.37-0.51	88.6	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.44	0.37-0.51	100	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.03	0.88-1.20	104	23-140
13C-OCDD	0.90	0.76-1.02	107	17-157
37Cl4-2,3,7,8-TCDD			100	35-197

Reported in Percent Recovery

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: CA-LF-IPA2-022412D

Lab Sample ID: UK02A
LIMS ID: 12-3476
Matrix: Soil
Data Release Authorized: MW
Reported: 03/21/12

QC Report No: UK02-Landau Associates, Inc.
Project: Port Of Bellingham
1020.400.480
Date Sampled: 02/24/12
Date Received: 02/27/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 19:20
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.2 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	EDL	RL	Result	
2,3,7,8-TCDF	0.81	0.65-0.89		0.984	1.53	
2,3,7,8-TCDD	0.50	0.65-0.89		0.984	0.248	JEMPC
1,2,3,7,8-PeCDF	1.61	1.32-1.78		1.97	0.813	J
2,3,4,7,8-PeCDF	1.91	1.32-1.78		0.984	0.900	JEMPC
1,2,3,7,8-PeCDD	1.68	1.32-1.78		0.984	2.42	
1,2,3,4,7,8-HxCDF	1.09	1.05-1.43		1.97	3.22	
1,2,3,6,7,8-HxCDF	1.18	1.05-1.43		1.97	1.72	J
2,3,4,6,7,8-HxCDF	1.55	1.05-1.43		1.97	1.06	JEMPC
1,2,3,7,8,9-HxCDF	1.16	1.05-1.43		1.97	1.37	J
1,2,3,4,7,8-HxCDD	1.35	1.05-1.43		1.97	4.17	
1,2,3,6,7,8-HxCDD	1.22	1.05-1.43		1.97	17.4	
1,2,3,7,8,9-HxCDD	1.27	1.05-1.43		1.97	9.94	
1,2,3,4,6,7,8-HpCDF	0.99	0.88-1.20		1.97	42.3	
1,2,3,4,7,8,9-HpCDF	1.03	0.88-1.20		1.97	2.38	
1,2,3,4,6,7,8-HpCDD	1.04	0.88-1.20		1.97	459	
OCDF	0.86	0.76-1.02		4.92	103	
OCDD	0.90	0.76-1.02		24.6	4,280	#

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC
Total TCDF		0.984	8.93	9.69
Total TCDD		0.984	23.6	25.0
Total PeCDF		1.97	24.7	27.8
Total PeCDD		0.984	31.6	33.5
Total HxCDF		1.97	77.1	79.1
Total HxCDD		1.97	166	168
Total HpCDF		1.97	139	140
Total HpCDD		1.97	1,190	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC): 13.4

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC): 13.4

#-Result from diluted secondary analysis.

Reported in pg/g

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: CA-LF-IPA2-022412D

Lab Sample ID: UK02A
LIMS ID: 12-3476
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK02-Landau Associates, Inc.
Project: Port Of Bellingham
1020.400.480
Date Sampled: 02/24/12
Date Received: 02/27/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 19:20
Instrument/Analyst: AS1/PK

Sample Amount: 10.2 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.77	0.65-0.89	85.4	24-169
13C-2,3,7,8-TCDD	0.77	0.65-0.89	85.4	25-164
13C-1,2,3,7,8-PeCDF	1.59	1.32-1.78	76.6	24-185
13C-2,3,4,7,8-PeCDF	1.58	1.32-1.78	75.4	21-178
13C-1,2,3,7,8-PeCDD	1.54	1.32-1.78	77.3	25-181
13C-1,2,3,4,7,8-HxCDF	0.51	0.43-0.59	85.1	26-152
13C-1,2,3,6,7,8-HxCDF	0.51	0.43-0.59	82.3	26-123
13C-2,3,4,6,7,8-HxCDF	0.52	0.43-0.59	82.4	28-136
13C-1,2,3,7,8,9-HxCDF	0.52	0.43-0.59	90.2	29-147
13C-1,2,3,4,7,8-HxCDD	1.26	1.05-1.43	87.1	32-141
13C-1,2,3,6,7,8-HxCDD	1.25	1.05-1.43	84.9	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.44	0.37-0.51	75.8	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.44	0.37-0.51	79.0	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.05	0.88-1.20	85.1	23-140
13C-OCDD	0.90	0.76-1.02	77.5	17-157
37Cl4-2,3,7,8-TCDD			88.8	35-197

Reported in Percent Recovery

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: CA-LF-IPA2-022412D
DILUTION

Lab Sample ID: UK02A
LIMS ID: 12-3476
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK02-Landau Associates, Inc.
Project: Port Of Bellingham
1020.400.480
Date Sampled: 02/24/12
Date Received: 02/27/12

Date Extracted: 03/07/12
Date Analyzed: 03/15/12 13:21
Instrument/Analyst: AS1/PK

Sample Amount: 10.2 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 5.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-OCDD	0.86	0.76-1.02	98.1	17-157
37Cl4-2,3,7,8-TCDD			95.2	35-197

Reported in Percent Recovery

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: CA-LF-IPA2-022412E

Lab Sample ID: UK02B
LIMS ID: 12-3477
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK02-Landau Associates, Inc.
Project: Port Of Bellingham
1020.400.480
Date Sampled: 02/24/12
Date Received: 02/27/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 20:13
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	EDL	RL	Result	
2,3,7,8-TCDF	0.82	0.65-0.89		0.997	1.16	
2,3,7,8-TCDD	0.51	0.65-0.89		0.997	0.201	JEMPC
1,2,3,7,8-PeCDF	1.51	1.32-1.78		1.99	0.634	J
2,3,4,7,8-PeCDF	1.24	1.32-1.78		0.997	0.670	JEMPC
1,2,3,7,8-PeCDD	1.60	1.32-1.78		0.997	1.67	
1,2,3,4,7,8-HxCDF	1.22	1.05-1.43		1.99	2.49	
1,2,3,6,7,8-HxCDF	1.03	1.05-1.43		1.99	1.27	JEMPC
2,3,4,6,7,8-HxCDF	1.07	1.05-1.43		1.99	1.06	J
1,2,3,7,8,9-HxCDF	1.34	1.05-1.43		1.99	0.921	J
1,2,3,4,7,8-HxCDD	1.33	1.05-1.43		1.99	2.84	
1,2,3,6,7,8-HxCDD	1.23	1.05-1.43		1.99	13.2	
1,2,3,7,8,9-HxCDD	1.31	1.05-1.43		1.99	7.02	
1,2,3,4,6,7,8-HpCDF	0.98	0.88-1.20		1.99	35.5	
1,2,3,4,7,8,9-HpCDF	0.90	0.88-1.20		1.99	2.05	
1,2,3,4,6,7,8-HpCDD	1.03	0.88-1.20		1.99	348	
OCDF	0.85	0.76-1.02		4.99	94.1	
OCDD	0.89	0.76-1.02		4.99	3,380	

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC
Total TCDF		0.997	4.23	6.29
Total TCDD		0.997	15.2	16.1
Total PeCDF		1.99	19.5	20.5
Total PeCDD		0.997	22.6	
Total HxCDF		1.99	60.8	63.2
Total HxCDD		1.99	114	118
Total HpCDF		1.99	120	
Total HpCDD		1.99	922	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC): 9.98

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC): 9.98

Reported in pg/g

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B

Page 1 of 1

Sample ID: CA-LF-IPA2-022412E

Lab Sample ID: UK02B
LIMS ID: 12-3477
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK02-Landau Associates, Inc.
Project: Port Of Bellingham
1020.400.480
Date Sampled: 02/24/12
Date Received: 02/27/12

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 20:13
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.78	0.65-0.89	89.6	24-169
13C-2,3,7,8-TCDD	0.77	0.65-0.89	81.3	25-164
13C-1,2,3,7,8-PeCDF	1.54	1.32-1.78	70.7	24-185
13C-2,3,4,7,8-PeCDF	1.56	1.32-1.78	68.9	21-178
13C-1,2,3,7,8-PeCDD	1.59	1.32-1.78	70.6	25-181
13C-1,2,3,4,7,8-HxCDF	0.51	0.43-0.59	79.9	26-152
13C-1,2,3,6,7,8-HxCDF	0.52	0.43-0.59	75.4	26-123
13C-2,3,4,6,7,8-HxCDF	0.52	0.43-0.59	78.5	28-136
13C-1,2,3,7,8,9-HxCDF	0.52	0.43-0.59	89.2	29-147
13C-1,2,3,4,7,8-HxCDD	1.26	1.05-1.43	83.0	32-141
13C-1,2,3,6,7,8-HxCDD	1.26	1.05-1.43	78.2	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.44	0.37-0.51	71.7	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.45	0.37-0.51	76.4	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.03	0.88-1.20	80.1	23-140
13C-OCDD	0.88	0.76-1.02	76.4	17-157
37Cl4-2,3,7,8-TCDD			87.4	35-197

Reported in Percent Recovery

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: OPR-030712

Lab Sample ID: OPR-030712
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: NA
Date Received: NA

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 15:47
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	RL	Result
2,3,7,8-TCDF	0.74	0.65-0.89	1.00	19.5
2,3,7,8-TCDD	0.78	0.65-0.89	1.00	19.6
1,2,3,7,8-PeCDF	1.51	1.32-1.78	2.00	99.0
2,3,4,7,8-PeCDF	1.49	1.32-1.78	1.00	96.5
1,2,3,7,8-PeCDD	1.55	1.32-1.78	1.00	100
1,2,3,4,7,8-HxCDF	1.19	1.05-1.43	2.00	98.3
1,2,3,6,7,8-HxCDF	1.19	1.05-1.43	2.00	96.1
2,3,4,6,7,8-HxCDF	1.21	1.05-1.43	2.00	97.8
1,2,3,7,8,9-HxCDF	1.23	1.05-1.43	2.00	100
1,2,3,4,7,8-HxCDD	1.25	1.05-1.43	2.00	101
1,2,3,6,7,8-HxCDD	1.25	1.05-1.43	2.00	98.2
1,2,3,7,8,9-HxCDD	1.23	1.05-1.43	2.00	99.6
1,2,3,4,6,7,8-HpCDF	1.02	0.88-1.20	2.00	116
1,2,3,4,7,8,9-HpCDF	1.02	0.88-1.20	2.00	98.4
1,2,3,4,6,7,8-HpCDD	1.10	0.88-1.20	2.00	99.5
OCDF	0.87	0.76-1.02	5.00	171
OCDD	0.87	0.76-1.02	5.00	203

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC
Total TCDF		1.00	21.1	21.5
Total TCDD		1.00	19.6	20.1
Total PeCDF		2.00	202	205
Total PeCDD		1.00	100	101
Total HxCDF		2.00	395	
Total HxCDD		2.00	299	
Total HpCDF		2.00	215	
Total HpCDD		2.00	99.5	100

Reported in pg/g

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: OPR-030712

Lab Sample ID: OPR-030712
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: NA
Date Received: NA

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 15:47
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.76	0.65-0.89	88.8	24-169
13C-2,3,7,8-TCDD	0.76	0.65-0.89	87.0	25-164
13C-1,2,3,7,8-PeCDF	1.55	1.32-1.78	74.4	24-185
13C-2,3,4,7,8-PeCDF	1.56	1.32-1.78	71.2	21-178
13C-1,2,3,7,8-PeCDD	1.58	1.32-1.78	76.0	25-181
13C-1,2,3,4,7,8-HxCDF	0.52	0.43-0.59	82.0	26-152
13C-1,2,3,6,7,8-HxCDF	0.54	0.43-0.59	86.0	26-123
13C-2,3,4,6,7,8-HxCDF	0.52	0.43-0.59	80.7	28-136
13C-1,2,3,7,8,9-HxCDF	0.52	0.43-0.59	74.0	29-147
13C-1,2,3,4,7,8-HxCDD	1.25	1.05-1.43	88.4	32-141
13C-1,2,3,6,7,8-HxCDD	1.26	1.05-1.43	90.2	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.44	0.37-0.51	71.6	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.43	0.37-0.51	71.0	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.06	0.88-1.20	82.9	23-140
13C-OCDD	0.89	0.76-1.02	69.8	17-157
37Cl4-2,3,7,8-TCDD			89.2	35-197

Reported in Percent Recovery

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: OPR-030712

Lab Sample ID: OPR-030712
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: NA
Date Received: NA

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 15:47
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	OPR	Spiked	Recovery	Limits
2,3,7,8-TCDF	19.5	20.0	97.5	30-160
2,3,7,8-TCDD	19.6	20.0	98.0	30-160
1,2,3,7,8-PeCDF	99.0	100	99.0	30-160
2,3,4,7,8-PeCDF	96.5	100	96.5	30-160
1,2,3,7,8-PeCDD	100	100	100	30-160
1,2,3,4,7,8-HxCDF	98.3	100	98.3	30-160
1,2,3,6,7,8-HxCDF	96.1	100	96.1	30-160
2,3,4,6,7,8-HxCDF	97.8	100	97.8	30-160
1,2,3,7,8,9-HxCDF	100	100	100	30-160
1,2,3,4,7,8-HxCDD	101	100	101	30-160
1,2,3,6,7,8-HxCDD	98.2	100	98.2	30-160
1,2,3,7,8,9-HxCDD	99.6	100	99.6	30-160
1,2,3,4,6,7,8-HpCDF	116	100	116	30-160
1,2,3,4,7,8,9-HpCDF	98.4	100	98.4	30-160
1,2,3,4,6,7,8-HpCDD	99.5	100	99.5	30-160
OCDF	171	200	85.5	30-160
OCDD	203	200	102	30-160

Reported in pg/g

4DF - FORM IV-HR CDD
CDD/CDF METHOD BLANK SUMMARY
HIGH RESOLUTION

Blank No.

UK00MB

Lab Name: ANALYTICAL RESOURCES, INC.

Contract: LANDAU

Lab Code: UK00

Project: CORNWALL AVE.

Matrix:(Soil/Water/Ash/Tissue/Oil) SOIL

Lab Sample ID: UK00MB

Sample wt/vol: 10 (g/ml) g

Lab File ID: 12031405

Water Sample Prep: (sep/spe)

Date Received: 02-FEB-12

GC Column: RTX-DIOXIN2 ID: 0.25 mm

Date Extracted: 07-MAR-12

Instrument ID: AUTOSPEC1

Date Analyzed: 14-MAR-12

Client Sample No.	Lab Sample ID	Lab File ID	Date Analyzed
UK00OPR	UK05OPR	12031406	03/14/12
CA-LF-IPA1-0201112A	UK00A	12031407	03/14/12
CA-LF-IPA1-0201512B	UK01A	12031408	03/14/12
CA-LF-IPA1-0201512C	UK01B	12031409	03/14/12
CA-LF-IPA2-0202412D	UK02A	12031410	03/14/12
CA-LF-IPA2-0202412E	UK02B	12031411	03/14/12
CA-LF-IPA1-0201512B	UK01A 5X	12031504	03/15/12
CA-LF-IPA1-0201512C	UK01B 5X	12031505	03/15/12
CA-LF-IPA2-0202412D	UK02A 5X	12031506	03/15/12

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: MB-030712

Lab Sample ID: MB-030712
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: NA
Date Received: NA

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 14:57
Instrument/Analyst: AS1/PK
Acid Cleanup: Yes
Silica-Carbon Cleanup: No

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00
Silica-Florisil Cleanup: Yes

Analyte	Ion Ratio	Ratio Limits	EDL	RL	Result	
2,3,7,8-TCDF		0.65-0.89	0.0102	1.00	< 0.0102	U
2,3,7,8-TCDD		0.65-0.89	0.0230	1.00	< 0.0230	U
1,2,3,7,8-PeCDF		1.32-1.78	0.0143	2.00	< 0.0143	U
2,3,4,7,8-PeCDF	1.91	1.32-1.78		1.00	0.0360	JEMPC
1,2,3,7,8-PeCDD		1.32-1.78	0.0219	1.00	< 0.0219	U
1,2,3,4,7,8-HxCDF		1.05-1.43	0.0217	2.00	< 0.0217	U
1,2,3,6,7,8-HxCDF		1.05-1.43	0.0196	2.00	< 0.0196	U
2,3,4,6,7,8-HxCDF		1.05-1.43	0.0227	2.00	< 0.0227	U
1,2,3,7,8,9-HxCDF		1.05-1.43	0.0364	2.00	< 0.0364	U
1,2,3,4,7,8-HxCDD		1.05-1.43	0.0288	2.00	< 0.0288	U
1,2,3,6,7,8-HxCDD		1.05-1.43	0.0300	2.00	< 0.0300	U
1,2,3,7,8,9-HxCDD		1.05-1.43	0.0318	2.00	< 0.0318	U
1,2,3,4,6,7,8-HpCDF	1.26	0.88-1.20		2.00	0.0680	JEMPC
1,2,3,4,7,8,9-HpCDF		0.88-1.20	0.0444	2.00	< 0.0444	U
1,2,3,4,6,7,8-HpCDD		0.88-1.20	0.0397	2.00	< 0.0397	U
OCDF		0.76-1.02	0.0810	5.00	< 0.0810	U
OCDD	0.83	0.76-1.02		5.00	0.334	J

Homologue Group	EDL	RL	W/O EMPC	WITH EMPC	
Total TCDF	0.0102	1.00	< 0.0102		U
Total TCDD	0.0230	1.00	< 0.0230		U
Total PeCDF		2.00	< 0.0143	0.0360	U
Total PeCDD	0.0219	1.00	< 0.0219		U
Total HxCDF	0.0364	2.00	< 0.0364		U
Total HxCDD	0.0318	2.00	< 0.0318		U
Total HpCDF		2.00	< 0.0444	0.0680	U
Total HpCDD	0.0397	2.00	< 0.0397		U

Reported in pg/g

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Dioxins/Furans by EPA 1613B
Page 1 of 1

Sample ID: MB-030712

Lab Sample ID: MB-030712
LIMS ID: 12-3457
Matrix: Soil
Data Release Authorized:
Reported: 03/21/12

QC Report No: UK00-Landau Associates, Inc.
Project: Cornwall Avenue LF/Interim Action
001020.400.470
Date Sampled: NA
Date Received: NA

Date Extracted: 03/07/12
Date Analyzed: 03/14/12 14:57
Instrument/Analyst: AS1/PK

Sample Amount: 10.0 g-dry-wt
Final Extract Volume: 20 uL
Dilution Factor: 1.00

Analyte	Ion Ratio	Ratio Limits	Result	Limits
13C-2,3,7,8-TCDF	0.78	0.65-0.89	88.6	24-169
13C-2,3,7,8-TCDD	0.76	0.65-0.89	86.6	25-164
13C-1,2,3,7,8-PeCDF	1.55	1.32-1.78	74.4	24-185
13C-2,3,4,7,8-PeCDF	1.56	1.32-1.78	68.8	21-178
13C-1,2,3,7,8-PeCDD	1.58	1.32-1.78	74.8	25-181
13C-1,2,3,4,7,8-HxCDF	0.52	0.43-0.59	84.4	26-152
13C-1,2,3,6,7,8-HxCDF	0.53	0.43-0.59	88.8	26-123
13C-2,3,4,6,7,8-HxCDF	0.52	0.43-0.59	83.0	28-136
13C-1,2,3,7,8,9-HxCDF	0.51	0.43-0.59	72.6	29-147
13C-1,2,3,4,7,8-HxCDD	1.27	1.05-1.43	92.0	32-141
13C-1,2,3,6,7,8-HxCDD	1.26	1.05-1.43	91.9	28-130
13C-1,2,3,4,6,7,8-HpCDF	0.44	0.37-0.51	71.8	28-143
13C-1,2,3,4,7,8,9-HpCDF	0.44	0.37-0.51	68.5	26-138
13C-1,2,3,4,6,7,8-HpCDD	1.04	0.88-1.20	83.2	23-140
13C-OCDD	0.90	0.76-1.02	67.3	17-157
37Cl4-2,3,7,8-TCDD			89.5	35-197

Reported in Percent Recovery

5DFA - FORM V-HR CDD-1
CDD/CDF WINDOW DEFINING MIX (WDM) SUMMARY
HIGH RESOLUTION

Standard No. CS3

Lab Name: ANALYTICAL RESOURCES, INC.

Contract: LANDAU

Lab Code: UK00

Project: CORNWALL AVE.

GC Column: RTX-DIOXIN2 ID: 0.25 mm

Lab File ID: 12031402

Instrument ID: AUTOSPEC1

Date Analyzed: 14-MAR-12

Time Analyzed: 1145

CDD/CDF	RT First Eluting	RT Last Eluting
TCDD	22.75	26.17
TCDF	21.51	26.42
PeCDD	27.89	30.99
PeCDF	26.24	31.36
HxCDD	33.04	35.72
HxCDF	32.25	36.18
HpCDD	38.74	39.89
HpCDF	38.23	40.71

5DFB - FORM V-HR CDD-2
CDD/CDF CHROMATOGRAPHIC RESOLUTION SUMMARY
HIGH RESOLUTION

Standard No.
TETRA ISC

Lab Name: ANALYTICAL RESOURCES, INC.
Lab Code: UK00
GC Column: RTX-DIOXIN2 ID: .25 mm
Instrument ID:
AUTOSPEC1

Contract: LANDAU
Project: CORNWALL AVE.
Lab File ID: 12031403
Date Analyzed: 14-MAR-12
Time Analyzed: 1237

Percent Valley determination for RTX-DIOXIN2 column -
For the column performance solution beginning 12-hour period:

1278-TCDD/2378-TCDD: 21.4

Quality Control (QC) Limits:

Percent Valley between the TCDD isomers must be less than or equal to 25%

Percent Valley determination for RTX-DIOXIN2 column -
For the column performance solution beginning 12-hour period:

3467-TCDF/2378-TCDF: 17.7

QC Limits:

Percent Valley between the TCDD/TCDF isomers must be less than or equal to 25%

5DFB - FORM V-HR CDD-3
CDD/CDF ANALTYICAL SEQUENCE SUMMARY
HIGH RESOLUTION

Lab Name: ANALYTICAL RESOURCES, INC.

Contract: LANDAU

Lab Code: UK00

Project: CORNWALL AVE.

GC Column: RTX-DIOXIN2 ID: 0.25 mm

Instrument ID: AUTOSPEC1

Init. Calib. Date(s): 15-FEB-11

Init: Calib. Times: 17:54 to 22:21

The Analytical Sequence of standards, samples, blanks, and Laboratory Control Samples (LCS) is as follows:

Client Sample No.	Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed
I6804	CS3	12031402	03/14/12	1145
1929-2	TETRA ISC	12031403	03/14/12	1237
UK00MB	UK00MB	12031405	03/14/12	1457
UK00OPR	UK00OPR	12031406	03/14/12	1547
CA-LF-IPA1-0201112A	UK00A	12031407	03/14/12	1640
CA-LF-IPA1-0201512B	UK01A	12031408	03/14/12	1733
CA-LF-IPA1-0201512C	UK01B	12031409	03/14/12	1827
CA-LF-IPA2-0202412D	UK02A	12031410	03/14/12	1920
CA-LF-IPA2-0202412E	UK02B	12031411	03/14/12	2013
I6804	CS3	12031412	03/14/12	2106

5DFB - FORM V-HR CDD-3
CDD/CDF ANALTYICAL SEQUENCE SUMMARY
HIGH RESOLUTION

Lab Name: ANALYTICAL RESOURCES, INC.

Contract: LANDAU

Lab Code: UK00

Project: CORNWALL AVE.

GC Column: RTX-DIOXIN2 ID: 0.25 mm

Instrument ID: AUTOSPEC1

Init. Calib. Date(s): 15-FEB-11

Init: Calib. Times: 17:54 to 22:21

The Analytical Sequence of standards, samples, blanks, and Laboratory Control Samples (LCS) is as follows:

Client Sample No.	Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed
I6804	CS3	12031502	03/15/12	0941
1929-2	TETRA ISC	12031503	03/15/12	1032
CA-LF-IPA1-0201512B	UK01A 5X	12031504	03/15/12	1137
CA-LF-IPA1-0201512C	UK01B 5X	12031505	03/15/12	1227
CA-LF-IPA2-0202412D	UK02A 5X	12031506	03/15/12	1321
I6804	CS3	12031509	03/15/12	1600

USEPA
6DFA - Form VI-HR CDD-1
CDD/CDF INITIAL CALIBRATION RESPONSE FACTOR SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1		
Init.Calib.Date CSL:	15-Feb-12	Init.Calib.Time CSL:	17:54:44
Init.Calib.Date CS1:	15-Feb-12	Init.Calib.Time CS1:	18:48:03
Init.Calib.Date CS2:	15-Feb-12	Init.Calib.Time CS2:	19:41:15
Init.Calib.Date CS3:	15-Feb-12	Init.Calib.Time CS3:	20:34:33
Init.Calib.Date CS4:	15-Feb-12	Init.Calib.Time CS4:	21:27:45
Init.Calib.Date CS5:	15-Feb-12	Init.Calib.Time CS5:	22:21:04

Target Analytes	RRF						Mean RRF	% RSD	QC Limits
	CSL	CS1	CS2	CS3	CS4	CS5			
2378-TCDD	1.15	0.98	1.00	1.02	1.02	1.02	1.03	5.8	20.0
2378-TCDF	0.84	0.84	0.84	0.83	0.88	0.89	0.85	2 8	20.0
12378-PeCDF	0.96	0.87	0.89	0.90	0.91	0.95	0 91	3.9	20.0
12378-PeCDD	1.04	0.97	0.95	0.96	0.97	1.00	0.98	3.3	20.0
23478-PeCDF	0.88	0.94	0.92	0.93	0.95	0.96	0.93	3.1	20.0
123478-HxCDF	1.05	1.07	1.09	1.10	1.12	1.13	1.09	2.6	20.0
123678-HxCDF	1.06	1.05	1.06	1.08	1.07	1.10	1.07	1.8	20.0
123478-HxCDD	0.99	0.96	0.94	0.98	0.97	0.97	0.97	1.7	20 0
123678-HxCDD	0.88	0.93	0.90	0.90	0.95	0.93	0.91	2.7	20.0
123789-HxCDD[2]	0.86	0.86	0.86	0.89	0.89	0.89	0.88	1.9	20 0
234678-HxCDF	1.04	1.08	1.07	1.08	1.08	1.11	1.08	2.2	20.0
123789-HxCDF	0.95	1.00	1.00	1.00	1.04	1.04	1.01	3.4	20.0
1234678-HpCDF	1.28	1.17	1.22	1.26	1.24	1.28	1.24	3.2	20.0
1234678-HpCDD	1.02	0.99	1.00	0.99	1.00	1.02	1.00	1.5	20.0
1234789-HpCDF	1.19	1.20	1.22	1.26	1.27	1.27	1.24	2.9	20.0
OCDD	0.95	0.97	0.96	0.99	0.99	1.01	0.98	2.1	20.0
OCDF[1]	1.02	1.10	1.08	1.13	1.18	1.23	1.12	6.8	20.0

(1) The RRF is calculated based on the labeled analog of OCDD.
(2) The relative response factor (RRF) is calculated based on the labeled analogs of the other two HxCDDs.

Labeled Compounds	RRF						Mean RRF	% RSD	QC Limits
	CSL	CS1	CS2	CS3	CS4	CS5			
13C-2378-TCDD	0.95	0.94	0.91	0.91	0.93	1.06	0 95	5.9	20.0
13C-12378-PeCDD	0.69	0.71	0.68	0.68	0.73	0.86	0.72	9.5	20.0
13C-123478-HxCDD	1.03	1.02	1.04	1.00	1.02	1.04	1.03	1.4	20.0
13C-123678-HxCDD	1.11	1.10	1.13	1 10	1 08	1.08	1.10	1.8	20 0
13C-1234678-HpCDD	0.75	0.75	0.77	0.76	0.78	0.77	0.76	1.6	20.0
13C-OCDD	0.56	0.56	0.59	0.61	0.65	0.68	0.61	8.1	20.0
13C-2378-TCDF	1.48	1.42	1.39	1.40	1.42	1.57	1.45	4.8	20.0
13C-12378-PeCDF	1.13	1.14	1.11	1.11	1.17	1.37	1.17	8.4	20.0
13C-23478-PeCDF	1.06	1.07	1.04	1.03	1.10	1.31	1.10	9.6	20.0
13C-123478-HxCDF	1.28	1.26	1.31	1.27	1.27	1.22	1.27	2.1	20.0
13C-123678-HxCDF	1.45	1.40	1.47	1.42	1.42	1.34	1.42	3.2	20.0
13C-234678-HxCDF	1.26	1.26	1.29	1.27	1.28	1.24	1.27	1.4	20.0
13C-123789-HxCDF	0.99	1.01	1.02	1.05	1.02	1.06	1.03	2.4	20.0
13C-1234678-HpCDF	0.98	1.01	1.01	0.98	1.02	0.98	1.00	1.9	20.0
13C-1234789-HpCDF	0.65	0.67	0.68	0.68	0.70	0.72	0.68	3.6	20.0

USEPA
6DFB - Form VI-HR CDD-2
CDD/CDF INITIAL CALIBRATION ION ABUNDANCE RATIO SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm)	25
Instrument ID:	AUTOSPEC1		
Init.Calib.Date CSL:	15-Feb-12	Init.Calib.Time CSL	17:54:44
Init.Calib.Date CS1:	15-Feb-12	Init.Calib.Time CS1	18:48:03
Init.Calib.Date CS2:	15-Feb-12	Init.Calib.Time CS2:	19:41:15
Init.Calib.Date CS3:	15-Feb-12	Init.Calib.Time CS3	20:34:33
Init.Calib.Date CS4:	15-Feb-12	Init.Calib.Time CS4	21:27:45
Init.Calib.Date CS5:	15-Feb-12	Init.Calib.Time CS5	22:21:04

Target Analytes	Selected Ions	Ion Abundance Ratio						Ratio Flag	Ratio QC Limits#
		CSL	CS1	CS2	CS3	CS4	CS5		
2378-TCDD	320/322	0.77	0.72	0.79	0.75	0.79	0.77		0.65 - 0.89
2378-TCDF	304/306	0.77	0.72	0.78	0.74	0.74	0.76		0.65 - 0.89
12378-PeCDF	340/342	1.67	1.53	1.53	1.52	1.52	1.53		1.32 - 1.78
12378-PeCDD	356/358	1.59	1.44	1.58	1.54	1.52	1.55		1.32 - 1.78
23478-PeCDF	340/342	1.59	1.58	1.52	1.50	1.53	1.52		1.32 - 1.78
123478-HxCDF	374/376	1.20	1.26	1.23	1.20	1.21	1.24		1.05 - 1.43
123678-HxCDF	374/376	1.19	1.19	1.21	1.19	1.18	1.21		1.05 - 1.43
123478-HxCDD	390/392	1.39	1.23	1.23	1.23	1.25	1.24		1.05 - 1.43
123678-HxCDD	390/392	1.22	1.15	1.27	1.22	1.27	1.24		1.05 - 1.43
123789-HxCDD	390/392	1.16	1.19	1.26	1.24	1.25	1.23		1.05 - 1.43
234678-HxCDF	374/376	1.13	1.19	1.22	1.19	1.22	1.22		1.05 - 1.43
123789-HxCDF	374/376	1.25	1.26	1.24	1.18	1.22	1.22		1.05 - 1.43
1234678-HpCDF	408/410	1.09	0.97	0.99	0.99	1.00	1.01		0.89 - 1.21
1234678-HpCDD	424/426	1.01	1.01	1.01	1.03	1.05	1.05		0.89 - 1.21
1234789-HpCDF	408/410	0.89	0.95	0.99	1.01	0.98	1.01		0.89 - 1.21
OCDD	458/460	0.84	0.86	0.91	0.88	0.86	0.89		0.76 - 1.02
OCDF	442/444	0.88	0.85	0.88	0.89	0.88	0.89		0.76 - 1.02

Labeled Compounds	Selected Ions	Ion Abundance Ratio						Ratio Flag	Ratio QC Limits
		CSL	CS1	CS2	CS3	CS4	CS5		
13C-2378-TCDD	332/334	0.76	0.77	0.78	0.77	0.78	0.78		0.65 - 0.89
13C-12378-PeCDD	368/370	1.57	1.59	1.62	1.56	1.57	1.57		1.32 - 1.78
13C-123478-HxCDD	402/404	1.26	1.25	1.25	1.26	1.26	1.26		1.05 - 1.43
13C-123678-HxCDD	402/404	1.25	1.21	1.27	1.22	1.24	1.24		1.05 - 1.43
13C-1234678-HpCDD	436/438	1.06	1.03	1.03	1.05	1.07	1.04		0.89 - 1.21
13C-OCDD	470/472	0.88	0.88	0.89	0.91	0.90	0.88		0.76 - 1.02
13C-2378-TCDF	316/318	0.78	0.80	0.76	0.76	0.77	0.77		0.65 - 0.89
13C-12378-PeCDF	352/354	1.57	1.57	1.56	1.55	1.56	1.56		1.32 - 1.78
13C-23478-PeCDF	352/354	1.57	1.56	1.52	1.57	1.56	1.55		1.32 - 1.78
13C-123478-HxCDF	384/386	0.52	0.52	0.52	0.52	0.52	0.52		0.43 - 0.59
13C-123678-HxCDF	384/386	0.51	0.51	0.52	0.52	0.53	0.52		0.43 - 0.59
13C-234678-HxCDF	384/386	0.52	0.52	0.52	0.52	0.52	0.53		0.43 - 0.59
13C-123789-HxCDF	384/386	0.54	0.53	0.52	0.51	0.52	0.52		0.43 - 0.59
13C-1234678-HpCDF	418/420	0.45	0.45	0.45	0.45	0.46	0.45		0.37 - 0.51
13C-1234789-HpCDF	418/420	0.46	0.46	0.46	0.46	0.46	0.45		0.37 - 0.51

Internal Standards	Selected Ions	Ion Abundance Ratio						Ratio Flag	Ion Ratio QC Limits
		CSL	CS1	CS2	CS3	CS4	CS5		
13C-1234-TCDD	332/334	0.79	0.78	0.79	0.78	0.79	0.79		0.65 - 0.89
13C-123789-HxCDD	402/404	1.20	1.25	1.24	1.23	1.24	1.24		1.05 - 1.43

(#) Quality Control (QC) limits represent ±15% window around the theoretical ion abundance ratio. The laboratory must flag any analyte in any calibration solution which does not meet the ion abundance ratio QC limit by placing an asterisk in the flag column

USEPA
7DFA - Form VII-HR CDD-1
CDD/CDF CONTINUING CALIBRATION SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031402
Date Analysed	14-Mar-12	Time Analysed	11:45:50
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
2378-TCDD	320/322	1.00	1.03	-3.2		0.83		0.65 - 0.89
2378-TCDF	304/306	0.84	0.85	-1.8		0.74		0.65 - 0.89
12378-PeCDF	340/342	0.86	0.91	-5.3		1.48		1.32 - 1.78
12378-PeCDD	356/358	0.95	0.98	-3.2		1.55		1.32 - 1.78
23478-PeCDF	340/342	0.91	0.93	-1.7		1.50		1.32 - 1.78
123478-HxCDF	374/376	1.08	1.09	-0.6		1.19		1.05 - 1.43
123678-HxCDF	374/376	1.07	1.07	-0.5		1.20		1.05 - 1.43
123478-HxCDD	390/392	0.95	0.97	-1.4		1.22		1.05 - 1.43
123678-HxCDD	390/392	0.87	0.91	-4.8		1.23		1.05 - 1.43
123789-HxCDD	390/392	0.87	0.88	-1.1		1.24		1.05 - 1.43
234678-HxCDF	374/376	1.02	1.08	-5.1		1.18		1.05 - 1.43
123789-HxCDF	374/376	1.01	1.01	0.0		1.20		1.05 - 1.43
1234678-HpCDF	408/410	1.21	1.24	-2.8		1.01		0.89 - 1.21
1234678-HpCDD	424/426	1.00	1.00	-0.6		1.05		0.89 - 1.21
1234789-HpCDF	408/410	1.21	1.24	-2.2		0.99		0.89 - 1.21
OCDD	458/460	0.97	0.98	-1.0		0.89		0.76 - 1.02
OCDF	442/444	1.05	1.12	-6.5		0.88		0.76 - 1.02

Labeled Compounds	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
13C-2378-TCDD	332/334	0.94	0.95	-1.2		0.75		0.65 - 0.89
13C-12378-PeCDD	368/370	0.64	0.72	-12.2		1.59		1.32 - 1.78
13C-123478-HxCDD	402/404	1.03	1.03	0.0		1.26		1.05 - 1.43
13C-123678-HxCDD	402/404	1.13	1.10	2.7		1.25		1.05 - 1.43
13C-1234678-HpCDD	436/438	0.76	0.76	-0.8		1.03		0.89 - 1.21
13C-OCDD	470/472	0.56	0.61	-7.3		0.90		0.76 - 1.02
13C-2378-TCDF	316/318	1.43	1.45	-1.1		0.75		0.65 - 0.89
13C-12378-PeCDF	352/354	1.00	1.17	-15.2		1.55		1.32 - 1.78
13C-23478-PeCDF	352/354	0.92	1.10	-16.4		1.54		1.32 - 1.78
13C-123478-HxCDF	384/386	1.21	1.27	-4.3		0.51		0.43 - 0.59
13C-123678-HxCDF	384/386	1.35	1.42	-4.9		0.51		0.43 - 0.59
13C-234678-HxCDF	384/386	1.22	1.27	-3.7		0.53		0.43 - 0.59
13C-123789-HxCDF	384/386	0.96	1.03	-6.7		0.52		0.43 - 0.59
13C-1234678-HpCDF	418/420	0.93	1.00	-7.0		0.45		0.37 - 0.51
13C-1234789-HpCDF	418/420	0.64	0.68	-6.8		0.45		0.37 - 0.51

Clean-up	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits

Internal Standards	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ion Ratio Flag#	Ion Ratio QC Limits
13C-1234-TCDD	332/334	NA	NA	NA	NA	0.78		0.65 - 0.89
13C-123789-HxCDD	402/404	NA	NA	NA	NA	1.24		1.05 - 1.43

(#) The laboratory must flag any analyte which does not meet the criteria for Percentage Difference (%D) or ion abundance ratio by placing an asterisk in the appropriate

USEPA
7DFB - Form VII-HR CDD-2
CDD/CDF CONTINUING CALIBRATION RETENTION TIME SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031402
Date Analysed	14-Mar-12	Time Analysed	11:45:50
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	RRT#	RT
2378-TCDD	1.00	25.57
2378-TCDF	1.00	24.94
12378-PeCDF	1.00	29.00
12378-PeCDD	1.00	30.58
23478-PeCDF	1.00	30.34
123478-HxCDF	1.00	33.95
123678-HxCDF	1.00	34.10
123478-HxCDD	1.00	35.16
123678-HxCDD	1.00	35.30
123789-HxCDD	1.01	35.72
234678-HxCDF	1.00	35.06
123789-HxCDF	1.00	36.18
1234678-HpCDF	1.00	38.23
1234678-HpCDD	1.00	39.89
1234789-HpCDF	1.00	40.71
OCDD	1.00	45.25
OCDF	1.01	45.51

Labeled Compounds	RRT#	RT
13C-2378-TCDD	1.03	25.54
13C-12378-PeCDD	1.23	30.56
13C-123478-HxCDD	0.98	35.15
13C-123678-HxCDD	0.99	35.27
13C-1234678-HpCDD	1.12	39.88
13C-OCDD	1.27	45.23
13C-2378-TCDF	1.01	24.93
13C-12378-PeCDF	1.17	28.98
13C-23478-PeCDF	1.22	30.32
13C-123478-HxCDF	0.95	33.94
13C-123678-HxCDF	0.95	34.08
13C-234678-HxCDF	0.98	35.03
13C-123789-HxCDF	1.01	36.16
13C-1234678-HpCDF	1.07	38.21
13C-1234789-HpCDF	1.14	40.69

Clean up Standard	RRT#	RT

Internal Standards	RRT#	RT
13C-1234-TCDD	0.00	24.76
13C-123789-HxCDD	0.00	35.70

(#) RRT = (RT of Analyte)/(RT of appropriate labeled compound).

USEPA
7DFA - Form VII-HR CDD-1
CDD/CDF CONTINUING CALIBRATION SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031412
Date Analysed	14-Mar-12	Time Analysed	21:06:48
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
2378-TCDD	320/322	1.00	1.03	-3.5		0.81		0.65 - 0.89
2378-TCDF	304/306	0.83	0.85	-2.6		0.75		0.65 - 0.89
12378-PeCDF	340/342	0.87	0.91	-5.0		1.50		1.32 - 1.78
12378-PeCDD	356/358	0.96	0.98	-2.4		1.60		1.32 - 1.78
23478-PeCDF	340/342	0.91	0.93	-2.7		1.47		1.32 - 1.78
123478-HxCDF	374/376	1.07	1.09	-1.9		1.17		1.05 - 1.43
123678-HxCDF	374/376	1.04	1.07	-2.8		1.18		1.05 - 1.43
123478-HxCDD	390/392	0.96	0.97	-0.4		1.23		1.05 - 1.43
123678-HxCDD	390/392	0.88	0.91	-4.3		1.22		1.05 - 1.43
123789-HxCDD	390/392	0.86	0.88	-2.0		1.23		1.05 - 1.43
234678-HxCDF	374/376	1.04	1.08	-3.1		1.17		1.05 - 1.43
123789-HxCDF	374/376	0.98	1.01	-2.5		1.18		1.05 - 1.43
1234678-HpCDF	408/410	1.20	1.24	-3.3		0.99		0.89 - 1.21
1234678-HpCDD	424/426	0.98	1.00	-2.8		1.03		0.89 - 1.21
1234789-HpCDF	408/410	1.18	1.24	-4.6		0.99		0.89 - 1.21
OCDD	458/460	0.95	0.98	-2.8		0.84		0.76 - 1.02
OCDF	442/444	1.07	1.12	-4.6		0.85		0.76 - 1.02

Labeled Compounds	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
13C-2378-TCDD	332/334	0.95	0.95	-0.4		0.76		0.65 - 0.89
13C-12378-PeCDD	368/370	0.64	0.72	-11.7		1.56		1.32 - 1.78
13C-123478-HxCDD	402/404	1.01	1.03	-1.4		1.29		1.05 - 1.43
13C-123678-HxCDD	402/404	1.14	1.10	3.9		1.25		1.05 - 1.43
13C-1234678-HpCDD	436/438	0.76	0.76	0.0		1.02		0.89 - 1.21
13C-OCDD	470/472	0.58	0.61	-4.0		0.89		0.76 - 1.02
13C-2378-TCDF	316/318	1.46	1.45	0.6		0.78		0.65 - 0.89
13C-12378-PeCDF	352/354	1.01	1.17	-14.0		1.55		1.32 - 1.78
13C-23478-PeCDF	352/354	0.94	1.10	-14.7		1.56		1.32 - 1.78
13C-123478-HxCDF	384/386	1.20	1.27	-5.2		0.52		0.43 - 0.59
13C-123678-HxCDF	384/386	1.40	1.42	-1.2		0.52		0.43 - 0.59
13C-234678-HxCDF	384/386	1.22	1.27	-4.1		0.52		0.43 - 0.59
13C-123789-HxCDF	384/386	0.98	1.03	-4.4		0.53		0.43 - 0.59
13C-1234678-HpCDF	418/420	0.93	1.00	-6.7		0.44		0.37 - 0.51
13C-1234789-HpCDF	418/420	0.66	0.68	-4.0		0.45		0.37 - 0.51

Clean-up	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits

Internal Standards	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ion Ratio Flag#	Ion Ratio QC Limits
13C-1234-TCDD	332/334	NA	NA	NA	NA	0.78		0.65 - 0.89
13C-123789-HxCDD	402/404	NA	NA	NA	NA	1.24		1.05 - 1.43

(#) The laboratory must flag any analyte which does not meet the criteria for Percentage Difference (%D) or ion abundance ratio by placing an asterisk in the appropriate

USEPA
7DFB - Form VII-HR CDD-2
CDD/CDF CONTINUING CALIBRATION RETENTION TIME SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031412
Date Analysed	14-Mar-12	Time Analysed	21:06:48
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	RRT#	RT
2378-TCDD	1.00	25.56
2378-TCDF	1.00	24.94
12378-PeCDF	1.00	29.01
12378-PeCDD	1.00	30.58
23478-PeCDF	1.00	30.34
123478-HxCDF	1.00	33.95
123678-HxCDF	1.00	34.10
123478-HxCDD	1.00	35.17
123678-HxCDD	1.00	35.30
123789-HxCDD	1.01	35.72
234678-HxCDF	1.00	35.04
123789-HxCDF	1.00	36.19
1234678-HpCDF	1.00	38.23
1234678-HpCDD	1.00	39.89
1234789-HpCDF	1.00	40.71
OCDD	1.00	45.24
OCDF	1.01	45.50

Labeled Compounds	RRT#	RT
13C-2378-TCDD	1.03	25.54
13C-12378-PeCDD	1.23	30.56
13C-123478-HxCDD	0.98	35.14
13C-123678-HxCDD	0.99	35.28
13C-1234678-HpCDD	1.12	39.88
13C-OCDD	1.27	45.22
13C-2378-TCDF	1.01	24.93
13C-12378-PeCDF	1.17	28.98
13C-23478-PeCDF	1.23	30.32
13C-123478-HxCDF	0.95	33.94
13C-123678-HxCDF	0.95	34.08
13C-234678-HxCDF	0.98	35.03
13C-123789-HxCDF	1.01	36.16
13C-1234678-HpCDF	1.07	38.21
13C-1234789-HpCDF	1.14	40.70

Clean up Standard	RRT#	RT

Internal Standards	RRT#	RT
13C-1234-TCDD	0.00	24.75
13C-123789-HxCDD	0.00	35.70

(#) RRT = (RT of Analyte)/(RT of appropriate labeled compound).

USEPA
7DFA - Form VII-HR CDD-1
CDD/CDF CONTINUING CALIBRATION SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031502
Date Analysed	15-Mar-12	Time Analysed	09:41:53
Init.Calib.Date:	15-FEB-12	Init Calib.Time:	

Target Analytes	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
2378-TCDD	320/322	1.00	1.03	-3.4		0.80		0.65 - 0.89
2378-TCDF	304/306	0.80	0.85	-6.1		0.74		0.65 - 0.89
12378-PeCDF	340/342	0.90	0.91	-1.5		1.51		1 32 - 1.78
12378-PeCDD	356/358	0.95	0.98	-3.0		1.54		1.32 - 1.78
23478-PeCDF	340/342	0.89	0.93	-3.9		1.48		1.32 - 1.78
123478-HxCDF	374/376	1.06	1.09	-3.1		1.20		1.05 - 1.43
123678-HxCDF	374/376	1.02	1.07	-4.8		1.16		1.05 - 1 43
123478-HxCDD	390/392	0.95	0.97	-1.5		1.24		1.05 - 1.43
123678-HxCDD	390/392	0.87	0.91	-4.6		1.22		1.05 - 1.43
123789-HxCDD	390/392	0.86	0.88	-2.3		1.25		1.05 - 1.43
234678-HxCDF	374/376	1.03	1.08	-4.6		1.19		1.05 - 1.43
123789-HxCDF	374/376	0.95	1.01	-5.4		1.24		1.05 - 1.43
1234678-HpCDF	408/410	1.19	1.24	-4.5		1.01		0.89 - 1.21
1234678-HpCDD	424/426	0.97	1.00	-3.5		1.02		0.89 - 1.21
1234789-HpCDF	408/410	1.17	1.24	-5.1		1.01		0.89 - 1.21
OCDD	458/460	0.98	0.98	-0.2		0.87		0.76 - 1.02
OCDF	442/444	1.06	1.12	-5.9		0.88		0.76 - 1.02

Labeled Compounds	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
13C-2378-TCDD	332/334	0.94	0.95	-1.5		0.79		0.65 - 0.89
13C-12378-PeCDD	368/370	0.63	0.72	-12.7		1.54		1.32 - 1.78
13C-123478-HxCDD	402/404	1.02	1.03	-0.9		1.25		1.05 - 1.43
13C-123678-HxCDD	402/404	1.13	1.10	3.0		1.22		1.05 - 1.43
13C-1234678-HpCDD	436/438	0.75	0.76	-2.2		1.04		0.89 - 1 21
13C-OCDD	470/472	0.59	0.61	-2.5		0.87		0.76 - 1.02
13C-2378-TCDF	316/318	1.43	1.45	-1.2		0.75		0.65 - 0.89
13C-12378-PeCDF	352/354	0.96	1.17	-18.4		1.56		1.32 - 1.78
13C-23478-PeCDF	352/354	0.93	1.10	-15.4		1.53		1.32 - 1.78
13C-123478-HxCDF	384/386	1.23	1.27	-3.0		0.52		0.43 - 0.59
13C-123678-HxCDF	384/386	1.39	1.42	-2.1		0.51		0.43 - 0.59
13C-234678-HxCDF	384/386	1.21	1.27	-5.0		0.52		0.43 - 0.59
13C-123789-HxCDF	384/386	0.98	1.03	-4.8		0.51		0.43 - 0.59
13C-1234678-HpCDF	418/420	0.88	1.00	-12.2		0.44		0.37 - 0.51
13C-1234789-HpCDF	418/420	0.64	0.68	-5 7		0.45		0.37 - 0.51

Clean-up	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits

Internal Standards	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ion Ratio Flag#	Ion Ratio QC Limits
13C-1234-TCDD	332/334	NA	NA	NA	NA	0.79		0.65 - 0.89
13C-123789-HxCDD	402/404	NA	NA	NA	NA	1.27		1.05 - 1.43

(#) The laboratory must flag any analyte which does not meet the criteria for Percentage Difference (%D) or ion abundance ratio by placing an asterisk in the appropriate

USEPA
7DFB - Form VII-HR CDD-2
CDD/CDF CONTINUING CALIBRATION RETENTION TIME SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031502
Date Analysed	15-Mar-12	Time Analysed	09:41:53
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	**RRT#**	**RT**
2378-TCDD	1.00	25.59
2378-TCDF	1.00	24.97
12378-PeCDF	1.00	29.03
12378-PeCDD	1.00	30.61
23478-PeCDF	1.00	30.36
123478-HxCDF	1.00	33.97
123678-HxCDF	1.00	34.12
123478-HxCDD	1.00	35.19
123678-HxCDD	1.00	35.31
123789-HxCDD	1.01	35.75
234678-HxCDF	1.00	35.07
123789-HxCDF	1.00	36.20
1234678-HpCDF	1.00	38.25
1234678-HpCDD	1.00	39.91
1234789-HpCDF	1.00	40.73
OCDD	1.00	45.27
OCDF	1.01	45.53

Labeled Compounds	**RRT#**	**RT**
13C-2378-TCDD	1.03	25.57
13C-12378-PeCDD	1.23	30.58
13C-123478-HxCDD	0.98	35.17
13C-123678-HxCDD	0.99	35.30
13C-1234678-HpCDD	1.12	39.90
13C-OCDD	1.27	45.25
13C-2378-TCDF	1.01	24.94
13C-12378-PeCDF	1.17	29.01
13C-23478-PeCDF	1.22	30.34
13C-123478-HxCDF	0.95	33.96
13C-123678-HxCDF	0.95	34.10
13C-234678-HxCDF	0.98	35.06
13C-123789-HxCDF	1.01	36.18
13C-1234678-HpCDF	1.07	38.23
13C-1234789-HpCDF	1.14	40.71

Clean up Standard	**RRT#**	**RT**

Internal Standards	**RRT#**	**RT**
13C-1234-TCDD	0.00	24.78
13C-123789-HxCDD	0.00	35.72

(#) RRT = (RT of Analyte)/(RT of appropriate labeled compound)

USEPA
7DFA - Form VII-HR CDD-1
CDD/CDF CONTINUING CALIBRATION SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031509
Date Analysed	15-Mar-12	Time Analysed	16:00:57
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
2378-TCDD	320/322	1.04	1.03	0.6		0.75		0.65 - 0.89
2378-TCDF	304/306	0.83	0.85	-3.2		0.72		0.65 - 0.89
12378-PeCDF	340/342	0.87	0.91	-4.8		1.53		1.32 - 1.78
12378-PeCDD	356/358	0.95	0.98	-3.0		1.54		1.32 - 1.78
23478-PeCDF	340/342	0.90	0.93	-3.2		1.50		1.32 - 1.78
123478-HxCDF	374/376	1.06	1.09	-2.6		1.22		1.05 - 1.43
123678-HxCDF	374/376	1.03	1.07	-3.4		1.19		1.05 - 1.43
123478-HxCDD	390/392	0.93	0.97	-4.0		1.25		1.05 - 1.43
123678-HxCDD	390/392	0.92	0.91	0.9		1.22		1.05 - 1.43
123789-HxCDD	390/392	0.86	0.88	-1.4		1.23		1.05 - 1.43
234678-HxCDF	374/376	1.05	1.08	-2.5		1.20		1.05 - 1.43
123789-HxCDF	374/376	0.98	1.01	-2.3		1.23		1.05 - 1.43
1234678-HpCDF	408/410	1.22	1.24	-2.1		1.01		0.89 - 1.21
1234678-HpCDD	424/426	0.98	1.00	-1.9		1.03		0.89 - 1.21
1234789-HpCDF	408/410	1.19	1.24	-3.3		0.97		0.89 - 1.21
OCDD	458/460	0.99	0.98	0.9		0.88		0.76 - 1.02
OCDF	442/444	1.08	1.12	-4.0		0.88		0.76 - 1.02

Labeled Compounds	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits
13C-2378-TCDD	332/334	0.93	0.95	-2.4		0.77		0.65 - 0.89
13C-12378-PeCDD	368/370	0.66	0.72	-9.1		1.54		1.32 - 1.78
13C-123478-HxCDD	402/404	1.01	1.03	-2.0		1.26		1.05 - 1.43
13C-123678-HxCDD	402/404	1.10	1.10	-0.4		1.24		1.05 - 1.43
13C-1234678-HpCDD	436/438	0.77	0.76	1.1		1.06		0.89 - 1.21
13C-OCDD	470/472	0.62	0.61	2.9		0.87		0.76 - 1.02
13C-2378-TCDF	316/318	1.47	1.45	1.2		0.77		0.65 - 0.89
13C-12378-PeCDF	352/354	1.03	1.17	-12.0		1.59		1.32 - 1.78
13C-23478-PeCDF	352/354	0.98	1.10	-11.4		1.59		1.32 - 1.78
13C-123478-HxCDF	384/386	1.16	1.27	-8.2		0.51		0.43 - 0.59
13C-123678-HxCDF	384/386	1.32	1.42	-7.0		0.55		0.43 - 0.59
13C-234678-HxCDF	384/386	1.18	1.27	-6.8		0.51		0.43 - 0.59
13C-123789-HxCDF	384/386	0.97	1.03	-5.3		0.52		0.43 - 0.59
13C-1234678-HpCDF	418/420	0.90	1.00	-9.3		0.44		0.37 - 0.51
13C-1234789-HpCDF	418/420	0.67	0.68	-2.1		0.45		0.37 - 0.51

Clean-up	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ratio Flag#	Ratio QC Limits

Internal Standards	Selected Ions	RRF	Mean RRF	%D	%D Flag#	Ion Ratio	Ion Ratio Flag#	Ion Ratio QC Limits
13C-1234-TCDD	332/334	NA	NA	NA	NA	0.79		0.65 - 0.89
13C-123789-HxCDD	402/404	NA	NA	NA	NA	1.22		1.05 - 1.43

(#) The laboratory must flag any analyte which does not meet the criteria for Percentage Difference (%D) or ion abundance ratio by placing an asterisk in the appropriate

USEPA
7DFB - Form VII-HR CDD-2
CDD/CDF CONTINUING CALIBRATION RETENTION TIME SUMMARY
HIGH RESOLUTION

Lab Name:	ARI	Contract:	LANDAU
Lab Code:	UK00	Case No.:	CORNWALL AVE.
TO No.:		SDG No.:	
GC Column:	RTX-DIOXIN2	ID (mm):	.25
Instrument ID:	AUTOSPEC1	Lab File ID:	12031509
Date Analysed	15-Mar-12	Time Analysed	16:00:57
Init.Calib.Date:	15-FEB-12	Init.Calib.Time:	

Target Analytes	**RRT#**	**RT**
2378-TCDD	1.00	25.57
2378-TCDF	1.00	24.94
12378-PeCDF	1.00	29.01
12378-PeCDD	1.00	30.58
23478-PeCDF	1.00	30.34
123478-HxCDF	1.00	33.96
123678-HxCDF	1.00	34.10
123478-HxCDD	1.00	35.18
123678-HxCDD	1.00	35.30
123789-HxCDD	1.01	35.72
234678-HxCDF	1.00	35.06
123789-HxCDF	1.00	36.18
1234678-HpCDF	1.00	38.23
1234678-HpCDD	1.00	39.90
1234789-HpCDF	1.00	40.72
OCDD	1.00	45.26
OCDF	1.01	45.52

Labeled Compounds	**RRT#**	**RT**
13C-2378-TCDD	1.03	25.54
13C-12378-PeCDD	1.23	30.56
13C-123478-HxCDD	0.98	35.15
13C-123678-HxCDD	0.99	35.29
13C-1234678-HpCDD	1.12	39.88
13C-OCDD	1.27	45.24
13C-2378-TCDF	1.01	24.93
13C-12378-PeCDF	1.17	28.99
13C-23478-PeCDF	1.22	30.32
13C-123478-HxCDF	0.95	33.94
13C-123678-HxCDF	0.95	34.09
13C-234678-HxCDF	0.98	35.03
13C-123789-HxCDF	1.01	36.17
13C-1234678-HpCDF	1.07	38.22
13C-1234789-HpCDF	1.14	40.70

Clean up Standard	**RRT#**	**RT**

Internal Standards	**RRT#**	**RT**
13C-1234-TCDD	0.00	24.76
13C-123789-HxCDD	0.00	35.71

(#) RRT = (RT of Analyte)/(RT of appropriate labeled compound).

General Chemistry Analysis
Report and Summary QC Forms

ARI Job ID: UK00, UK01, UK02

SAMPLE RESULTS-CONVENTIONALS
UK00-Landau Associates, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized
Reported: 03/02/12

Project: Cornwall Avenue LF/Interim A
Event: 001020.400.470
Date Sampled: 02/01/12
Date Received: 02/02/12

Client ID: CA-LF-IPA1-0201112A
ARI ID: 12-3457 UK00A

Analyte	Date	Method	Units	RL	Sample
pH	03/01/12 030112#1	SW9045	std units	0.01	11.98

RL	Analytical reporting limit
U	Undetected at reported detection limit

Results reported on a fresh weight basis
pH determined on 1:1 soil:D.I. water extracts.

LAB CONTROL RESULTS-CONVENTIONALS
UK00-Landau Associates, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 03/02/12

Project: Cornwall Avenue LF/Interim A
Event: 001020.400.470
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
pH SW9045	ICVL	03/01/12	std units	6.96	7.00	0.04

pH is evaluated as the Absolute Difference between the values rather than Percent Recovery.

REPLICATE RESULTS-CONVENTIONALS
UK00-Landau Associates, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 03/02/12

Project: Cornwall Avenue LF/Interim A
Event: 001020.400.470
Date Sampled: 02/01/12
Date Received: 02/02/12

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: UK00A Client ID: CA-LF-IPA1-0201112A					
pH	03/01/12	std units	11.98	12.04	0.06

pH is evaluated as the Absolute Difference between the values rather than Relative Percent Difference

INORGANICS ANALYSIS DATA SHEET
pH by Method SW9045

Data Release Authorized:
Reported: 03/02/12
Date Received: 02/15/12
Page 1 of 1

QC Report No: UK01-Landau Associates, Inc.
Project: POB-Cornwall LF Interim
07020.400.480

Client/ ARI ID	**Date Sampled**	**Matrix**	**Analysis Date**	**RL**	**Result**
CA-LF-IPA1-021512B UK01A 12-3474	02/15/12	Soil	03/01/12	0.01	11.54
CA-LF-IPA1-021512C UK01B 12-3475	02/15/12	Soil	03/01/12	0.01	12.17

Reported in std units

RL-Analytical reporting limit
U-Undetected at reported detection limit

LAB CONTROL RESULTS-CONVENTIONALS
UK01-Landau Associates, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 03/02/12

Project: POB-Cornwall LF Interim
Event: 07020.400.480
Date Sampled: NA
Date Received: NA

Analyte	Date	Units	LCS	Spike Added	Recovery
pH	03/01/12	std units	6.96	7.00	0.04

pH is evaluated as the Absolute Difference between the values rather than Percent Recovery.

REPLICATE RESULTS-CONVENTIONALS
UK01-Landau Associates, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 03/02/12

Project: POB-Cornwall LF Interim
Event: 07020.400.480
Date Sampled: 02/15/12
Date Received: 02/15/12

Analyte	**Date**	**Units**	**Sample**	**Replicate(s)**	**RPD/RSD**
ARI ID: UK01A Client ID: CA-LF-IPA1-021512B					
pH	03/01/12	std units	11.54	11.57	0.03

pH is evaluated as the Absolute Difference between the values rather than Relative Percent Difference

INORGANICS ANALYSIS DATA SHEET
pH by Method SW9045

ANALYTICAL RESOURCES INCORPORATED

Data Release Authorized:
Reported: 03/02/12
Date Received: 02/27/12
Page 1 of 1

QC Report No: UK02-Landau Associates, Inc.
Project: Port Of Bellingham
1020.400.480

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	RL	Result
CA-LF-IPA2-022412D UK02A 12-3476	02/24/12	Soil	03/01/12	0.01	12.18
CA-LF-IPA2-022412E UK02B 12-3477	02/24/12	Soil	03/01/12	0.01	11.85

Reported in std units

RL-Analytical reporting limit
U-Undetected at reported detection limit

LAB CONTROL RESULTS-CONVENTIONALS
UK02-Landau Associates, Inc.

Matrix: Soil
Data Release Authorized:
Reported: 03/02/12

Project: Port Of Bellingham
Event: 1020.400.480
Date Sampled: NA
Date Received: NA

Analyte	Date	Units	LCS	Spike Added	Recovery
pH	03/01/12	std units	6.96	7.00	0.04

pH is evaluated as the Absolute Difference between the values rather than Percent Recovery.

REPLICATE RESULTS-CONVENTIONALS
UK02-Landau Associates, Inc.

Matrix: Soil
Data Release Authorized:
Reported: 03/02/12

Project: Port Of Bellingham
Event: 1020.400.480
Date Sampled: 02/24/12
Date Received: 02/27/12

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: UK02A Client ID: CA-LF-IPA2-022412D					
pH	03/01/12	std units	12.18	12.14	0.04

pH is evaluated as the Absolute Difference between the values rather than Relative Percent Difference

Total Solids

ARI Job ID: UK00, UK01, UK02

Extractions Total Solids-extts
Data By: Yen Luu
Created: 2/29/12

Worklist: 9909
Analyst: RVR
Comments:

Oven ID:________________

Balance ID:____________________

Samples In: Date:________ Time:________ Temp:________ Analyst:________

Samples Out: Date:________ Time:________ Temp:________ Analyst:________

	ARI ID CLIENT ID	Tare Wt (g)	Wet Wt (g)	Dry Wt (g)	% Solids	pH
1.	UK00A 12-3457 CA-LF-IPA1-0201112A	1.13	12.26	7.59	58.0	NR

Extractions Total Solids-extts
Data By: Yen Luu
Created: 2/29/12

Worklist: 9909
Analyst: YL
Comments:

Oven ID: 015

Balance ID: B1392980 02

Samples In: Date: 2/29/12 Time: 20:00 Temp: 104° Analyst: YL

Samples Out: Date: 03/01/12 Time: 08:15 Temp: 98° Analyst: RR

ARI ID CLIENT ID	Tare Wt (g)	Wet Wt (g)	Dry Wt (g)	% Solids	pH
1. UK00A 12-3457 CA-LF-IPA1-0201112A	1.13	12.26	7.59		NR

Total Solids Targets-Extractions
Data By: Steve Potter
Created: 3/ 1/12

Worklist: 9966
Analyst: SDP
Comments:

	ARI ID	Target Dry Wt (g)	Total Solids	Min Wet Wt (g)
1.	UK00A	10.00	58.0	17.24

Extractions Total Solids-extts
Data By: Yen Luu
Created: 2/29/12

Worklist: 9910
Analyst: RVR
Comments:

Oven ID:________________

Balance ID:____________________

Samples In: Date:________ Time:________ Temp:________ Analyst:________

Samples Out: Date:________ Time:________ Temp:________ Analyst:________

	ARI ID CLIENT ID	Tare Wt (g)	Wet Wt (g)	Dry Wt (g)	% Solids	pH
1.	UK01A 12-3474 CA-LF-IPA1-021512B	1.14	12.68	7.83	58.0	NR
2.	UK01B 12-3475 CA-LF-IPA1-021512C	1.15	12.34	7.84	59.8	NR

Extractions Total Solids-extts
Data By: Yen Luu
Created: 2/29/12

Worklist: 9910
Analyst: YL
Comments:

Oven ID: 015

Balance ID: B139298002

Samples In: Date: 2/29/12 Time: 20:00 Temp: 104 Analyst: YL

Samples Out: Date: 03/01/12 Time: 08:15 Temp: 98° Analyst: RR

ARI ID CLIENT ID	Tare Wt (g)	Wet Wt (g)	Dry Wt (g)	% Solids	pH
1. UK01A 12-3474 CA-LF-IPA1-021512B	1.14	12.68	RR 03/01/12 ~~7.26~~ 7.83		NR
2. UK01B 12-3475 CA-LF-IPA1-021512C	1.15	12.34	7.84		NR

Total Solids Targets-Extractions
Data By: Steve Potter
Created: 3/ 1/12

Worklist: 9967
Analyst: SDP
Comments:

	ARI ID	Target Dry Wt (g)	Total Solids	Min Wet Wt (g)
1.	UK01A	10.00	58.0	17.24
2.	UK01B	10.00	59.8	16.72

Extractions Total Solids-extts
Data By: Yen Luu
Created: 2/29/12

Worklist: 9911
Analyst: RVR
Comments:

Oven ID:

Balance ID:

Samples In: Date: Time: Temp: Analyst:

Samples Out: Date: Time: Temp: Analyst:

	ARI ID CLIENT ID	Tare Wt (g)	Wet Wt (g)	Dry Wt (g)	% Solids	pH
1.	UK02A 12-3476 CA-LF-IPA2-022412D	1.14	12.23	7.48	57.2	NR
2.	UK02B 12-3477 CA-LF-IPA2-022412E	1.15	12.47	7.73	58.1	NR

Extractions Total Solids-extts
Data By: Yen Luu
Created: 2/29/12

Worklist: 9911
Analyst: YL
Comments:

Oven ID: 015

Balance ID: B139298002

Samples In: Date: 2/29/12 Time: 20:00 Temp: 104 Analyst: YL

Samples Out: Date: 03/01/12 Time: 08:15 Temp: 98° Analyst: RR

ARI ID CLIENT ID	Tare Wt (g)	Wet Wt (g)	Dry Wt (g)	% Solids	pH
1. UK02A 12-3476 CA-LF-IPA2-022412D	1.14	12.23	7.48		NR
2. UK02B 12-3477 CA-LF-IPA2-022412E	1.15	12.47	7.73		NR

Total Solids Targets-Extractions
Data By: Steve Potter
Created: 3/ 1/12

Worklist: 9968
Analyst: SDP
Comments:

	ARI ID	Target Dry Wt (g)	Total Solids	Min Wet Wt (g)
1.	UK02A	10.00	57.2	17.48
2.	UK02B	10.00	58.1	17.21

Analytical Resources, Incorporated
Analytical Chemists and Consultants

June 8, 2007

Shannon Khounnala
Landau Associates, Inc.
130 2^{nd} Avenue S.
Edmonds, WA 98020

RECEIVED
JUN 03 2010
LANDAU ASSOCIATES, INC.

RE: Project: Gate 3- POB 053097
ARI Job No: KQ93 (8290 Data)

Data Package amended to Level IV on June 2, 2010

Dear Shannon:

Please find enclosed the original chain of custody documentation and the analytical results for the samples from the project referenced above. Analytical Resources, Inc. (ARI) accepted forty five sediment samples on March 7, and March 8, 2007. There were no discrepancies between the sample containers' labels and the COCs. Thirty seven samples have been placed on hold pending further instructions and immediately frozen to protect the holding times.

The samples were analyzed for PSDDA VOCs, PSDDA PCBs, TBT, PSDDA Pesticides, SIM PNAs, PSDDA SVOA, TOC, TVS, TS, Ammonia, sulfide, Grainsize and Total Metals, as requested on the COC.

On May 16, 2007 at the request of Landau Associates select samples were removed from hold and subcontracted to Frontier Analytical Laboratory for EPA Method 8290. The samples were previously frozen to protect the holding time for the 8290 analysis.

Please reference the Frontier Analytical Laboratory data package for details.

An electronic copy of these reports and the supporting data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Project Manager
kellyb@arilabs.com
206/695-6211

Enclosures
cc: files KQ93

Analytical Resources, Incorporated
Analytical Chemists and Consultants

June 8, 2007

Shannon Khounnala
Landau Associates, Inc.
130 2nd Avenue S.
Edmonds, WA 98020

RE: Project: Gate 3- POB 053097
ARI Job No: KQ93 (8290 Data)

Dear Shannon:

Please find enclosed the original chain of custody documentation and the analytical results for the samples from the project referenced above. Analytical Resources, Inc. (ARI) accepted forty five sediment samples on March 7, and March 8, 2007. There were no discrepancies between the sample containers' labels and the COCs. Thirty seven samples have been placed on hold pending further instructions and immediately frozen to protect the holding times.

The samples were analyzed for PSDDA VOCs, PSDDA PCBs, TBT, PSDDA Pesticides, SIM PNAs, PSDDA SVOA, TOC, TVS, TS, Ammonia, sulfide, Grainsize and Total Metals, as requested on the COC.

On May 16, 2007 at the request of Landau Associates select samples were removed from hold and subcontracted to Frontier Analytical Laboratory for EPA Method 8290. The samples were previously frozen to protect the holding time for the 8290 analysis.

Please reference the Frontier Analytical Laboratory data package for details.

An electronic copy of these reports and the supporting data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem

Kelly Bottem
Project Manager
kellyb@arilabs.com
206/695-6211

Enclosures

cc: files KQ93

LANDAU ASSOCIATES

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Tigard)** (503) 443-6010
☐

Date 3/9/07
Page 1 of 1

Chain-of-Custody Record

Project Name Gate 3 - POB
Project No. 053097
Project Location/Event POB
Sampler's Name SM + NBM
Project Contact Shannon Khounnala
Send Results To " "

Turnaround Time
☒ Standard
☐ Accelerated
☐

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	PCDD/PCDFs	Organics	VOCs	Grainsize/Particlesize	Metals/Hg	TOC/TVS/TS/NH3	Sulfide	TBT Pore H2O	Archive	BIOASSAY (Archive)		
Gate 3-CMP1	3/9/07	1450	sed	8	X	X		X	X	X		X		X		
Gate 3-S1-Z	↓	1430	↓	1									X			
Gate 3-S2-Z		1435	↓	1									X			
Gate 3-S3-Z		1440	↓	1									X			
Gate 3-S4-Z		1445	↓	1									X			
Gate 3-S1-A		1455	↓	1									X			
Gate 3-S2-A		1500	↓	1									X			
Gate 3-S3-A		1505	↓	1									X			
Gate 3-S4-A		1510	↓	1									X			
~~Gate 3-CMP1 B~~		~~0~~	↓										~~X~~	~~X~~		
Gate 3-Core 1	↓	0945	↓	2			X				X					
		~~[illegible]~~	~~[illegible]~~													

Observations/Comments

___ Allow water samples to settle, collect aliquot from clear portion

NWTPH-Dx:
___ run acid wash/silica gel cleanup
___ run samples standardized to ___ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freese upon receipt

___ Dissolved metal water samples field filtered

Other * Hold Bioassay analysis until further notice (archive)

* Hold PCDD (DIOXIN) & archive until further notice

Special Shipment/Handling or Storage Requirements

Method of Shipment Processed at ARI

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature Nicole Aragon	Signature	Signature
Printed Name SACHA MAXWELL	Printed Name ARI	Printed Name	Printed Name
Company LANDAU ASSOCIATES	Company	Company	Company
Date 3/9/07 Time 1530	Date 3/8/07 Time 1530	Date Time	Date Time

WHITE COPY - Project File YELLOW COPY - Laboratory PINK COPY - Client Representative

Rev 4/01

LANDAU ASSOCIATES

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Tigard)** (503) 443-6010
☐ ____________

Chain-of-Custody Record

Date 3/8/07
Page 1 of 1

Project Name Gate 3 - POB
Project No. 053-097
Project Location/Event POB
Sampler's Name SM + NBM
Project Contact SEK
Send Results To SEK Shannon Whounela

Turnaround Time
☐ Standard
☐ Accelerated
☐ ____________

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	PCDD/PCDF	Organics	VOCs	Grainsize/Particles	Metals/Hg	TOC/TVS/TS/NH3	Sulfide	TBT Pore H2O	Archive	Bioassay (archive)		
Gate 3-CMP-Z	3/8/07	1940	Sed.	8	X	X		X	X	X		X	X	X		
Gate 3-S5-Z	↓	1900	↓	1									X			
Gate3-S6-Z		1905		1									X			
Gate3-S7-Z		1910		1									X			
Gate3-S8-Z		1915		1									X			
Gate3-S5-A		1920		1									X			
Gate 3-S6-A		1925		1									X			
Gate3-S7-A		1930		1									X			
Gate3-S8-A		1935		1									X			
Gate 3-core 5		1620		2			X				X					

Observations/Comments

____ Allow water samples to settle, collect aliquot from clear portion

NWTPH-Dx:
___ run acid wash/silica gel cleanup
___ run samples standardized to
______________ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freese upon receipt

___ Dissolved metal water samples field filtered

Other * Archive Bioassay until further notice.

* Archive PCDD (DIOXIN) until further notice.

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name SACHA MAXWELL	Printed Name	Printed Name	Printed Name
Company LANDAU ASSOCIATES	Company	Company	Company
Date 3/8/07 Time 1845	Date ______ Time ______	Date ______ Time ______	Date ______ Time ______

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 4/01

18

LANDAU ASSOCIATES

☒ Seattle (Edmonds) (425) 778-0907
☐ Tacoma (253) 926-2493
☐ Spokane (509) 327-9737
☐ Portland (Tigard) (503) 443-6010
☐ ______

Date 3/9/07
Page 1 of 1

Chain-of-Custody Record

Project Name POB
Project No. 053-097
Project Location/Event Gate 3
Sampler's Name SM + NBM
Project Contact SEK
Send Results To Shannon Khounala

Turnaround Time
☒ Standard
☐ Accelerated
☐ ______

Sample I.D.	Date	Time	Matrix	No. of Containers	PCDD/PCDFs	Organics	VOCs	Grainsize/Pestcide	Metals/Hg	TOC/TS/TVS/NH3	Sulfide	TBT Pore H2O	Archive	Bio Assay (Archive)		
Gate 3 - core 9	3/9/07	0835	Sed.	2			X				X					
Gate3 - CMP 3	3/9/07	1010		8	X	X		X	X	X		X		X		
Gate3 - ~~Core~~ S 9A		1035		1									X			
Gate 3 - ~~Core~~ S 10A		1040		1									X			
Gate 3 - ~~Core~~ S 11A		1045		1									X			
Gate 3 - ~~Core~~ S 12A		1050		1									X			
Gate 3 - ~~Core~~ S 10Z		1015		1									X			
Gate 3 - ~~Core~~ S 11Z		1020		1									X			
Gate3 - ~~Core~~ S 12Z		1025		1									X			
Gate3 - ~~Core~~ S 9Z		1030		1									X			

Observations/Comments

___ Allow water samples to settle, collect aliquot from clear portion

NWTPH-Dx:
___ run acid wash/silica gel cleanup
___ run samples standardized to ______ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freese upon receipt

___ Dissolved metal water samples field filtered

Other * Hold (Archive) PCDD (Dioxin) Until further notice

* Hold (Archive) Bio Assay until further notice!

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name SACHA MAXWELL	Printed Name Nicole Aragon	Printed Name	Printed Name
Company LANDAU ASSOCIATES	Company ARI	Company	Company
Date 3/9/07 Time 1100	Date 3/9/07 Time 1100	Date ____ Time ____	Date ____ Time ____

WHITE COPY - Project File YELLOW COPY - Laboratory PINK COPY - Client Representative

Rev 4/01

LANDAU ASSOCIATES

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Tigard)** (503) 443-6010
☐ ____________

Date 3/9/07
Page 1 of 1

Chain-of-Custody Record

Project Name POB
Project No. 053-097
Project Location/Event Gate 3
Sampler's Name SM + NBM
Project Contact SEK
Send Results To Shannon Whitehead

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____________

Sample I.D.	Date	Time	Matrix	No. of Containers	PCDD/PCDF	Organics	VOCs	Grainsize/pevdate	Metals/Hg	TOC/TVS/TS/NH3	Sulfide	TBT pore H2O	Archive	BioAssay		
Gate3 - core13	3/9/07	1200	Sed.	2			X				X					
Gate3 - CMP4		1330		8	X	X		X	X	X		X		X		
Gate3 - S13-A		1400		1									X			
Gate3 - S14-A		1405		1									X			
Gate3 - S15-A		1410		1									X			
Gate3 - S13-A		1340		1									X			
Gate3 - S14-Z		1345		1									X			
Gate3 - S15-Z		1350		1									X			
Gate3 - S16-Z		1355		1									X			
Gate3 - S16-A		1415		1									X			

Observations/Comments

___ Allow water samples to settle, collect aliquot from clear portion

NWTPH-Dx:
___ run acid wash/silica gel cleanup
___ run samples standardized to ____________ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freese upon receipt

___ Dissolved metal water samples field filtered

Other * Hold (archive) PCDD (Dioxins) until further notice.

* Hold (archive) BioAssay until further notice.

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature Nicole Aragon	Signature	Signature
Printed Name SACHA MAXWELL	Printed Name Nicole Aragon	Printed Name	Printed Name
Company LANDAU ASSOCIATES	Company ARI	Company	Company
Date 3/9/07 Time 1445	Date 3/9/07 Time 1445	Date ______ Time ______	Date ______ Time ______

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative** Rev 4/01

LANDAU ASSOCIATES

☑ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Tigard)** (503) 443-6010
☐

Chain-of-Custody Record

AmB

Date 3/9/07
Page 1 of 1

Project Name Gate 3
Project No. 053-097
Project Location/Event POB
Sampler's Name SM + NOM
Project Contact SEK
Send Results To Shannon Whandle

Turnaround Time
☑ Standard
☐ Accelerated
☐

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	PCDD/PCDFs	~~Organics~~	~~VOCs~~	~~Grainsize/Pre-Arch~~	~~Metals/TBT~~	~~TOC/[illegible]~~	~~Sulfide~~	~~TBT pore H2O~~	Archive	~~Bioassay~~		
~~Gate3 CMP Hab~~	~~3/9/07~~	~~1615~~	~~sed.~~	~~8~~	~~X~~	~~X~~		~~X~~	~~X~~	~~X~~		~~X~~		~~X~~		
~~Gate3 core17~~		~~1515~~		~~2~~			~~X~~				~~X~~					
Gate3 - S17	|	1530	|	|									X			
Gate3 - S18	|	1535	|	|									X			
Gate3 - S19	|	1540	|	|									X			
Gate3 - S20	↓	1545	↓	|									X			
Gate3-CMPHab	3/9/07	1615		1	X											

Observations/Comments

___ Allow water samples to settle, collect aliquot from clear portion

NWTPH-Dx:
___ run acid wash/silica gel cleanup
___ run samples standardized to
_____________ product

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
___ non-preserved
___ preserved w/methanol
___ preserved w/sodium bisulfate
___ Freese upon receipt

___ Dissolved metal water samples field filtered

Other * Hold (archive) Dioxin until further notice
~~* Hold (archive) bioassay until further notice~~

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature Bob Congleton	Signature	Signature
Printed Name SACHA MAXWELL	Printed Name Bob Congleton	Printed Name	Printed Name
Company LANDAU ASSOCIATES	Company ARI	Company	Company
Date 3/9/07 Time 1630	Date 3/9/07 Time 1630	Date ______ Time ______	Date ______ Time ______

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 4/01

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Landau
Project Name: Gate 3 POB
COC No: —
Delivered by: Hand
Assigned ARI Job No: KQ93
Tracking No:

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES [✓ NO]
Were custody papers included with the cooler?	[✓ YES] NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES] NO
Record cooler temperature (recommended 2.0-6.0 °C for chemistry	AMB °C

Cooler Accepted by: NA Date: 3/8/07 Time: 1530

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?	YES [✓ NO]
What kind of packing material was used?	—
Was sufficient ice used (if appropriate)?	YES [✓ NO] *
Were all bottles sealed in individual plastic bags?	[✓ YES] NO
Did all bottle arrive in good condition (unbroken)?	[✓ YES] NO
Were all bottle labels complete and legible?	[✓ YES] NO
Did all bottle labels and tags agree with custody papers?	[✓ YES] NO
Were all bottles used correct for the requested analyses?	[✓ YES] NO
Do any of the analyses (bottles) require preservation? (attach preservation checklist)	YES [✓ NO]
Were all VOC vials free of air bubbles?	[✓ NA] YES NO
Was sufficient amount of sample sent in each bottle?	[✓ YES] NO

Samples Logged by: Bob Congleton Date: 3/12/07 Time: 1230

***** Notify Project Manager of discrepancies or concerns *****

Explain discrepancies or negative responses:

*- Sample cores processed at ARI by LANDAU — NO ICE USED.

By: Date:

FRONTIER
ANALYTICAL LABORATORY

June 5, 2007

FAL Project ID: 4451

Ms. Kelly Bottem
Analytical Resources Incorporated
4611 South 134th Place
Tukwila, WA 98168-3240

Dear Ms. Bottem,

Enclosed are the results for Frontier Analytical Laboratory project **4451**. This corresponds to ARI Project; **KQ93** and Project ID; Gate 3 - POB. The five soil samples received on 5/17/2007 were extracted and analyzed by EPA Method 8290 for tetra through octa chlorinated dibenzo dioxins and dibenzo furans. All five samples were received after the recommended hold time for EPA Method 8290. You were contacted via telephone and notified us that your client wanted us to continue with the analysis. In addition the 2005 WHO TEF values were used in calculating the TEQ for each sample. Analytical Resources Incorporated requested a turnaround time of fifteen business days for project **4451**.

The following Level I report consists of an Analytical Data section and a Sample Receipt section. The Analytical Data section contains the project-sample tracking log and the analytical results. The Sample Receipt section contains your original chain of custody, our sample login form and sample photo. The Electronic Data Deliverable (EDD) you requested has been sent to you via email. The enclosed results are specifically for the samples referenced in this report only. These results meet all NELAC requirements and shall not be reproduced except in full.

If you have any questions regarding project **4451**, please contact me at (916) 934-0900. Thank you for choosing Frontier Analytical Laboratory for your analytical testing needs.

Sincerely,

Bradley B. Silverbush
Director of Operations

FRONTIER ANALYTICAL LABORATORY
5172 Hillsdale Circle • El Dorado Hills, CA 95762
Tel (916) 934-0900 • Fax (916) 934-0999
www.frontieranalytical.com

Analytical Data

Frontier Analytical Laboratory

Sample Tracking Log

FAL Project ID: **4451**

Received on: **05/17/2007** Project Due: **06/08/2007** Storage: **R2**

FAL Sample ID	Dup	Client Project ID	Client Sample ID	Requested Method	Matrix	Sampling Date	Sampling Time
4451-001-SA	0	Gate 3 - POB	07-4032-KQ93A	EPA 8290 D/F	Sediment	03/08/2007	02:50 pm
4451-002-SA	0	Gate 3 - POB	07-4034-KQ93C	EPA 8290 D/F	Sediment	03/08/2007	06:40 pm
4451-003-SA	0	Gate 3 - POB	07-4037-KQ93F	EPA 8290 D/F	Sediment	03/09/2007	10:10 am
4451-004-SA	0	Gate 3 - POB	07-4039-KQ93H	EPA 8290 D/F	Sediment	03/09/2007	01:30 pm
4451-005-SA	0	Gate 3 - POB	07-4040-KQ93I	EPA 8290 D/F	Sediment	03/09/2007	04:15 pm

FAL Sample ID	Notes
4451-005-SA	'Bottom of bottle broken during shipping. The integrity of sample was not compromised; analysis will proceed.

EPA Method 8290
PCDD/F

FRONTIER
ANALYTICAL LABORATORY

FAL ID: 4451-001-MB	Date Extracted: 05-30-2007	ICal: PCDDFAL3-4-17-07	Acquired: 06-01-2007
Client ID: Method Blank	Date Received: NA	GC Column: DB5	2005 WHO TEQ: 0.00
Matrix: Sediment	Amount: 10.00 g	Units: pg/g	
Batch No: X1156			

Compound	Conc	DL	Qual	2005 WHO Tox	MDL	Compound	Conc	DL	Qual
2,3,7,8-TCDD	ND	0.0754		-	0.0463				
1,2,3,7,8-PeCDD	ND	0.0856		-	0.0277				
1,2,3,4,7,8-HxCDD	ND	0.174		-	0.0904				
1,2,3,6,7,8-HxCDD	ND	0.185		-	0.100	Total TCDD	ND	0.0754	
1,2,3,7,8,9-HxCDD	ND	0.183		-	0.0918	Total PeCDD	ND	0.0856	
1,2,3,4,6,7,8-HpCDD	ND	0.188		-	0.0806	Total HxCDD	ND	0.187	
OCDD	ND	0.550		-	0.191	Total HpCDD	ND	0.188	
2,3,7,8-TCDF	ND	0.0704		-	0.0373				
1,2,3,7,8-PeCDF	ND	0.156		-	0.0383				
2,3,4,7,8-PeCDF	ND	0.165		-	0.0426				
1,2,3,4,7,8-HxCDF	ND	0.0638		-	0.0282				
1,2,3,6,7,8-HxCDF	ND	0.0630		-	0.0285				
2,3,4,6,7,8-HxCDF	ND	0.0720		-	0.0322				
1,2,3,7,8,9-HxCDF	ND	0.105		-	0.0289	Total TCDF	ND	0.0704	
1,2,3,4,6,7,8-HpCDF	ND	0.122		-	0.0383	Total PeCDF	ND	0.165	
1,2,3,4,7,8,9-HpCDF	ND	0.132		-	0.0403	Total HxCDF	ND	0.105	
OCDF	ND	0.444		-	0.104	Total HpCDF	ND	0.132	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	52.0	40.0 - 135	
13C-1,2,3,7,8-PeCDD	44.8	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	61.3	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	70.5	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	46.2	40.0 - 135	
13C-OCDD	41.8	40.0 - 135	
13C-2,3,7,8-TCDF	55.6	40.0 - 135	
13C-1,2,3,7,8-PeCDF	45.3	40.0 - 135	
13C-2,3,4,7,8-PeCDF	46.5	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	67.1	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	76.3	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	66.5	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	57.9	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	50.9	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	60.0	40.0 - 135	
13C-OCDF	41.3	40.0 - 135	
Cleanup Surrogate			
37Cl-2,3,7,8-TCDD	52.7	50.0 - 150	

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst:

Date: 6/4/07

Reviewed By:

Date: 6/5/07

EPA Method 8290
PCDD/F

FRONTIER ANALYTICAL LABORATORY

FAL ID: 4451-001-OPR	Date Extracted: 05-30-2007	ICal: PCDDFAL3-4-17-07	Acquired: 06-01-2007
Client ID: OPR	Date Received: NA	GC Column: DB5	2005 WHO TEQ: NA
Matrix: Sediment	Amount: 10.00 g	Units: ng/ml	
Batch No: X1156			

Compound	Conc	QC Limits	Qual
2,3,7,8-TCDD	9.38	7.00 - 13.0	
1,2,3,7,8-PeCDD	48.9	35.0 - 65.0	
1,2,3,4,7,8-HxCDD	49.4	35.0 - 65.0	
1,2,3,6,7,8-HxCDD	50.0	35.0 - 65.0	
1,2,3,7,8,9-HxCDD	44.5	35.0 - 65.0	
1,2,3,4,6,7,8-HpCDD	48.7	35.0 - 65.0	
OCDD	93.3	70.0 - 130	
2,3,7,8-TCDF	9.19	7.00 - 13.0	
1,2,3,7,8-PeCDF	49.7	35.0 - 65.0	
2,3,4,7,8-PeCDF	49.3	35.0 - 65.0	
1,2,3,4,7,8-HxCDF	49.2	35.0 - 65.0	
1,2,3,6,7,8-HxCDF	47.9	35.0 - 65.0	
2,3,4,6,7,8-HxCDF	47.6	35.0 - 65.0	
1,2,3,7,8,9-HxCDF	48.1	35.0 - 65.0	
1,2,3,4,6,7,8-HpCDF	47.4	35.0 - 65.0	
1,2,3,4,7,8,9-HpCDF	48.1	35.0 - 65.0	
OCDF	94.8	70.0 - 130	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	81.1	40.0 - 135	
13C-1,2,3,7,8-PeCDD	73.4	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	96.3	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	109	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	71.5	40.0 - 135	
13C-OCDD	61.4	40.0 - 135	
13C-2,3,7,8-TCDF	88.9	40.0 - 135	
13C-1,2,3,7,8-PeCDF	73.2	40.0 - 135	
13C-2,3,4,7,8-PeCDF	74.9	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	104	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	117	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	101	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	89.9	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	79.4	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	97.2	40.0 - 135	
13C-OCDF	65.6	40.0 - 135	

Cleanup Surrogate		
37Cl-2,3,7,8-TCDD	79.5	50.0 - 150

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst:________

Date: 6/4/07

Reviewed By:________

Date: 6/5/07

EPA Method 8290
PCDD/F

FRONTIER
ANALYTICAL LABORATORY

FAL ID: 4451-001-SA
Client ID: 07-4032-KQ93A
Matrix: Sediment
Batch No: X1156

Date Extracted: 05-30-2007
Date Received: 05-17-2007
Amount: 10.12 g
% Solids: 53.92

ICal: PCDDFAL3-4-17-07
GC Column: DB5
Units: pg/g

Acquired: 06-01-2007
2005 WHO TEQ: 10.6

Compound	Conc	DL	Qual	2005 WHO Tox	MDL	Compound	Conc	DL	Qual
2,3,7,8-TCDD	0.270	-	J	0.270	0.0463				
1,2,3,7,8-PeCDD	1.60	-	J	1.60	0.0277				
1,2,3,4,7,8-HxCDD	3.90	-		0.390	0.0904				
1,2,3,6,7,8-HxCDD	14.7	-		1.47	0.100	Total TCDD	51.2	-	
1,2,3,7,8,9-HxCDD	8.05	-		0.805	0.0918	Total PeCDD	41.4	-	
1,2,3,4,6,7,8-HpCDD	349	-		3.49	0.0806	Total HxCDD	212	-	
OCDD	2390	-		0.717	0.191	Total HpCDD	1040	-	
2,3,7,8-TCDF	2.04	-	F	0.204	0.0373				
1,2,3,7,8-PeCDF	1.05	-	J	0.0315	0.0383				
2,3,4,7,8-PeCDF	1.13	-	J	0.339	0.0426				
1,2,3,4,7,8-HxCDF	3.45	-		0.345	0.0282				
1,2,3,6,7,8-HxCDF	1.50	-	J	0.150	0.0285				
2,3,4,6,7,8-HxCDF	2.39	-	J	0.239	0.0322				
1,2,3,7,8,9-HxCDF	1.30	-	J	0.130	0.0289	Total TCDF	14.7	-	D,M
1,2,3,4,6,7,8-HpCDF	34.8	-		0.348	0.0383	Total PeCDF	30.5	-	D,M
1,2,3,4,7,8,9-HpCDF	2.08	-	J	0.0208	0.0403	Total HxCDF	87.3	-	D,M
OCDF	98.0	-		0.0294	0.104	Total HpCDF	131	-	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	82.9	40.0 - 135	
13C-1,2,3,7,8-PeCDD	63.0	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	90.2	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	107	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	79.2	40.0 - 135	
13C-OCDD	80.8	40.0 - 135	
13C-2,3,7,8-TCDF	88.2	40.0 - 135	
13C-1,2,3,7,8-PeCDF	68.7	40.0 - 135	
13C-2,3,4,7,8-PeCDF	68.4	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	96.8	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	114	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	98.7	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	90.3	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	82.5	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	101	40.0 - 135	
13C-OCDF	76.6	40.0 - 135	
Cleanup Surrogate			
37Cl-2,3,7,8-TCDD	78.1	50.0 - 150	

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst:
Date: 6/4/07

Reviewed By:
Date: 6/5/07

EPA Method 8290
PCDD/F

FRONTIER
ANALYTICAL LABORATORY

FAL ID: 4451-002-SA
Client ID: 07-4034-KQ93C
Matrix: Sediment
Batch No: X1156

Date Extracted: 05-30-2007
Date Received: 05-17-2007
Amount: 10.21 g
% Solids: 54.13

ICal: PCDDFAL3-4-17-07
GC Column: DB5
Units: pg/g

Acquired: 06-01-2007
2005 WHO TEQ: 6.24

Compound	Conc	DL	Qual	2005 WHO Tox	MDL	Compound	Conc	DL	Qual
2,3,7,8-TCDD	0.178	-	J	0.178	0.0463				
1,2,3,7,8-PeCDD	0.882	-	J	0.882	0.0277				
1,2,3,4,7,8-HxCDD	2.65	-		0.265	0.0904				
1,2,3,6,7,8-HxCDD	8.31	-		0.831	0.100	Total TCDD	50.4	-	
1,2,3,7,8,9-HxCDD	4.36	-		0.436	0.0918	Total PeCDD	36.8	-	
1,2,3,4,6,7,8-HpCDD	205	-		2.05	0.0806	Total HxCDD	128	-	
OCDD	1910	-		0.573	0.191	Total HpCDD	599	-	
2,3,7,8-TCDF	1.52	-	F	0.152	0.0373				
1,2,3,7,8-PeCDF	0.581	-	J	0.0174	0.0383				
2,3,4,7,8-PeCDF	0.493	-	J	0.148	0.0426				
1,2,3,4,7,8-HxCDF	1.99	-	J	0.199	0.0282				
1,2,3,6,7,8-HxCDF	0.951	-	J	0.0951	0.0285				
2,3,4,6,7,8-HxCDF	1.38	-	J	0.138	0.0322				
1,2,3,7,8,9-HxCDF	0.757	-	J	0.0757	0.0289	Total TCDF	9.49	-	D,M
1,2,3,4,6,7,8-HpCDF	17.1	-		0.171	0.0383	Total PeCDF	15.2	-	D,M
1,2,3,4,7,8,9-HpCDF	1.27	-	J	0.0127	0.0403	Total HxCDF	47.0	-	
OCDF	49.6	-		0.0149	0.104	Total HpCDF	67.4	-	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	83.2	40.0 - 135	
13C-1,2,3,7,8-PeCDD	68.6	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	90.5	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	109	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	80.7	40.0 - 135	
13C-OCDD	87.1	40.0 - 135	
13C-2,3,7,8-TCDF	88.1	40.0 - 135	
13C-1,2,3,7,8-PeCDF	72.0	40.0 - 135	
13C-2,3,4,7,8-PeCDF	72.1	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	102	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	118	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	102	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	89.7	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	87.8	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	104	40.0 - 135	
13C-OCDF	83.8	40.0 - 135	
Cleanup Surrogate			
37Cl-2,3,7,8-TCDD	73.8	50.0 - 150	

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst:__________
Date: 6/4/07

Reviewed By:__________
Date: 6/5/07

EPA Method 8290
PCDD/F

FAL ID: 4451-003-SA	Date Extracted: 05-30-2007	ICal: PCDDFAL3-4-17-07	Acquired: 06-01-2007
Client ID: 07-4037-KQ93F	Date Received: 05-17-2007	GC Column: DB5	2005 WHO TEQ: 27.3
Matrix: Sediment	Amount: 10.21 g	Units: pg/g	
Batch No: X1156	% Solids: 50.50		

Compound	Conc	DL	Qual	2005 WHO Tox	MDL	Compound	Conc	DL	Qual
2,3,7,8-TCDD	0.385	-	J	0.385	0.0463				
1,2,3,7,8-PeCDD	3.85	-		3.85	0.0277				
1,2,3,4,7,8-HxCDD	10.6	-		1.06	0.0904				
1,2,3,6,7,8-HxCDD	42.1	-		4.21	0.100	Total TCDD	58.0	-	
1,2,3,7,8,9-HxCDD	23.3	-		2.33	0.0918	Total PeCDD	56.2	-	
1,2,3,4,6,7,8-HpCDD	954	-		9.54	0.0806	Total HxCDD	370	-	
OCDD	6670	-		2.00	0.191	Total HpCDD	2320	-	
2,3,7,8-TCDF	2.79	-	F	0.279	0.0373				
1,2,3,7,8-PeCDF	2.92	-		0.0876	0.0383				
2,3,4,7,8-PeCDF	1.85	-	J	0.555	0.0426				
1,2,3,4,7,8-HxCDF	7.47	-		0.747	0.0282				
1,2,3,6,7,8-HxCDF	3.91	-		0.391	0.0285				
2,3,4,6,7,8-HxCDF	5.54	-		0.554	0.0322				
1,2,3,7,8,9-HxCDF	3.13	-		0.313	0.0289	Total TCDF	18.4	-	D,M
1,2,3,4,6,7,8-HpCDF	87.3	-		0.873	0.0383	Total PeCDF	80.2	-	D,M
1,2,3,4,7,8,9-HpCDF	3.68	-		0.0368	0.0403	Total HxCDF	248	-	D,M
OCDF	181	-		0.0543	0.104	Total HpCDF	291	-	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	71.4	40.0 - 135	
13C-1,2,3,7,8-PeCDD	54.7	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	76.2	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	92.4	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	70.1	40.0 - 135	
13C-OCDD	85.7	40.0 - 135	
13C-2,3,7,8-TCDF	72.6	40.0 - 135	
13C-1,2,3,7,8-PeCDF	58.2	40.0 - 135	
13C-2,3,4,7,8-PeCDF	59.0	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	84.1	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	97.2	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	82.9	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	73.6	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	71.6	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	88.6	40.0 - 135	
13C-OCDF	76.6	40.0 - 135	
Cleanup Surrogate			
37Cl-2,3,7,8-TCDD	67.6	50.0 - 150	

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst:

Date: 6/4/07

Reviewed By:

Date: 6/5/07

EPA Method 8290
PCDD/F

FRONTIER ANALYTICAL LABORATORY

FAL ID: 4451-004-SA
Client ID: 07-4039-KQ93H
Matrix: Sediment
Batch No: X1156

Date Extracted: 05-30-2007
Date Received: 05-17-2007
Amount: 10.19 g
% Solids: 50.95

ICal: PCDDFAL3-4-17-07
GC Column: DB5
Units: pg/g

Acquired: 06-01-2007
2005 WHO TEQ: 47.1

Compound	Conc	DL	Qual	2005 WHO Tox	MDL	Compound	Conc	DL	Qual
2,3,7,8-TCDD	0.684	-		0.684	0.0463				
1,2,3,7,8-PeCDD	7.12	-		7.12	0.0277				
1,2,3,4,7,8-HxCDD	19.3	-		1.93	0.0904				
1,2,3,6,7,8-HxCDD	64.7	-		6.47	0.100	Total TCDD	63.8	-	
1,2,3,7,8,9-HxCDD	41.9	-		4.19	0.0918	Total PeCDD	75.3	-	
1,2,3,4,6,7,8-HpCDD	1670	-		16.7	0.0806	Total HxCDD	688	-	
OCDD	12400	-		3.72	0.191	Total HpCDD	3680	-	
2,3,7,8-TCDF	2.93	-	F	0.293	0.0373				
1,2,3,7,8-PeCDF	3.12	-		0.0936	0.0383				
2,3,4,7,8-PeCDF	3.65	-		1.10	0.0426				
1,2,3,4,7,8-HxCDF	12.5	-		1.25	0.0282				
1,2,3,6,7,8-HxCDF	6.15	-		0.615	0.0285				
2,3,4,6,7,8-HxCDF	9.22	-		0.922	0.0322				
1,2,3,7,8,9-HxCDF	4.62	-		0.462	0.0289	Total TCDF	23.8	-	D,M
1,2,3,4,6,7,8-HpCDF	136	-		1.36	0.0383	Total PeCDF	100	-	D,M
1,2,3,4,7,8,9-HpCDF	6.83	-		0.0683	0.0403	Total HxCDF	332	-	D,M
OCDF	365	-		0.110	0.104	Total HpCDF	480	-	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	85.2	40.0 - 135	
13C-1,2,3,7,8-PeCDD	69.7	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	87.2	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	106	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	85.4	40.0 - 135	
13C-OCDD	106	40.0 - 135	
13C-2,3,7,8-TCDF	90.1	40.0 - 135	
13C-1,2,3,7,8-PeCDF	72.1	40.0 - 135	
13C-2,3,4,7,8-PeCDF	76.0	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	94.4	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	109	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	96.6	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	86.3	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	82.8	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	99.6	40.0 - 135	
13C-OCDF	90.5	40.0 - 135	
Cleanup Surrogate			
37Cl-2,3,7,8-TCDD	81.8	50.0 - 150	

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst:
Date: 6/4/07

Reviewed By:
Date: 6/5/07

EPA Method 8290
PCDD/F

FRONTIER ANALYTICAL LABORATORY

FAL ID: 4451-005-SA
Client ID: 07-4040-KQ93I
Matrix: Sediment
Batch No: X1156

Date Extracted: 05-30-2007
Date Received: 05-17-2007
Amount: 10.09 g
% Solids: 54.86

ICal: PCDDFAL3-4-17-07
GC Column: DB5
Units: pg/g

Acquired: 06-01-2007
2005 WHO TEQ: 2.72

Compound	Conc	DL	Qual	2005 WHO Tox	MDL	Compound	Conc	DL	Qual
2,3,7,8-TCDD	0.146	-	J	0.146	0.0463				
1,2,3,7,8-PeCDD	0.343	-	J	0.343	0.0277				
1,2,3,4,7,8-HxCDD	1.23	-	J	0.123	0.0904				
1,2,3,6,7,8-HxCDD	3.49	-		0.349	0.100	Total TCDD	38.4	-	
1,2,3,7,8,9-HxCDD	1.68	-	J	0.168	0.0918	Total PeCDD	26.0	-	
1,2,3,4,6,7,8-HpCDD	73.6	-		0.736	0.0806	Total HxCDD	69.9	-	
OCDD	656	-		0.197	0.191	Total HpCDD	185	-	
2,3,7,8-TCDF	1.48	-	F	0.148	0.0373				
1,2,3,7,8-PeCDF	0.371	-	J	0.0111	0.0383				
2,3,4,7,8-PeCDF	0.442	-	J	0.133	0.0426				
1,2,3,4,7,8-HxCDF	0.958	-	J	0.0958	0.0282				
1,2,3,6,7,8-HxCDF	0.542	-	J	0.0542	0.0285				
2,3,4,6,7,8-HxCDF	0.681	-	J	0.0681	0.0322				
1,2,3,7,8,9-HxCDF	0.442	-	J	0.0442	0.0289	Total TCDF	8.91	-	D,M
1,2,3,4,6,7,8-HpCDF	8.53	-		0.0853	0.0383	Total PeCDF	8.13	-	D,M
1,2,3,4,7,8,9-HpCDF	0.707	-	J	0.00707	0.0403	Total HxCDF	20.5	-	
OCDF	27.4	-		0.00822	0.104	Total HpCDF	34.1	-	

Internal Standards	% Rec	QC Limits	Qual
13C-2,3,7,8-TCDD	83.7	40.0 - 135	
13C-1,2,3,7,8-PeCDD	70.4	40.0 - 135	
13C-1,2,3,4,7,8-HxCDD	91.1	40.0 - 135	
13C-1,2,3,6,7,8-HxCDD	107	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDD	77.0	40.0 - 135	
13C-OCDD	81.6	40.0 - 135	
13C-2,3,7,8-TCDF	88.2	40.0 - 135	
13C-1,2,3,7,8-PeCDF	72.2	40.0 - 135	
13C-2,3,4,7,8-PeCDF	73.7	40.0 - 135	
13C-1,2,3,4,7,8-HxCDF	100	40.0 - 135	
13C-1,2,3,6,7,8-HxCDF	114	40.0 - 135	
13C-2,3,4,6,7,8-HxCDF	100	40.0 - 135	
13C-1,2,3,7,8,9-HxCDF	91.3	40.0 - 135	
13C-1,2,3,4,6,7,8-HpCDF	81.9	40.0 - 135	
13C-1,2,3,4,7,8,9-HpCDF	101	40.0 - 135	
13C-OCDF	81.9	40.0 - 135	
Cleanup Surrogate			
37Cl-2,3,7,8-TCDD	81.3	50.0 - 150	

A	Isotopic Labeled Standard outside QC range but signal to noise ratio is >10:1
B	Analyte is present in Method Blank
C	Chemical Interference
D	Presence of Diphenyl Ethers
E	Analyte concentration is above calibration range
F	Analyte confirmation on secondary column
J	Analyte concentration is below calibration range
M	Maximum possible concentration
ND	Analyte Not Detected
NP	Not Provided
S	Sample acceptance criteria not met
X	Matrix interferences
*	Result taken from dilution or reinjection

Analyst: JC
Date: 6/4/07

Reviewed By:
Date: 6/5/07

Sample Receipt

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 05/16/07

ANALYTICAL RESOURCES INCORPORATED

4451
0°

ARI Project: KQ93

Laboratory: Frontier Analytical Laboratory
Lab Contact: BRAD SILVERBUSH
Lab Address: 5172 Hillsdale Circle
El Dorado Hills, CA 95762
Phone: 916-934-0900
Fax: 916-934-0999

ARI Client: Landau Associates, Inc.
Project ID: Gate 3 - POB
ARI PM: Kelly BOttem
Phone: 206-695-6211
Fax: 206-695-6201

Analytical Protocol: PSDDA
Special Instructions:

Requested Turn Around: **06/14/07**
Fax Results (Y/N):

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses	
07-4032-KQ93A	Gate3-CMP1	03/08/07	Sediment	1	PCDD/PCDF	14:50
Special Instructions: None						
07-4034-KQ93C	Gate3-CMP2	03/08/07	Sediment	1	PCDD/PCDF	18:40
Special Instructions: None						
07-4037-KQ93F	Gate3-CMP3	03/09/07	Sediment		PCDD/PCDF	10:10
Special Instructions: None						
07-4039-KQ93H	Gate3-CMP4	03/09/07	Sediment	1	PCDD/PCDF	13:30
Special Instructions: None						
07-4040-KQ93I	Gate3-CMPHab	03/09/07	Sediment	1	PCDD/PCDF	16:15
Special Instructions: None						

Use 2005 TEF's to calculate TEQ. All samples to be analyzed by EPA 8290 DIF, as requested by Kelly to Brad.

Kelly to Kathy - Client authorize FAL to proceed w/ analysis after being informed samples have passed 30 day hold time. Client requested 15-TAT. KZ 5/17/07.

Kelly B@arilabs.com

Carrier UPS	Airbill 1Z 832 695 13 4490 1237		Date 5/16/7
Relinquished by	Company ARI	Date 5/16/7	Time 1600
Received by	Company FAL	Date 5/17/07	Time 1110

FRONTIER
ANALYTICAL LABORATORY

Frontier Analytical Laboratory

Sample Login Form

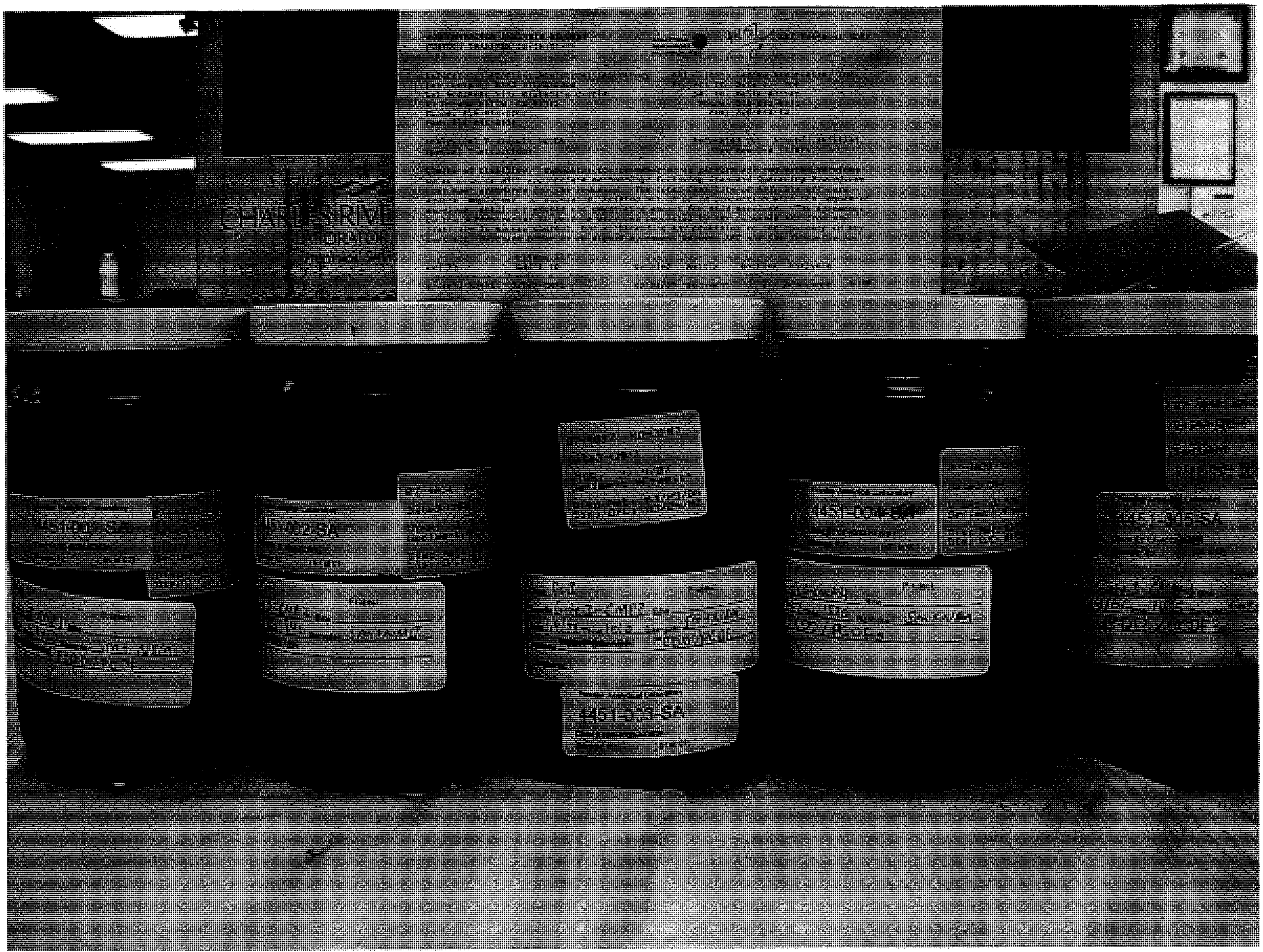
FAL Project ID: **4451**

Client:	Analytical Resources Inc. Kelly Bottem
Client Project ID:	Gate 3 - POB
Date Received:	05/17/2007
Time Received:	11:10 am
Received By:	NM
Logged In By:	JN
# of Samples Received:	5
Duplicates:	0
Storage Location:	R2

Method of Delivery:	UPS
Tracking Number:	1Z8326951344901237
Shipping Container Received Intact	Yes
Custody seals(s) present?	Yes
Custody seals(s) intact?	Yes
Sample Arrival Temperature (C)	0
Cooling Method	Ice
Chain Of Custody Present?	Yes
Return Shipping Container To Client	Yes
Test for residual Chlorine	No
Thiosulfate Added	No
Earliest Sample Hold Time Expiration	04/07/2007
Adequate Sample Volume	Yes

Anomalies or additional comments:

Use 2005 TEF's to calculate TEQ. Samples past EPA Method 8290 recommended hold time of 30 days - client was informed of this anomoly and authorized FAL to proceed with analysis.


1451-033-SA
1451-005-SA

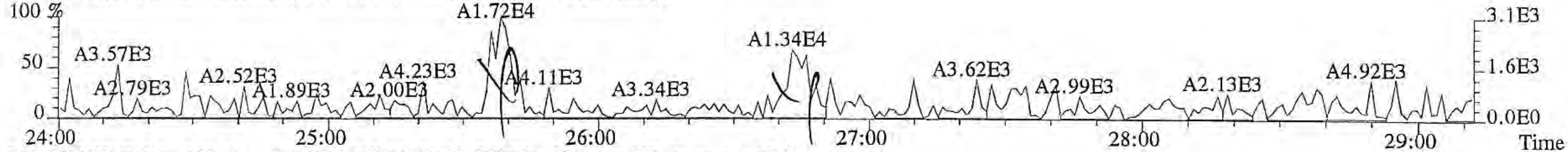
Instrument Raw Data

Sample Results

```
FAL ID: 1156-001-0001-MB      Filename: 01JUN07M    Sam:3    Acquired: 1-JUN-07  11:28:33   ICal: PCDDFAL3-4-17-07
Client ID: Method Blank                                          ConCal: ST060107M1        EndCal: ST060107M2
Results: 1156            GC Column: db5      Amount: 10.00                                NATO 1989 Tox:       0.00
                                                                                            WHO 1998 Tox:       0.00
                 Name        Resp     RA        RT     RRF       Conc      Qual    Fac    Noise       DL

           2,3,7,8-TCDD         *      * n NotFnd     1.11          *              2.50     928   0.0754
         1,2,3,7,8-PeCDD        *      * n NotFnd     1.10          *              2.50     616   0.0856
       1,2,3,4,7,8-HxCDD        *      * n NotFnd     0.82          *              2.50     738    0.174
       1,2,3,6,7,8-HxCDD        *      * n NotFnd     0.74          *              2.50     738    0.185
       1,2,3,7,8,9-HxCDD        *      * n NotFnd     0.80          *              2.50     738    0.183
     1,2,3,4,6,7,8-HpCDD        *      * n NotFnd     0.75          *              2.50     518    0.188
                    OCDD        *      * n NotFnd     0.80          *              2.50     933    0.550

           2,3,7,8-TCDF         *      * n NotFnd     0.85          *              2.50    1440   0.0704
         1,2,3,7,8-PeCDF        *      * n NotFnd     0.78          *              2.50    1300    0.156
         2,3,4,7,8-PeCDF        *      * n NotFnd     0.76          *              2.50    1300    0.165
       1,2,3,4,7,8-HxCDF        *      * n NotFnd     1.02          *              2.50     648   0.0638
       1,2,3,6,7,8-HxCDF        *      * n NotFnd     0.92          *              2.50     648   0.0630
       2,3,4,6,7,8-HxCDF        *      * n NotFnd     0.93          *              2.50     648   0.0720
       1,2,3,7,8,9-HxCDF        *      * n NotFnd     0.92          *              2.50     648    0.105
     1,2,3,4,6,7,8-HpCDF        *      * n NotFnd     1.10          *              2.50     853    0.122
     1,2,3,4,7,8,9-HpCDF        *      * n NotFnd     0.99          *              2.50     853    0.132
                    OCDF        *      * n NotFnd     0.77          *              2.50     962    0.444
                                                                                                           Rec
       13C-2,3,7,8-TCDD   4.46e+07  0.79 y  27:28     1.03        104                                     52.0
     13C-1,2,3,7,8-PeCDD  4.30e+07  1.57 y  33:16     1.15       89.7                                     44.8
   13C-1,2,3,4,7,8-HxCDD  3.08e+07  1.27 y  38:37     1.34        123                                     61.3
   13C-1,2,3,6,7,8-HxCDD  3.57e+07  1.27 y  38:47     1.35        141                                     70.5
 13C-1,2,3,4,6,7,8-HpCDD  2.40e+07  1.00 y  44:12     1.38       92.4                                     46.2
                13C-OCDD  3.46e+07  0.90 y  49:44     1.10        167                                     41.8

       13C-2,3,7,8-TCDF   9.36e+07  0.80 y  26:44     1.28        111                                     55.6
     13C-1,2,3,7,8-PeCDF  6.57e+07  1.60 y  31:33     1.10       90.7                                     45.3
     13C-2,3,4,7,8-PeCDF  6.55e+07  1.59 y  32:52     1.07       93.1                                     46.5
   13C-1,2,3,4,7,8-HxCDF  3.94e+07  0.52 y  37:14     1.56        134                                     67.1
   13C-1,2,3,6,7,8-HxCDF  4.98e+07  0.50 y  37:26     1.74        153                                     76.3
   13C-2,3,4,6,7,8-HxCDF  4.12e+07  0.50 y  38:22     1.65        133                                     66.5
   13C-1,2,3,7,8,9-HxCDF  3.20e+07  0.51 y  39:48     1.47        116                                     57.9
 13C-1,2,3,4,6,7,8-HpCDF  2.72e+07  0.44 y  42:19     1.42        102                                     50.9
 13C-1,2,3,4,7,8,9-HpCDF  3.02e+07  0.44 y  45:07     1.34        120                                     60.0
                13C-OCDF  4.48e+07  0.88 y  50:06     1.44        165                                     41.3

     37Cl-2,3,7,8-TCDD   1.34e+07           27:30     0.77       42.1                                     52.7

       13C-1,2,3,4-TCDD   8.33e+07  0.79 y  26:54       -        9.81
       13C-1,2,3,4-TCDF   1.31e+08  0.79 y  25:39       -        10.2
   13C-1,2,3,7,8,9-HxCDD  3.76e+07  1.26 y  39:14       -        5.20
                                                                               Fac    Noise       DL   #Hom
     Total Tetra-Dioxins        *            NotFnd   1.11          *             2.50     928   0.0754   0
     Total Penta-Dioxins        *            NotFnd   1.10          *             2.50     616   0.0856   0
      Total Hexa-Dioxins        *            NotFnd   0.79          *             2.50     738    0.187   0
     Total Hepta-Dioxins        *            NotFnd   0.75          *             2.50     518    0.188   0

      Total Tetra-Furans        *            NotFnd   0.85          *             2.50    1440   0.0704   0
1st Fn. Tot Penta-Furans        *            NotFnd   0.77          *             2.50    1300    0.165   0    PeCDF
      Total Penta-Furans        *            NotFnd   0.77          *             2.50    1300    0.165   0      *
       Total Hexa-Furans        *            NotFnd   0.95          *             2.50     648    0.105   0
      Total Hepta-Furans        *            NotFnd   1.04          *             2.50     853    0.132   0
```

Analyst: ______________   Date: 6/4/07

File:01JUN07M #1-390 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
319.8965 S:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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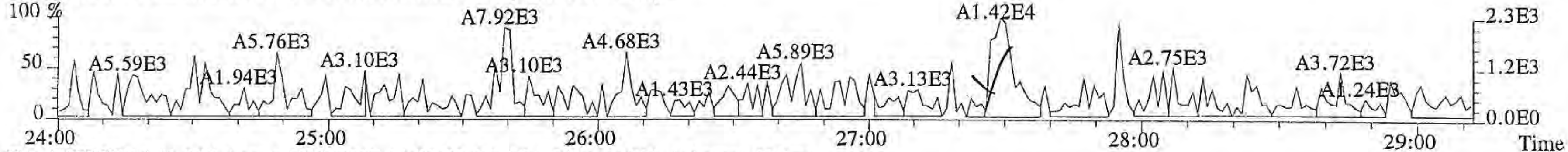
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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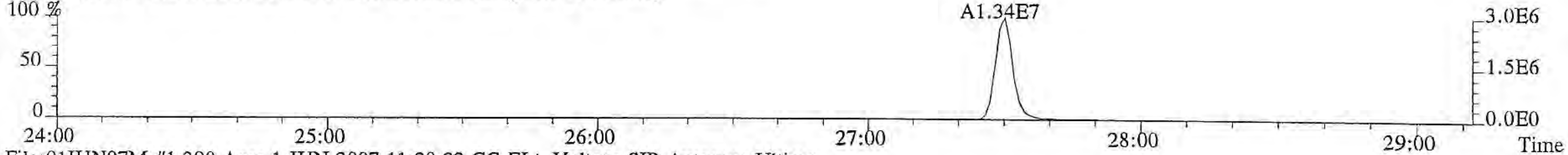
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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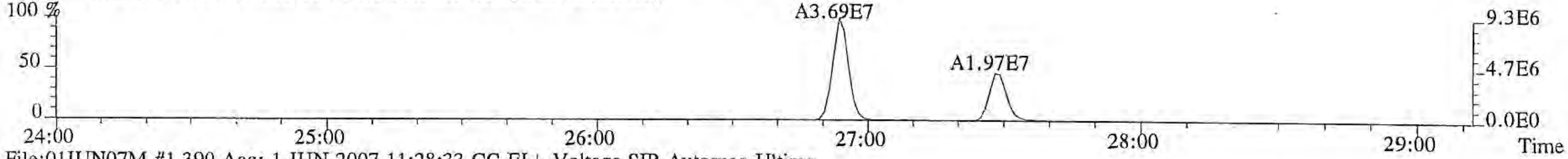

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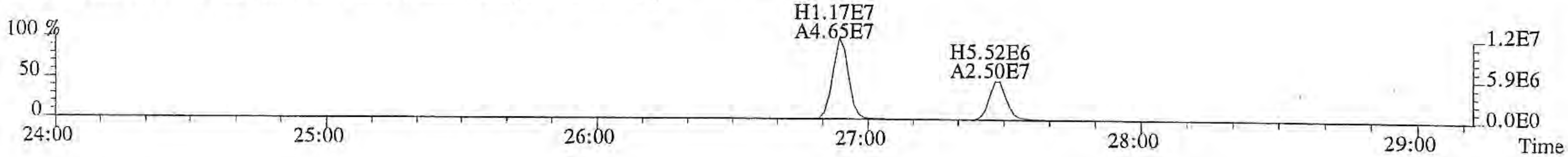

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355.8546 S:3 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
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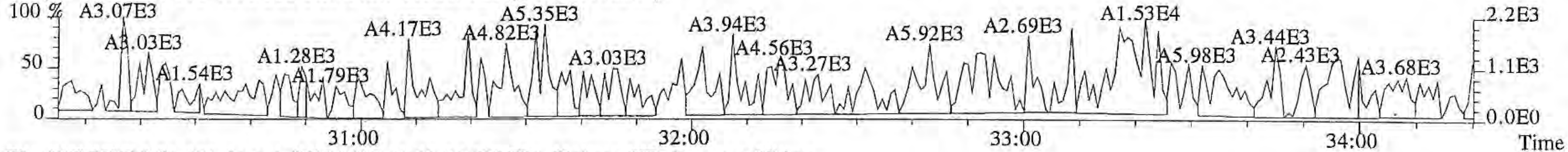

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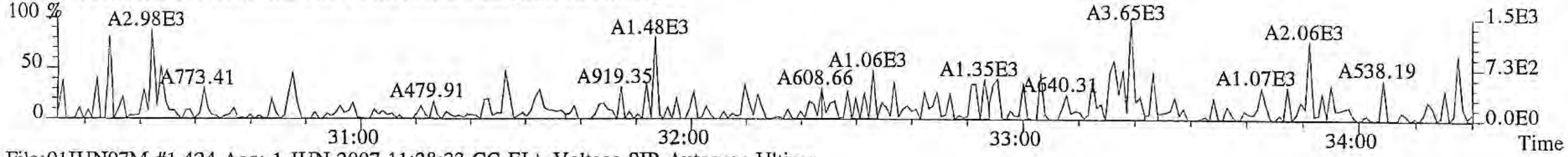

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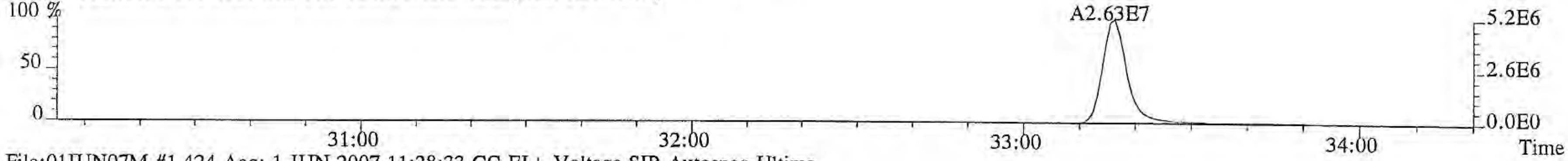

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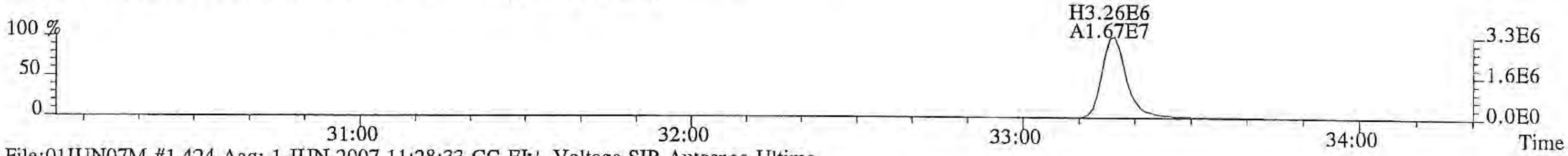

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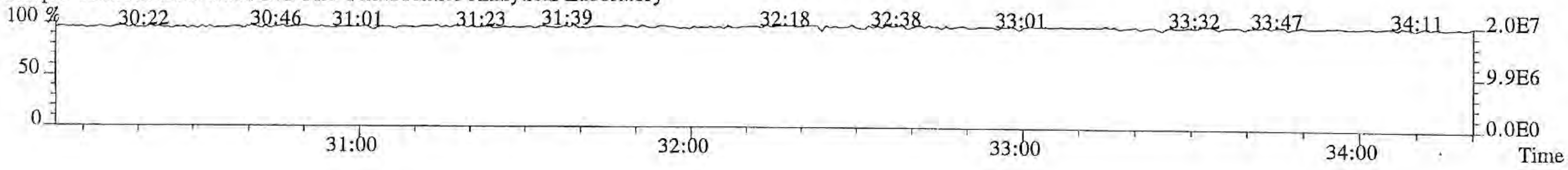
366.9792 S:3 F:2 Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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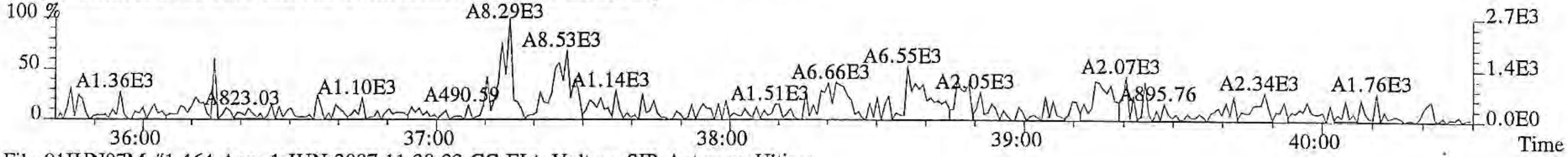

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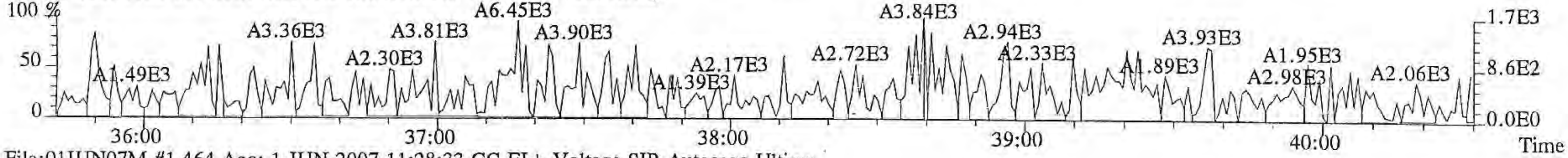

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401.8559 S:3 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
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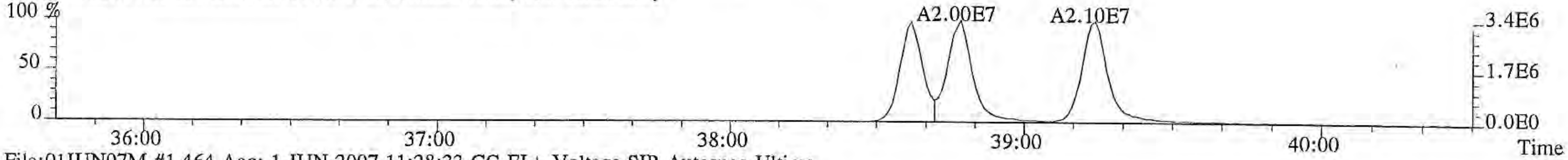

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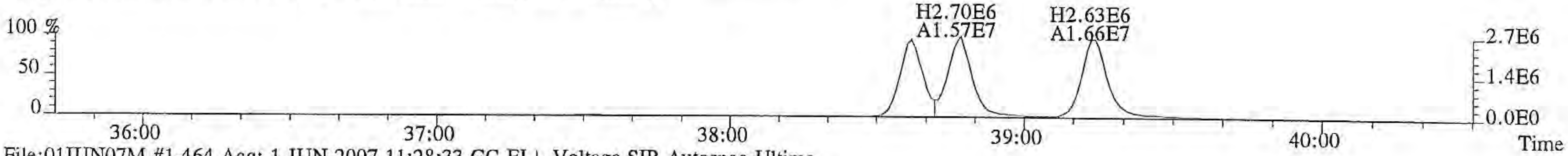

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380.9760 S:3 F:3 Exp:PCDD
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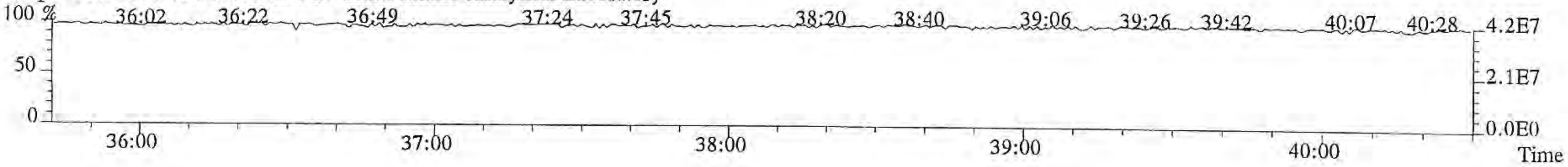
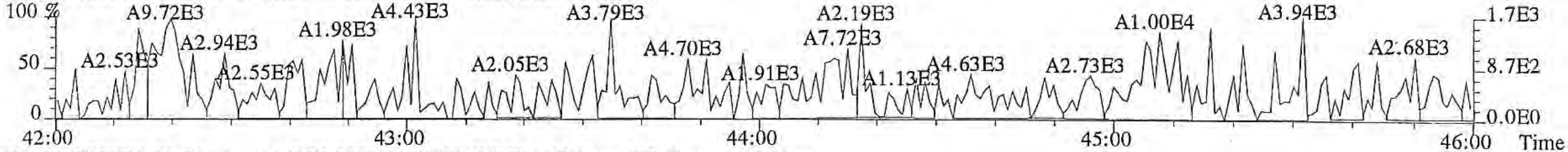
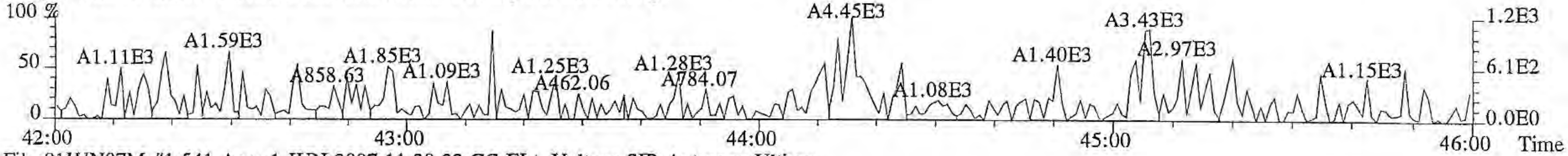


File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
423.7767 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
425.7737 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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435.8169 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
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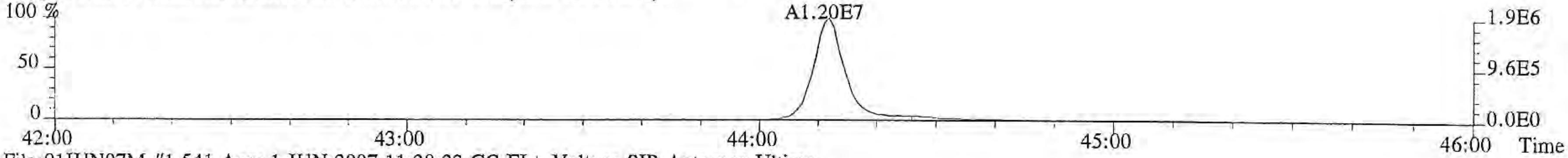

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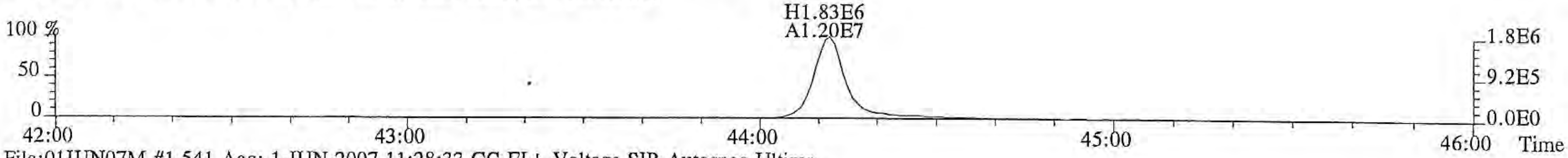

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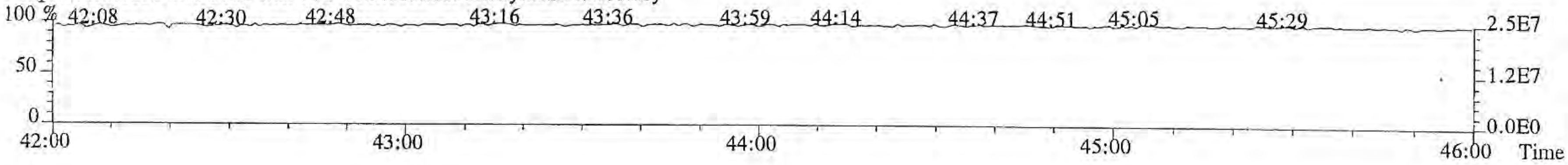

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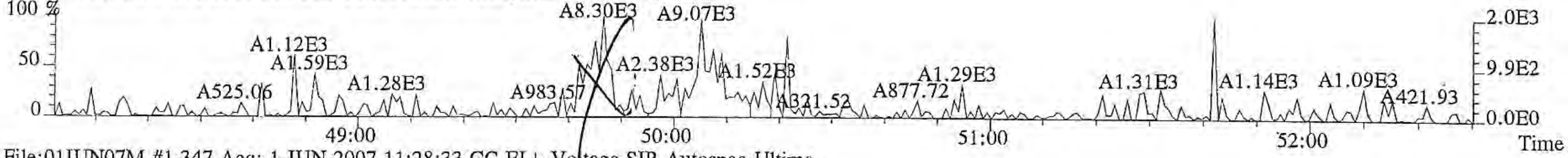

File:01JUN07M #1-347 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
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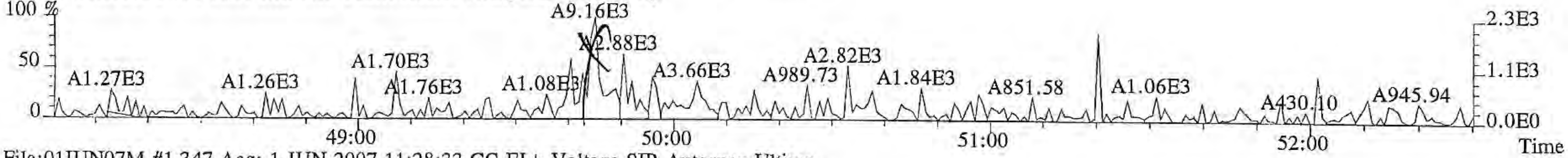

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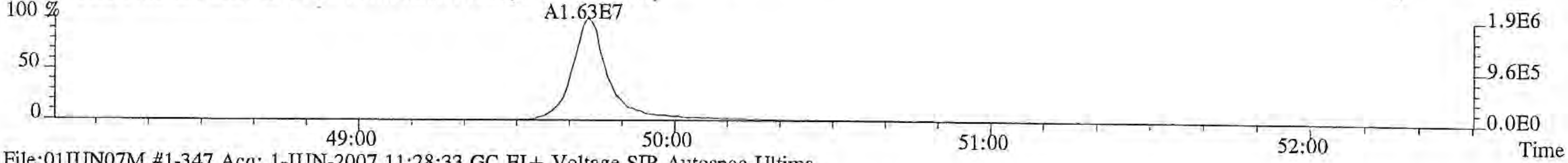

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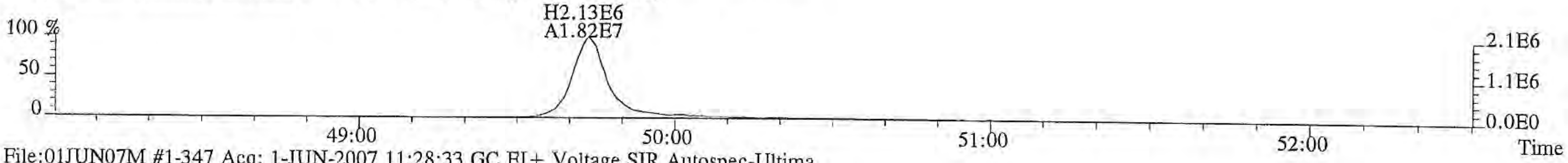

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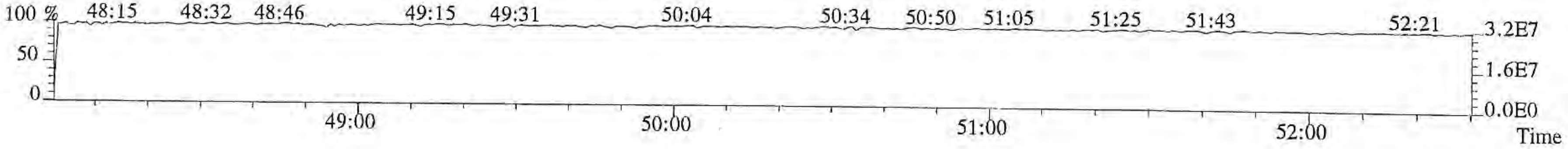

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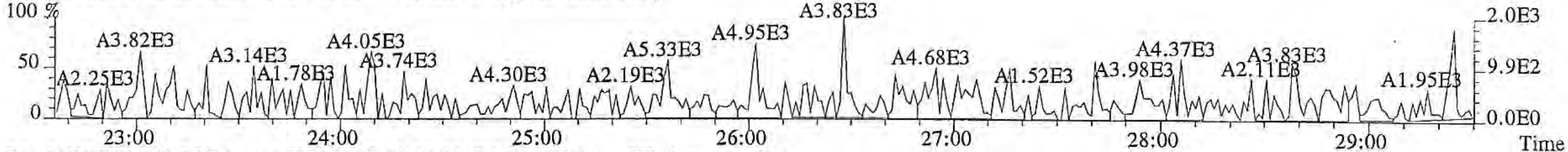

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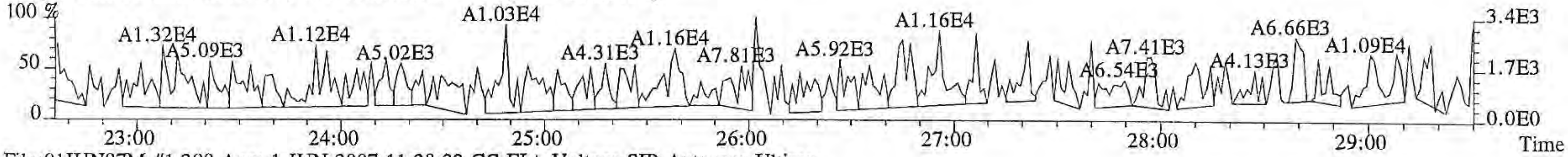

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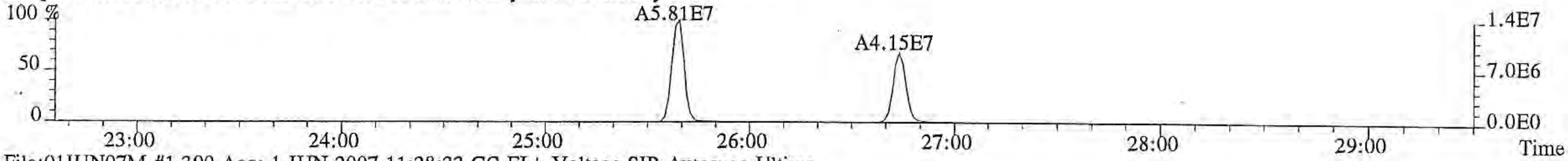

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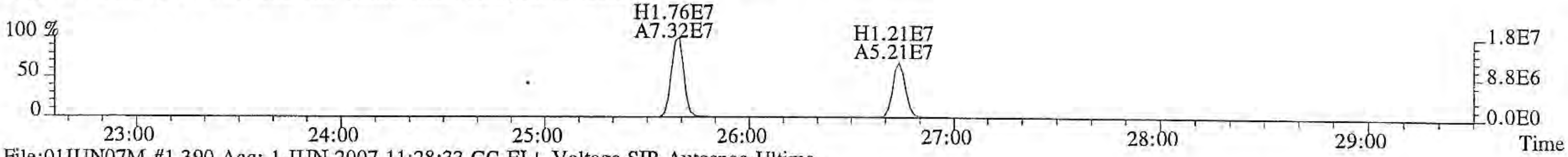

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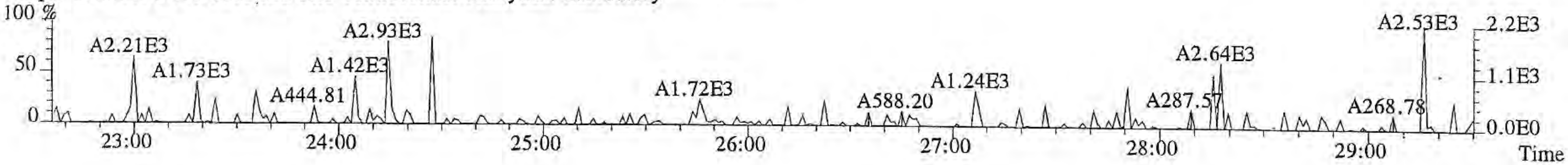

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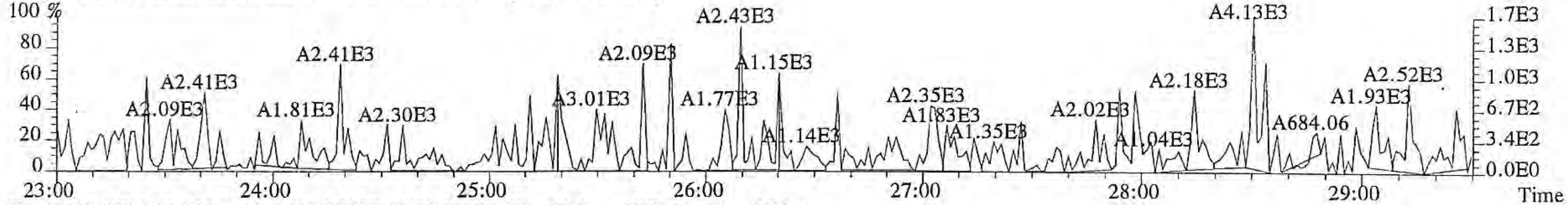
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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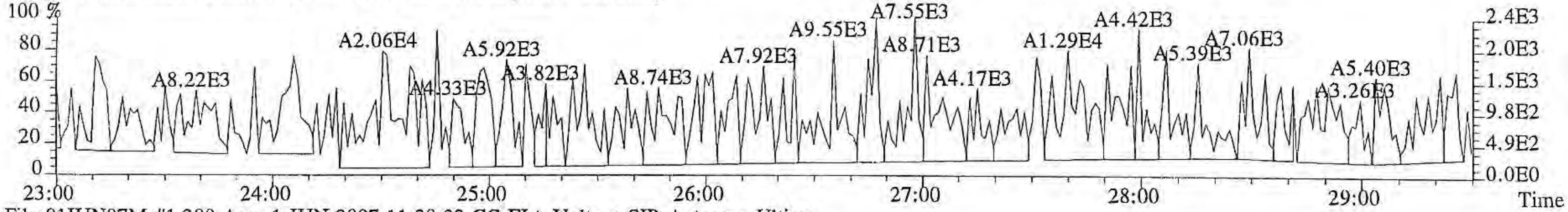
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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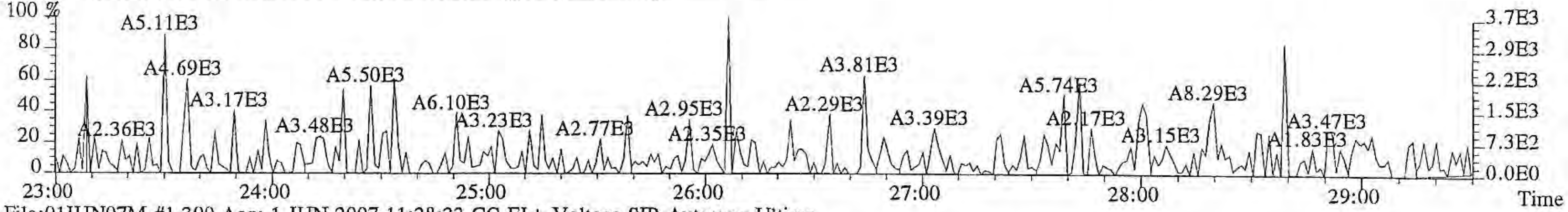

File:01JUN07M #1-390 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
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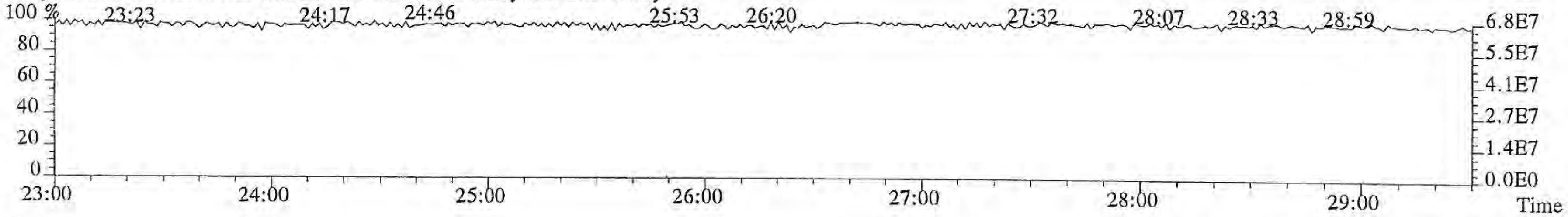
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



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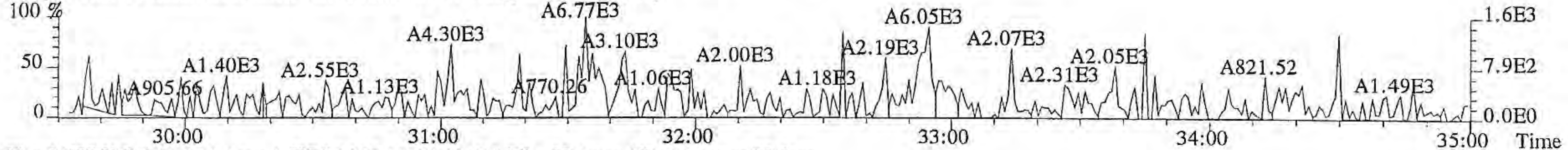
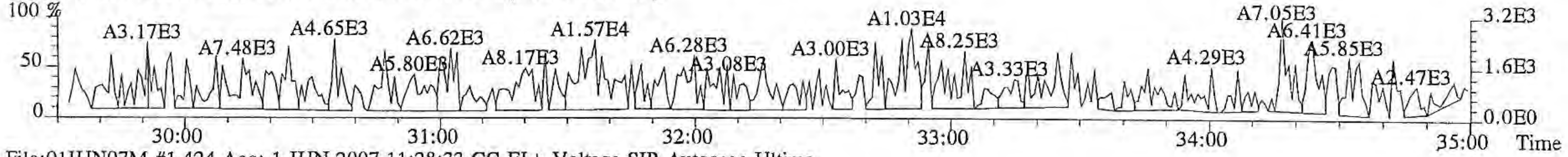
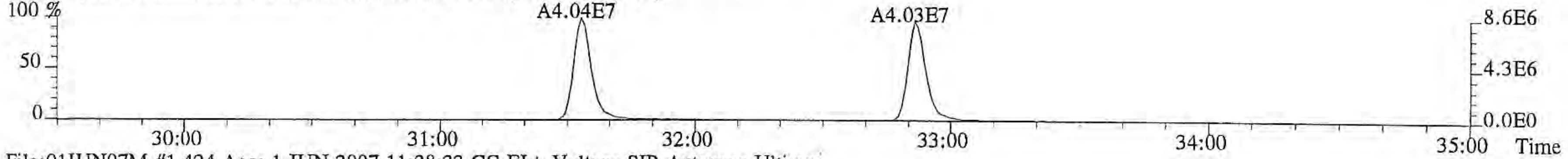
339.8597 S:3 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



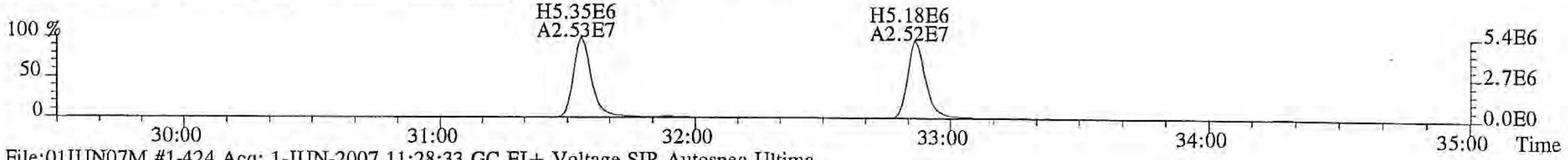
File:01JUN07M #1-424 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
341.8568 S:3 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



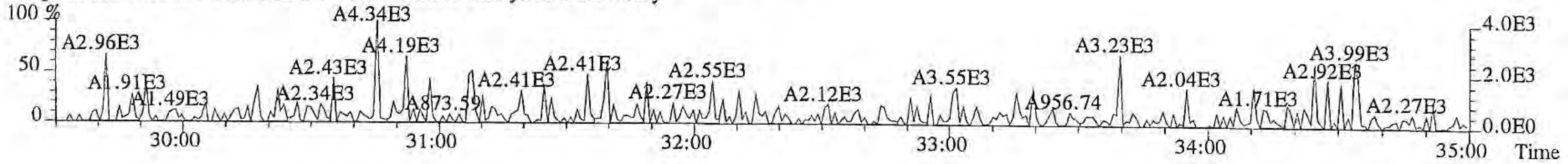
File:01JUN07M #1-424 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
351.9000 S:3 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



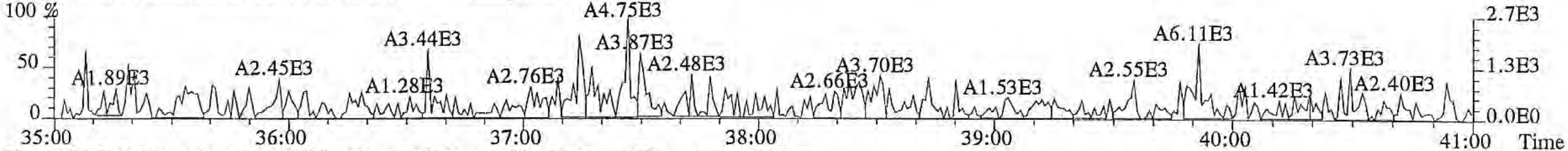
File:01JUN07M #1-424 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
353.8970 S:3 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



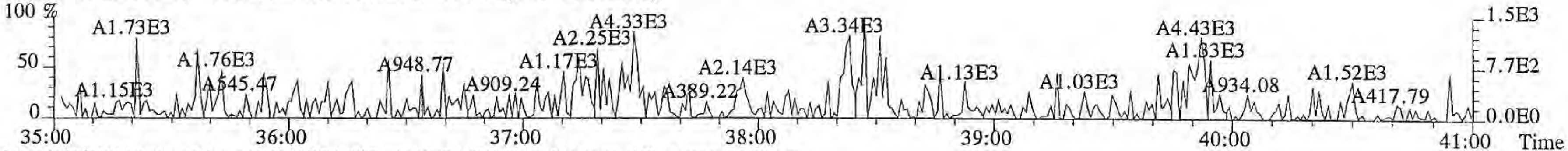
File:01JUN07M #1-424 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
409.7974 S:3 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



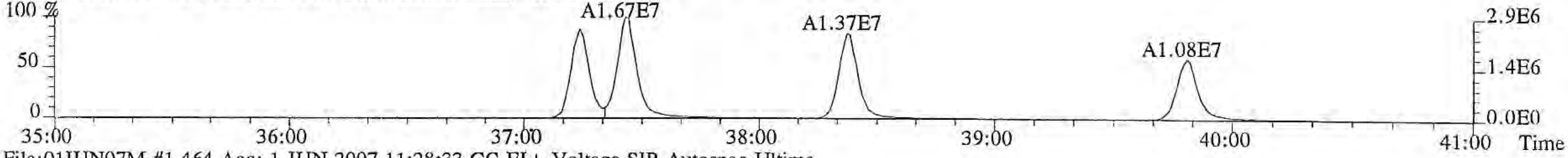
File:01JUN07M #1-464 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
373.8207 S:3 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



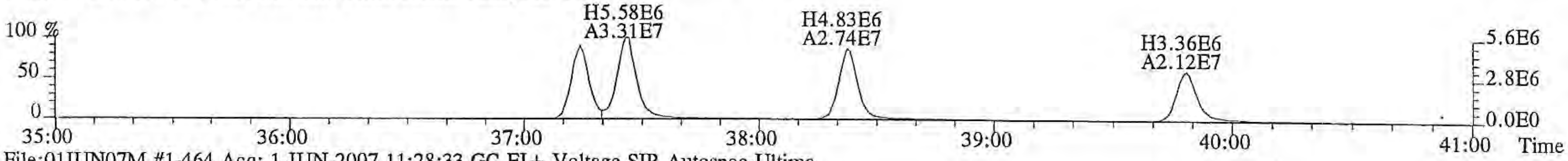
File:01JUN07M #1-464 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
375.8178 S:3 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



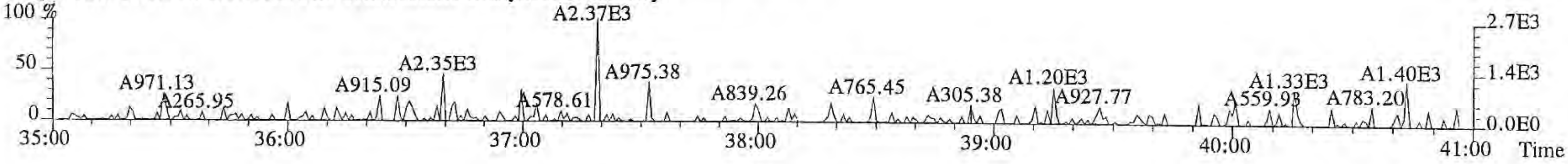
File:01JUN07M #1-464 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
383.8639 S:3 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



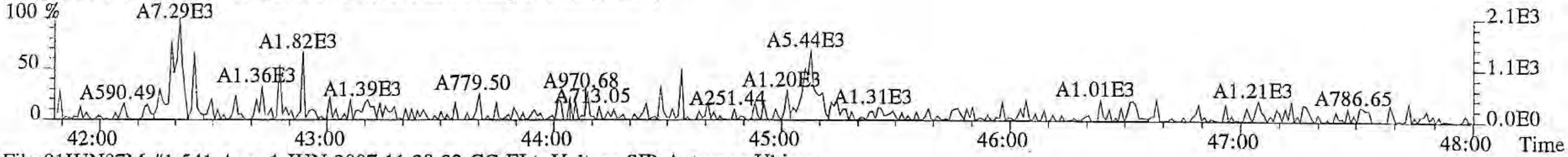
File:01JUN07M #1-464 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
385.8610 S:3 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



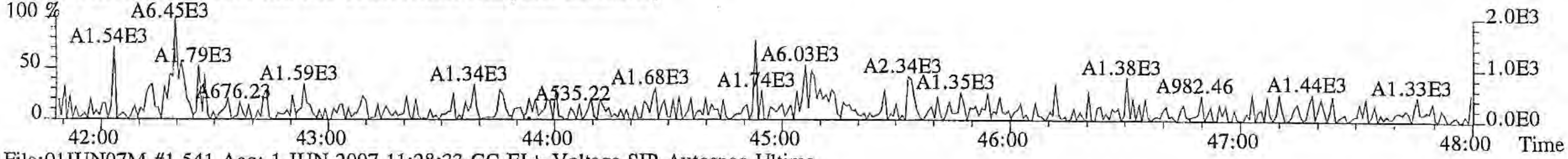
File:01JUN07M #1-464 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
445.7555 S:3 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



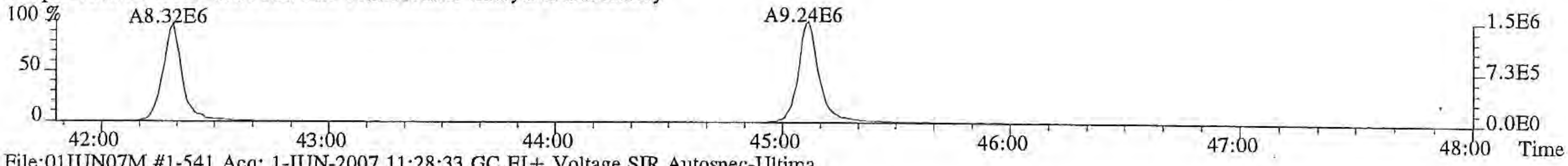
File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
407.7818 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



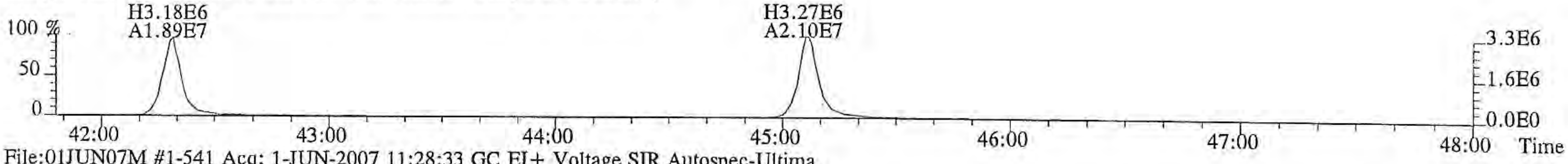
File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
409.7788 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



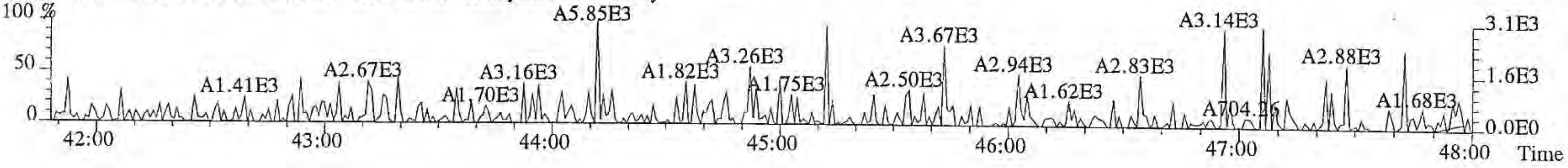
File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
417.8253 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



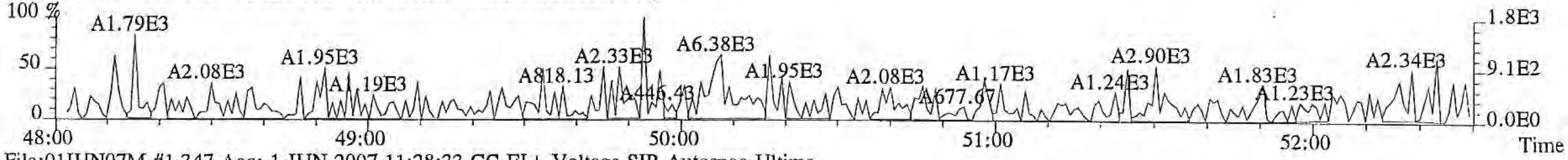
File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
419.8220 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



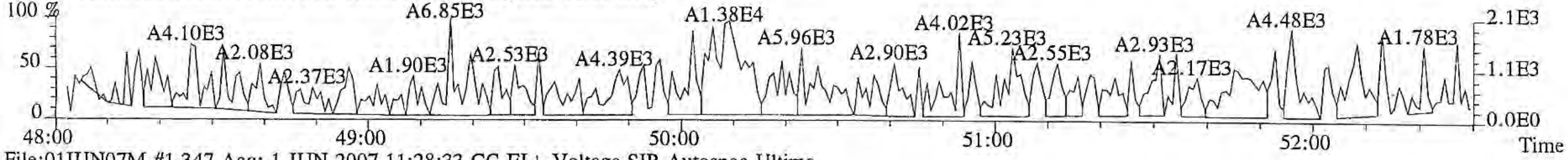
File:01JUN07M #1-541 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
479.7165 S:3 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



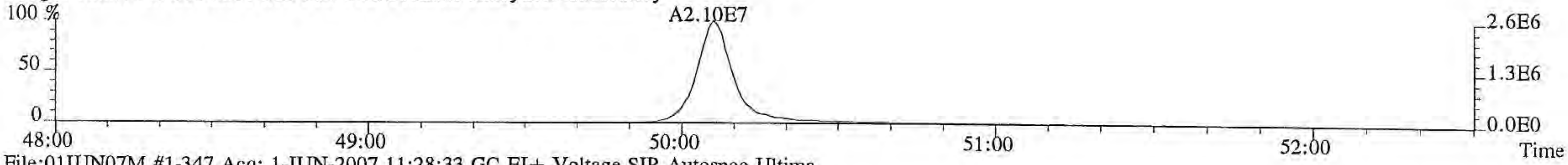
File:01JUN07M #1-347 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
441.7428 S:3 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



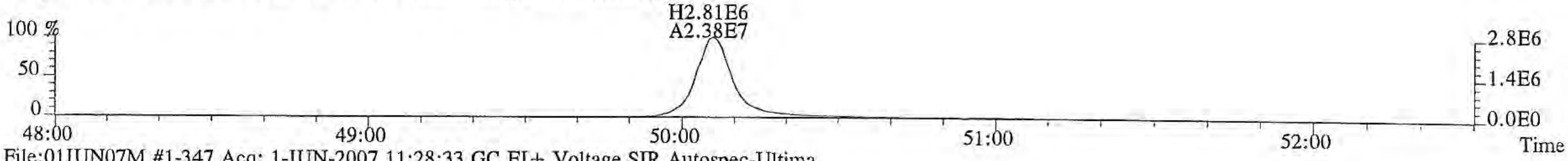
File:01JUN07M #1-347 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
443.7398 S:3 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



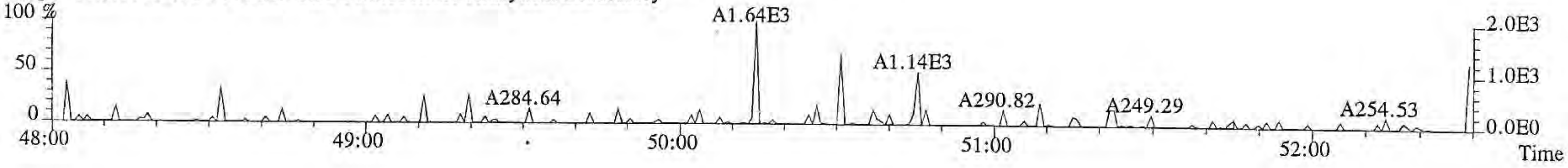
File:01JUN07M #1-347 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
453.7831 S:3 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



File:01JUN07M #1-347 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
455.7801 S:3 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



File:01JUN07M #1-347 Acq: 1-JUN-2007 11:28:33 GC EI+ Voltage SIR Autospec-Ultima
513.6775 S:3 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-MB File Text:Frontier Analytical Laboratory



EPA Method 8290
FORM 8A
PCDD/PCDF ONGOING PRECISION AND RECOVERY (OPR)

Lab Name: Frontier Analytical Laboratory
Episode No.:
Contract No.:
SAS No.:
Matrix (aqueous/solid/leachate): Soil
OPR Data Filename: 01JUN07M Sam:2
Ext. Date: 5/30/07 Shift: Day
Analysis Date: 1-JUN-07 10:33:13

ALL CONCENTRATIONS REPORTED ON THIS FORM ARE CONCENTRATIONS IN EXTRACT.

	SPIKE CONC. (ng/mL)	CONC. FOUND (ng/mL)	OPR CONC. LIMITS (ng/mL)
NATIVE ANALYTES			
2,3,7,8-TCDD	10	9.38	7.00 - 13.0
1,2,3,7,8-PeCDD	50	48.9	35.0 - 65.0
1,2,3,4,7,8-HxCDD	50	49.4	35.0 - 65.0
1,2,3,6,7,8-HxCDD	50	50.0	35.0 - 65.0
1,2,3,7,8,9-HxCDD	50	44.5	35.0 - 65.0
1,2,3,4,6,7,8-HpCDD	50	48.7	35.0 - 65.0
OCDD	100	93.3	70.0 - 130
2,3,7,8-TCDF	10	9.19	7.00 - 13.0
1,2,3,7,8-PeCDF	50	49.7	35.0 - 65.0
2,3,4,7,8-PeCDF	50	49.3	35.0 - 65.0
1,2,3,4,7,8-HxCDF	50	49.2	35.0 - 65.0
1,2,3,6,7,8-HxCDF	50	47.9	35.0 - 65.0
2,3,4,6,7,8-HxCDF	50	47.6	35.0 - 65.0
1,2,3,7,8,9-HxCDF	50	48.1	35.0 - 65.0
1,2,3,4,6,7,8-HpCDF	50	47.4	35.0 - 65.0
1,2,3,4,7,8,9-HpCDF	50	48.1	35.0 - 65.0
OCDF	100	94.8	70.0 - 130

Analyst:
Date: 6/4/07

EPA Method 8290
FORM 8B
PCDD/PCDF ONGOING PRECISION AND RECOVERY (OPR)

Lab Name: Frontier Analytical Laboratory
Episode No.:

Contract No.:
SAS No.:

Matrix (aqueous/solid/leachate): Soil
OPR Data Filename: 01JUN07M Sam:2

Ext. Date: 5/30/07 Shift: Day
Analysis Date: 1-JUN-07 10:33:13

ALL CONCENTRATIONS REPORTED ON THIS FORM ARE CONCENTRATIONS IN EXTRACT.

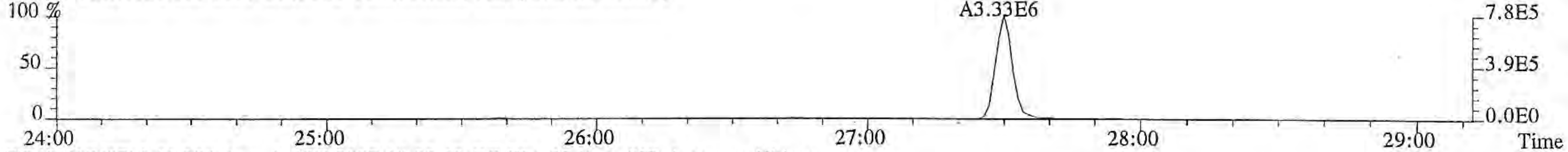
	SPIKE CONC. (ng/mL)	CONC. FOUND (ng/mL)	OPR CONC. LIMITS (1) (ng/mL)
LABELED COMPOUNDS			
13C-2,3,7,8-TCDD	100	81.1	40.0 - 135.0
13C-1,2,3,7,8-PeCDD	100	73.4	40.0 - 135.0
13C-1,2,3,4,7,8-HxCDD	100	96.3	40.0 - 135.0
13C-1,2,3,6,7,8-HxCDD	100	109	40.0 - 135.0
13C-1,2,3,4,6,7,8-HpCDD	100	71.5	40.0 - 135.0
13C-OCDD	200	123	80.0 - 270
13C-2,3,7,8-TCDF	100	88.9	40.0 - 135.0
13C-1,2,3,7,8-PeCDF	100	73.2	40.0 - 135.0
13C-2,3,4,7,8-PeCDF	100	74.9	40.0 - 135.0
13C-1,2,3,4,7,8-HxCDF	100	104	40.0 - 135.0
13C-1,2,3,6,7,8-HxCDF	100	117	40.0 - 135.0
13C-2,3,4,6,7,8-HxCDF	100	101	40.0 - 135.0
13C-1,2,3,7,8,9-HxCDF	100	89.9	40.0 - 135.0
13C-1,2,3,4,6,7,8-HpCDF	100	79.4	40.0 - 135.0
13C-1,2,3,4,7,8,9-HpCDF	100	97.2	40.0 - 135.0
13C-OCDF	200	131	80.0 - 270
CLEANUP STANDARD			
37Cl-2,3,7,8-TCDD	40	31.8	10.0 - 60.0

Analyst: ____________ Date: 6/4/07

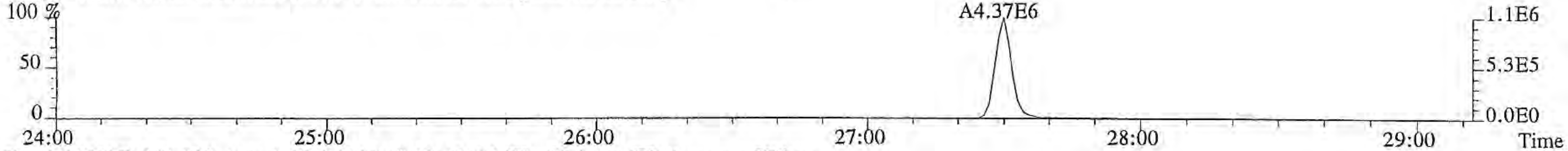
```
FAL ID: 1156-001-0001-OPR     Filename: 01JUN07M   Sam:2   Acquired:  1-JUN-07 10:33:13  ICal: PCDDFAL3-4-17-07
Client ID: OPR                                                       ConCal: ST060107M1     EndCal: ST060107M2
Results:                GC Column: DB5     Amount: 1.000                                      NATO 1989 Tox:      97.2
                                                                                              WHO 1998 Tox:       121
                   Name       Resp    RA        RT      RRF        Conc     Qual     Fac   Noise        DL

       2,3,7,8-TCDD   7.70e+06  0.76 y  27:30    1.11        9.38             2.50     -          *
     1,2,3,7,8-PeCDD  4.01e+07  1.58 y  33:18    1.10        48.9             2.50     -          *
   1,2,3,4,7,8-HxCDD  2.14e+07  1.26 y  38:38    0.82        49.4             2.50     -          *
   1,2,3,6,7,8-HxCDD  2.24e+07  1.27 y  38:48    0.74        50.0             2.50     -          *
   1,2,3,7,8,9-HxCDD  2.04e+07  1.25 y  39:16    0.80        44.5             2.50     -          *
 1,2,3,4,6,7,8-HpCDD  1.50e+07  1.03 y  44:13    0.75        48.7             2.50     -          *
                OCDD  2.07e+07  0.89 y  49:45    0.80        93.3             2.50     -          *

        2,3,7,8-TCDF  1.19e+07  0.77 y  26:45    0.85        9.19             2.50     -          *
     1,2,3,7,8-PeCDF  4.22e+07  1.61 y  31:35    0.78        49.7             2.50     -          *
     2,3,4,7,8-PeCDF  4.05e+07  1.57 y  32:53    0.76        49.3             2.50     -          *
   1,2,3,4,7,8-HxCDF  3.35e+07  1.26 y  37:16    1.02        49.2             2.50     -          *
   1,2,3,6,7,8-HxCDF  3.72e+07  1.26 y  37:27    0.92        47.9             2.50     -          *
   2,3,4,6,7,8-HxCDF  3.04e+07  1.27 y  38:24    0.93        47.6             2.50     -          *
   1,2,3,7,8,9-HxCDF  2.42e+07  1.27 y  39:50    0.92        48.1             2.50     -          *
 1,2,3,4,6,7,8-HpCDF  2.42e+07  1.03 y  42:19    1.10        47.4             2.50     -          *
 1,2,3,4,7,8,9-HpCDF  2.55e+07  1.03 y  45:08    0.99        48.1             2.50     -          *
                OCDF  2.86e+07  0.91 y  50:07    0.77        94.8             2.50     -          *
                                                                                                    Rec
    13C-2,3,7,8-TCDD  7.37e+07  0.78 y  27:29    1.03        81.1                                  81.1
  13C-1,2,3,7,8-PeCDD 7.45e+07  1.60 y  33:16    1.15        73.4                                  73.4
 13C-1,2,3,4,7,8-HxCDD 5.32e+07 1.23 y  38:37    1.34        96.3                                  96.3
 13C-1,2,3,6,7,8-HxCDD 6.08e+07 1.31 y  38:47    1.35         109                                   109
13C-1,2,3,4,6,7,8-HpCDD 4.08e+07 1.01 y 44:12    1.38        71.5                                  71.5
            13C-OCDD  5.59e+07  0.90 y  49:44    1.10         123                                  61.4

    13C-2,3,7,8-TCDF  1.54e+08  0.78 y  26:44    1.28        88.9                                  88.9
  13C-1,2,3,7,8-PeCDF 1.09e+08  1.60 y  31:33    1.10        73.2                                  73.2
  13C-2,3,4,7,8-PeCDF 1.08e+08  1.60 y  32:52    1.07        74.9                                  74.9
 13C-1,2,3,4,7,8-HxCDF 6.71e+07 0.52 y  37:14    1.56         104                                   104
 13C-1,2,3,6,7,8-HxCDF 8.42e+07 0.51 y  37:26    1.74         117                                   117
 13C-2,3,4,6,7,8-HxCDF 6.86e+07 0.52 y  38:22    1.65         101                                   101
 13C-1,2,3,7,8,9-HxCDF 5.47e+07 0.50 y  39:49    1.47        89.9                                  89.9
13C-1,2,3,4,6,7,8-HpCDF 4.66e+07 0.44 y 42:19    1.42        79.4                                  79.4
13C-1,2,3,4,7,8,9-HpCDF 5.38e+07 0.44 y 45:07    1.34        97.2                                  97.2
            13C-OCDF  7.82e+07  0.90 y  50:06    1.44         131                                  65.6

   37Cl-2,3,7,8-TCDD  2.15e+07          27:30    0.77        31.8                                  79.5

    13C-1,2,3,4-TCDD  8.81e+07  0.79 y  26:53      -          104
    13C-1,2,3,4-TCDF  1.35e+08  0.78 y  25:39      -          104
 13C-1,2,3,7,8,9-HxCDD 4.13e+07 1.26 y  39:14      -         57.1
                                                                          Fac   Noise        DL   #Hom
  Total Tetra-Dioxins 7.80e+06          24:13    1.11        9.51         2.50     -          *   9
  Total Penta-Dioxins 4.01e+07          33:18    1.10        48.9         2.50     -          *   1
   Total Hexa-Dioxins 6.49e+07          38:38    0.79         145         2.50     -          *   10
  Total Hepta-Dioxins 1.56e+07          42:50    0.75        50.7         2.50     -          *   22

   Total Tetra-Furans 1.24e+07          24:18    0.85        9.54         2.50     -          *   16
1st Fn. Tot Penta-Furans 1.27e+05       22:48    0.77       0.152         2.50     -          *   28   PeCDF
   Total Penta-Furans 8.44e+07          30:19    0.77         101         2.50     -          *   10   101
    Total Hexa-Furans 1.26e+08          35:36    0.95         194         2.50     -          *   16
   Total Hepta-Furans 5.02e+07          42:19    1.04        96.4         2.50     -          *   20
```

Analyst:______________   Date: 6/4/07

File:01JUN07M #1-390 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
319.8965 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
321.8936 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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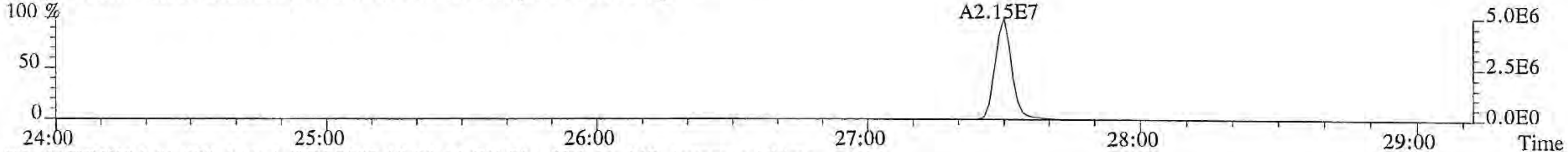
327.8847 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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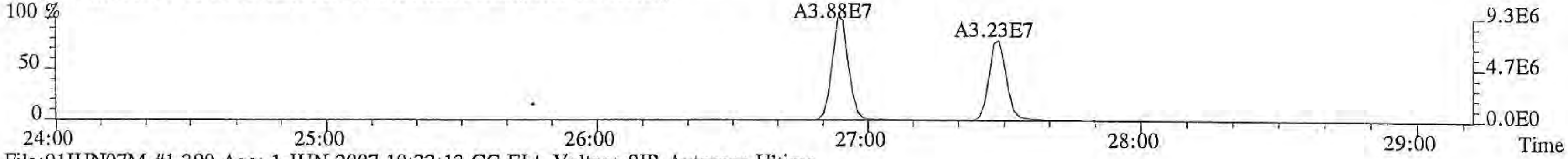
331.9368 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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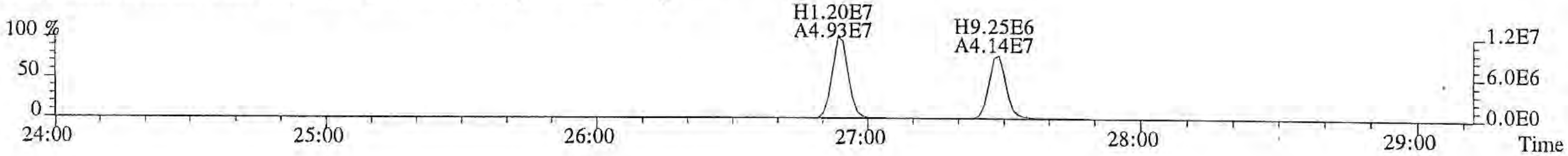
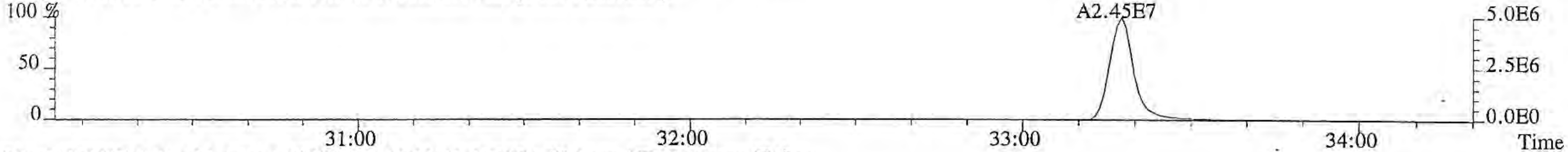
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
355.8546 S:2 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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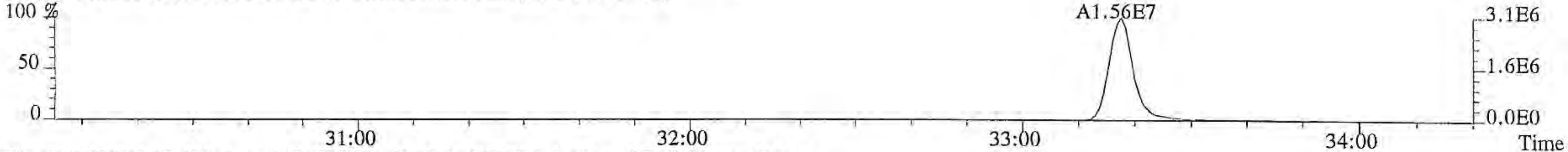
357.8517 S:2 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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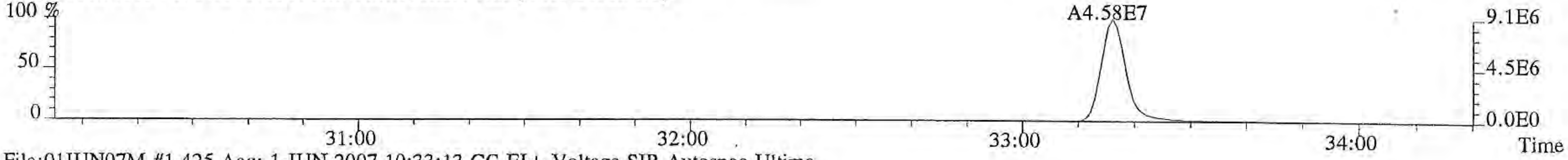
367.8949 S:2 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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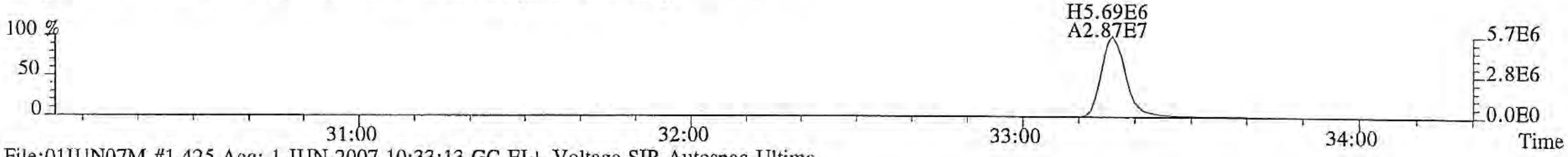
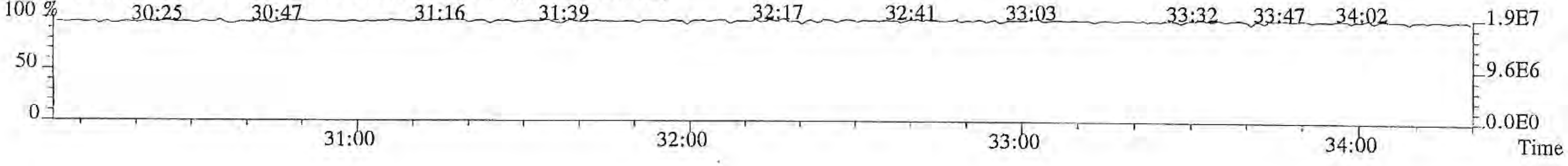
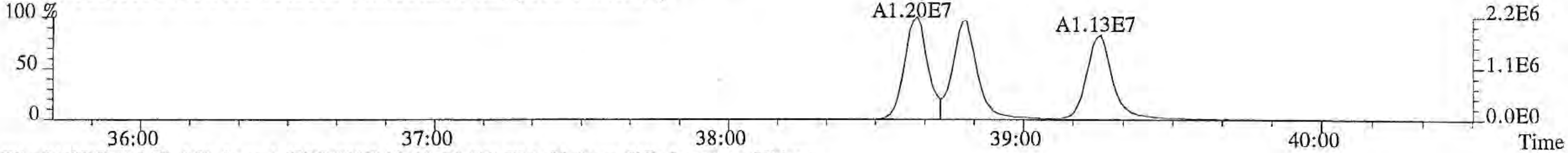
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



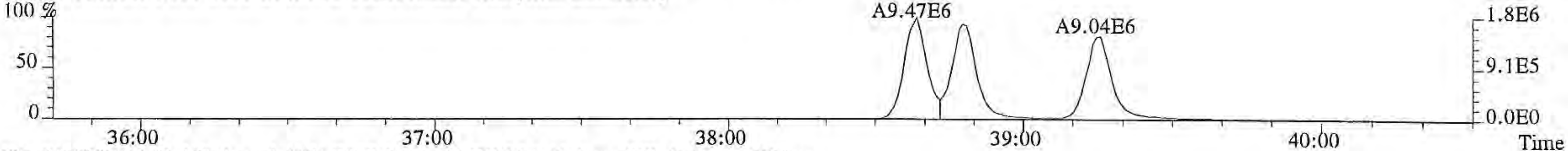
File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
366.9792 S:2 F:2 Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



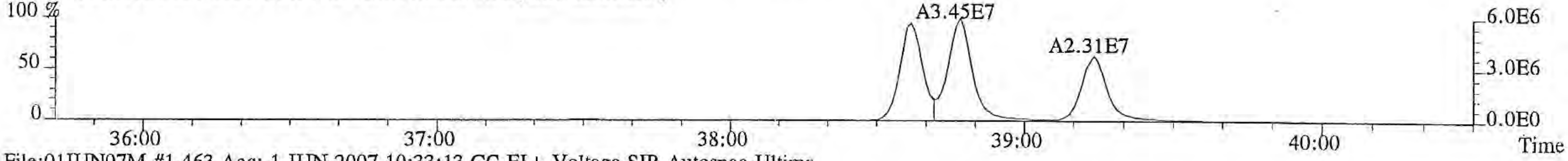
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
389.8156 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



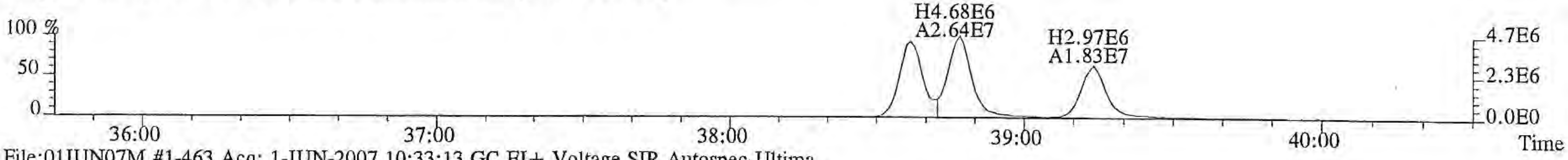
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
391.8127 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



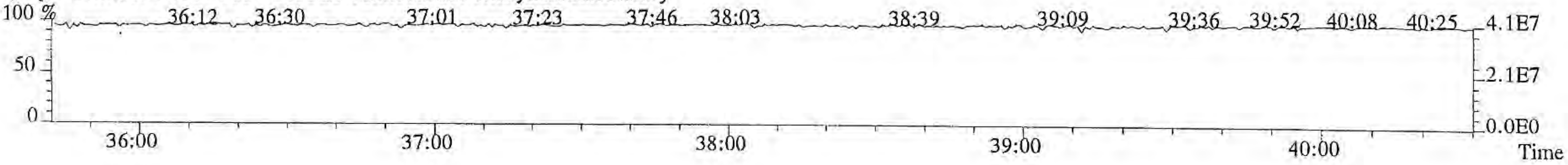
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
401.8559 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



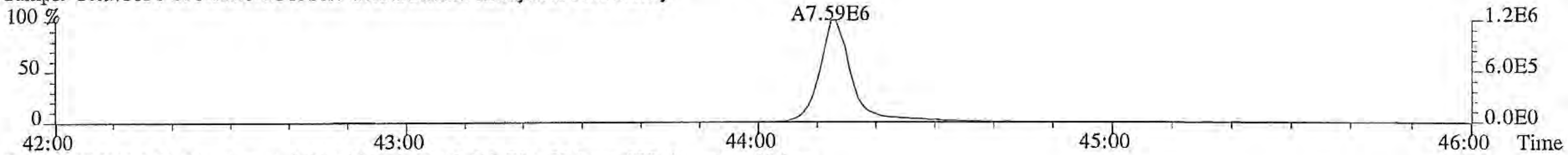
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
403.8530 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



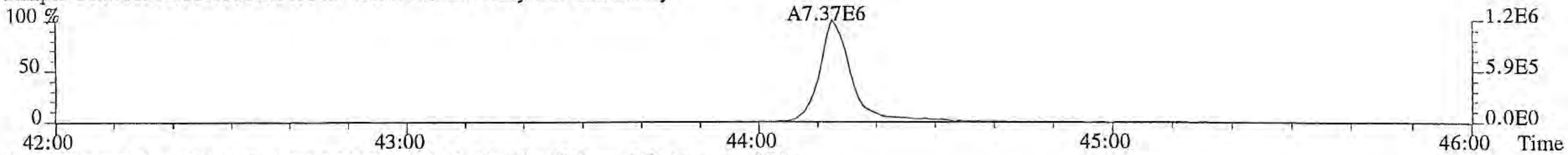
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
380.9760 S:2 F:3 Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



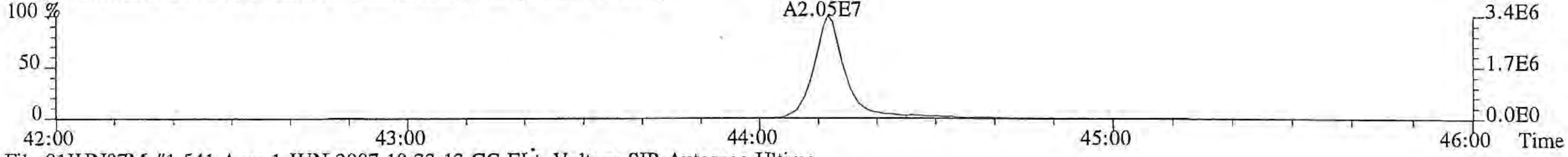
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
423.7767 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



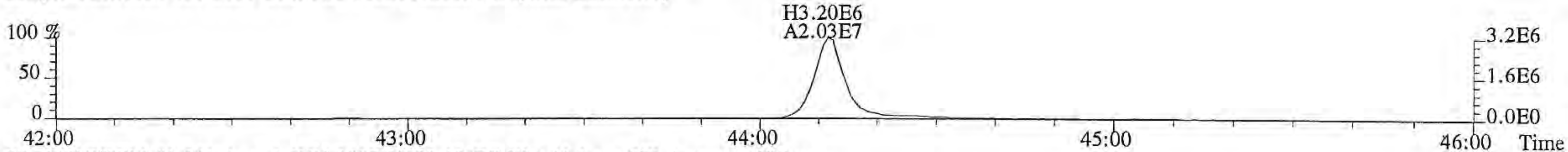
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
425.7737 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



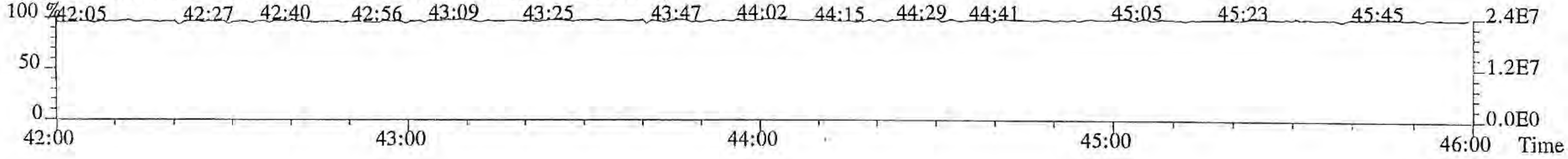
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
435.8169 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
437.8140 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory

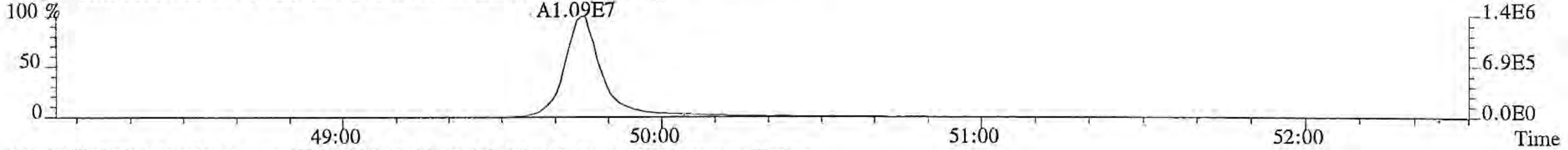


File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
430.9728 S:2 F:4 Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory

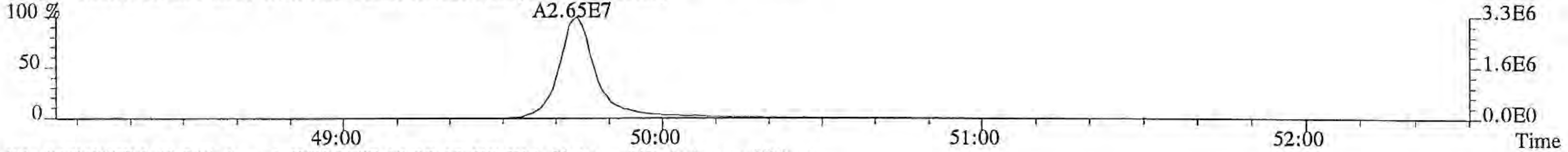


File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
457.7377 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory

File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
459.7348 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
469.7780 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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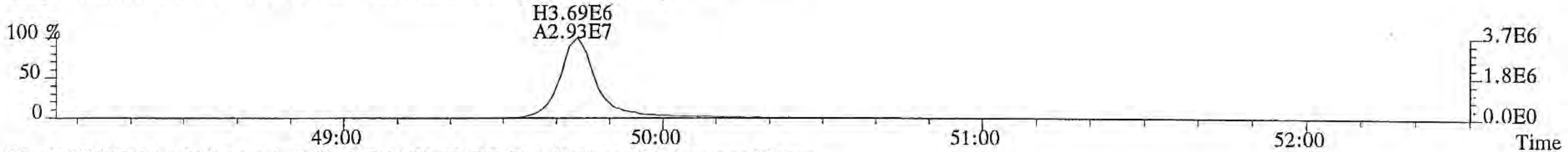
471.7750 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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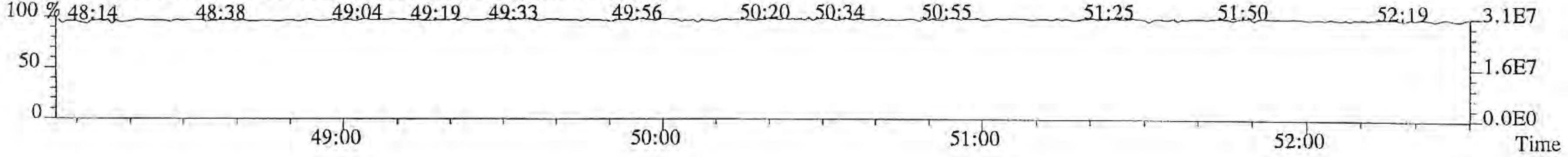
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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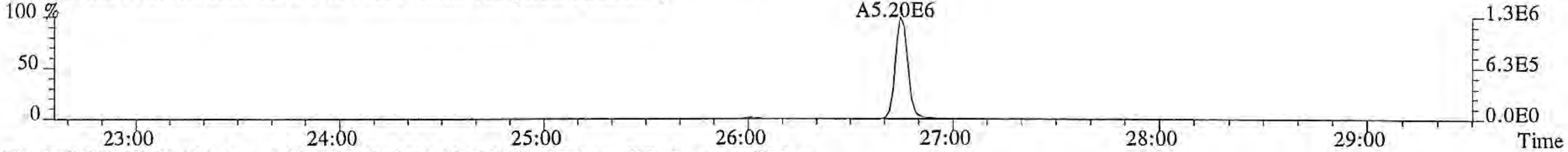

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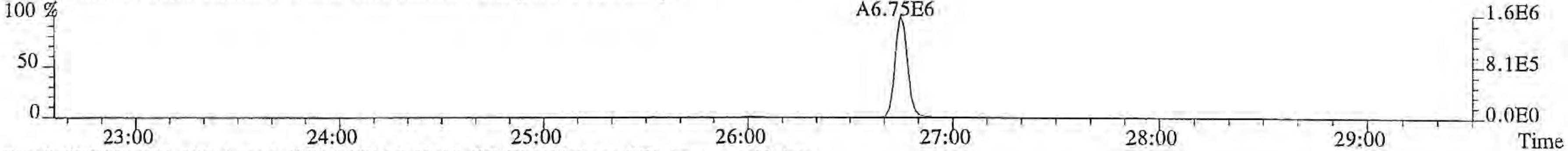
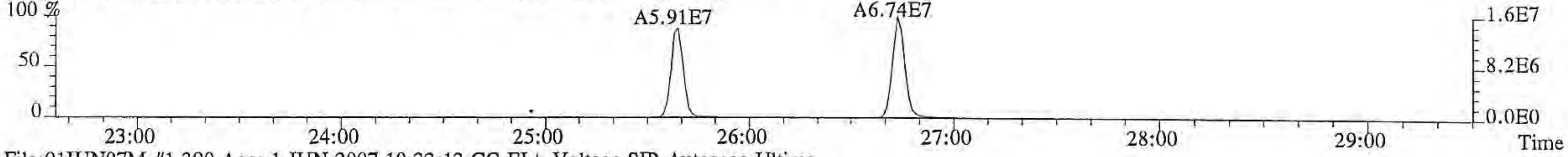
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
315.9419 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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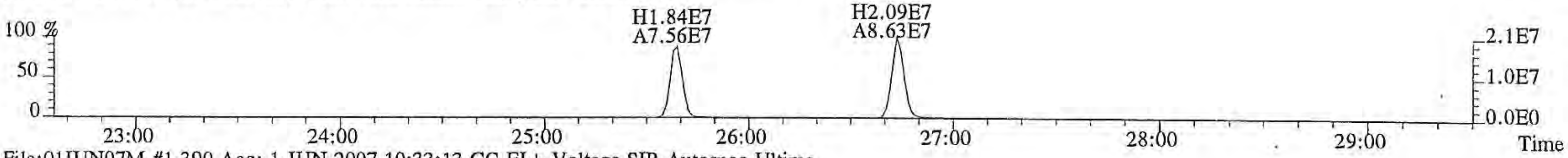
317.9389 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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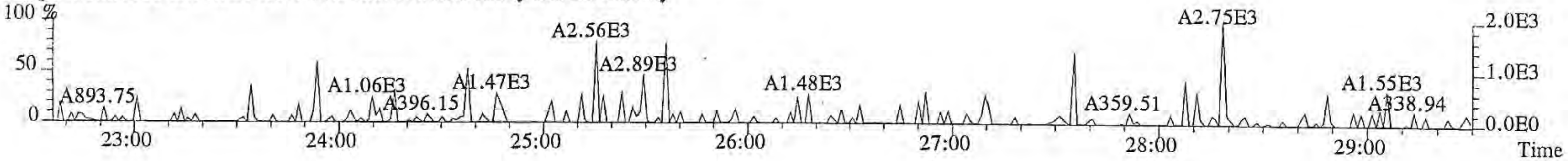
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
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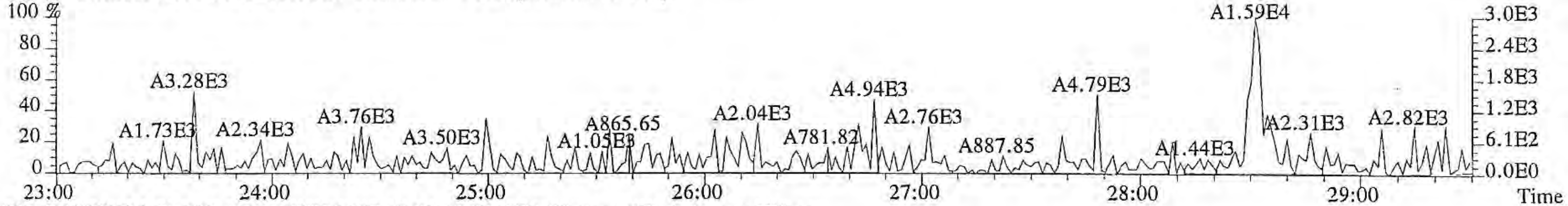
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
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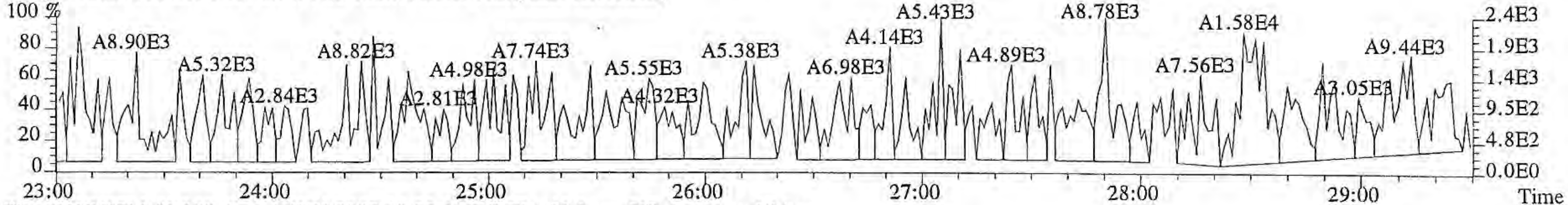
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



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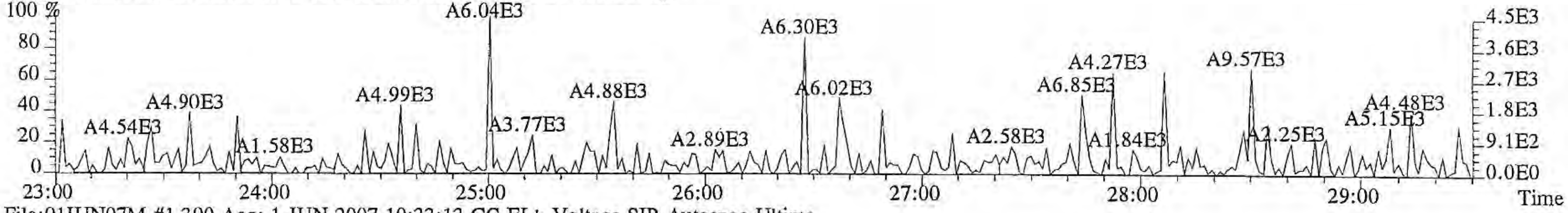
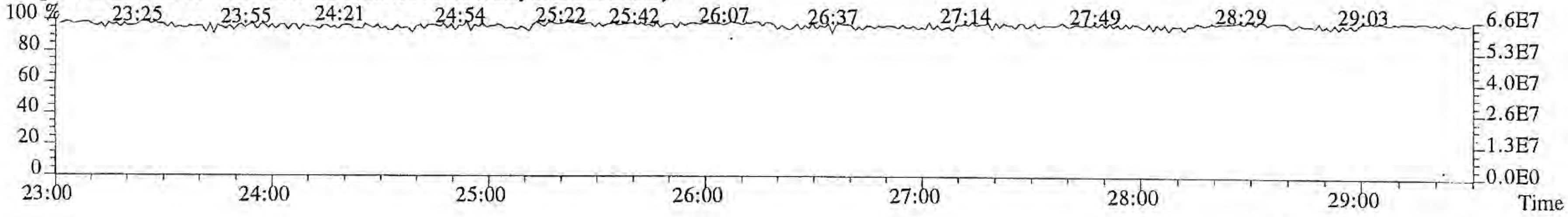
409.7974 S:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
330.9792 S:2 Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
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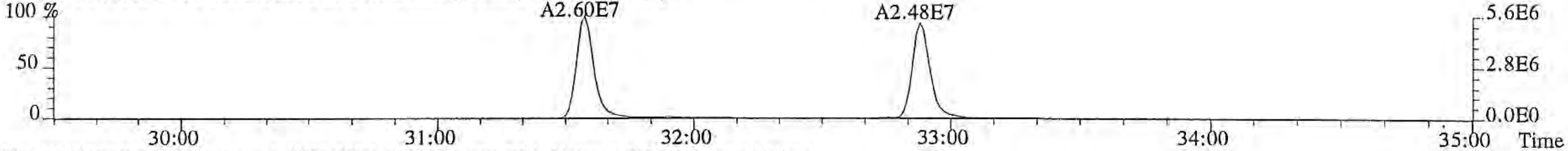
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
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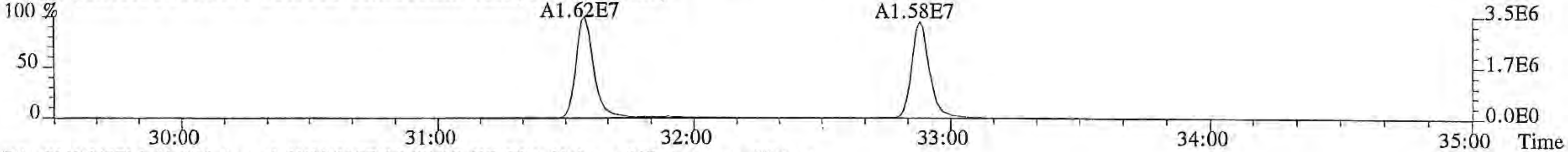
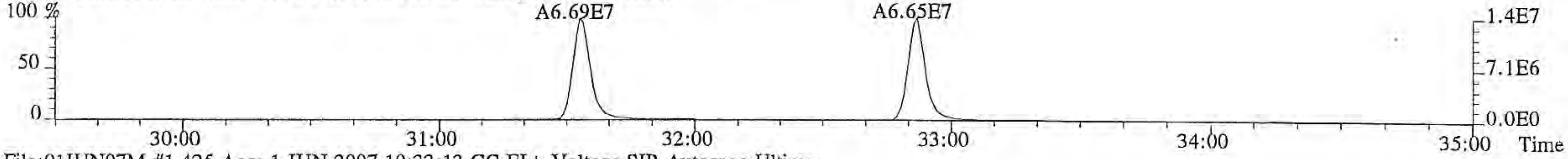
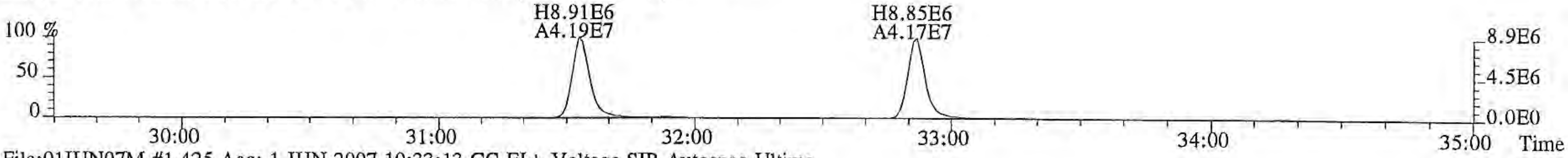
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



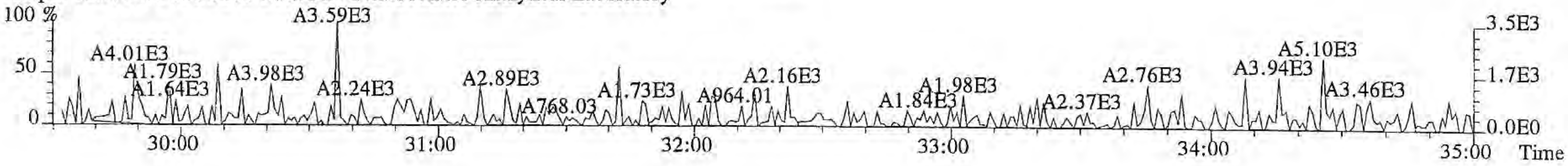
File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
351.9000 S:2 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



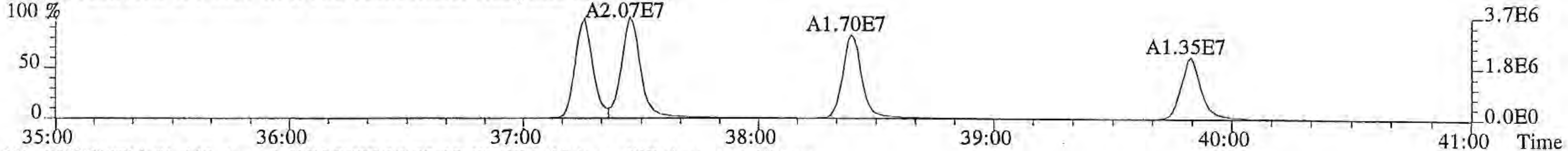
File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
353.8970 S:2 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



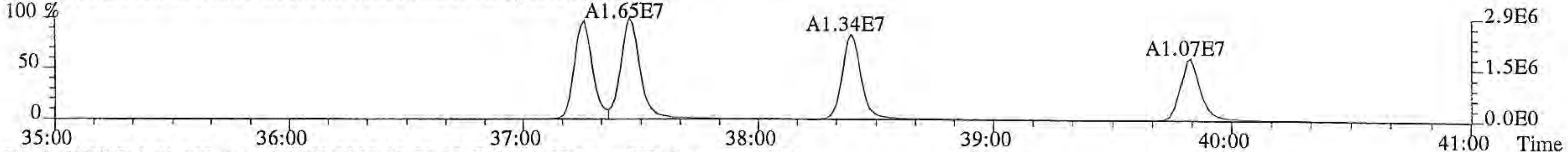
File:01JUN07M #1-425 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
409.7974 S:2 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



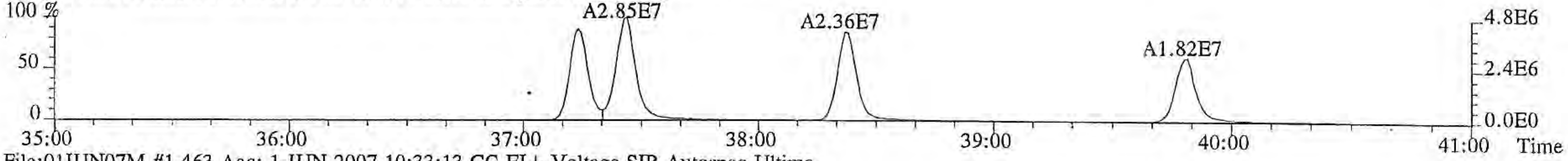
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
373.8207 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



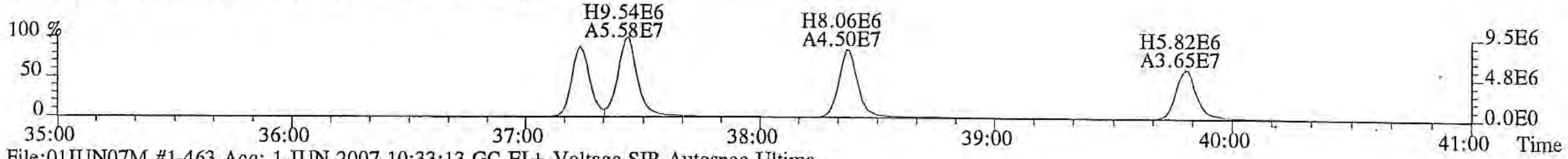
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
375.8178 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



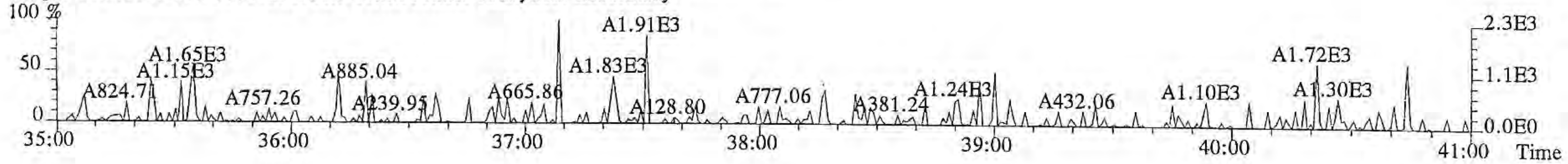
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
383.8639 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



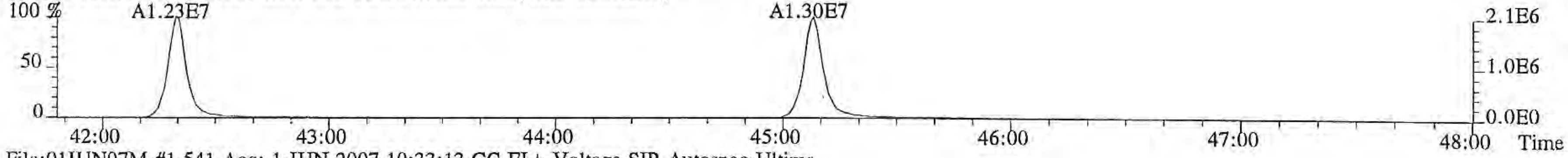
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
385.8610 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



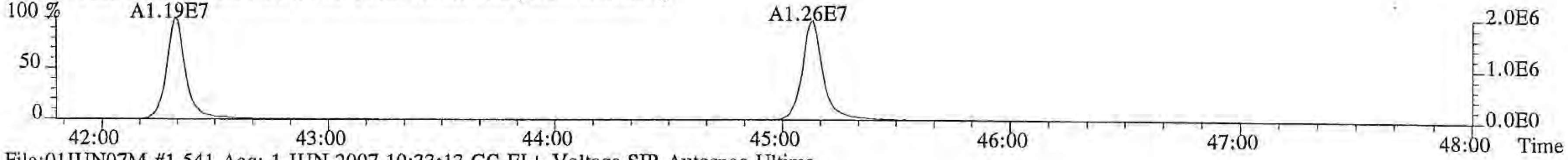
File:01JUN07M #1-463 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
445.7555 S:2 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



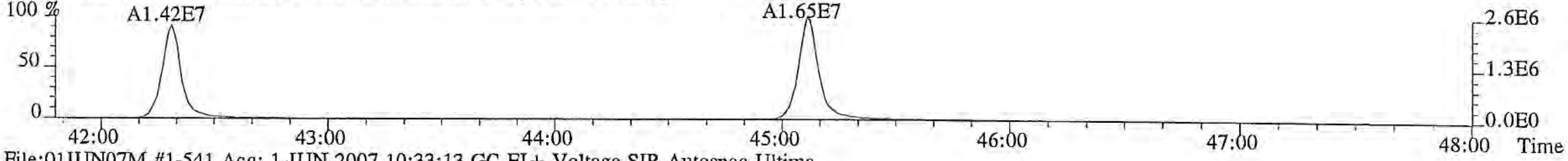
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
407.7818 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



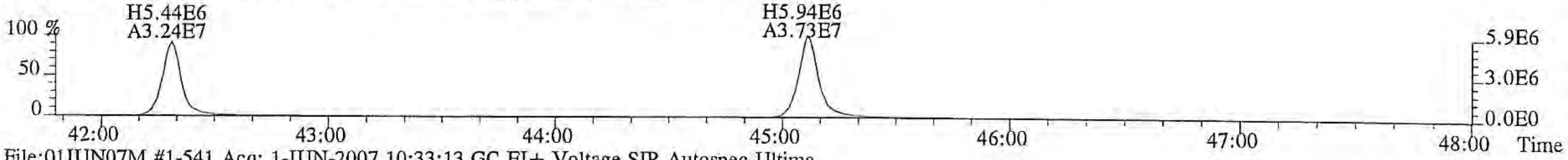
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
409.7788 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



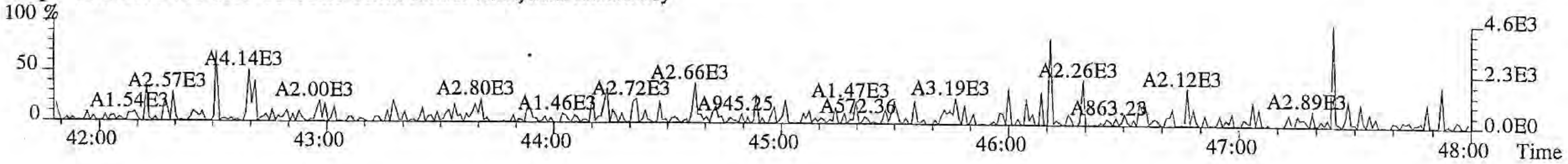
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
417.8253 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



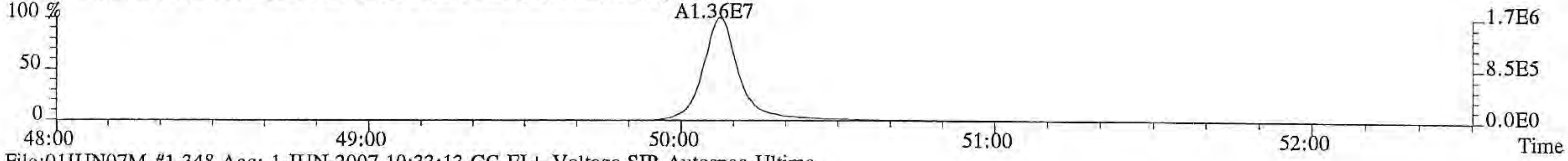
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
419.8220 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



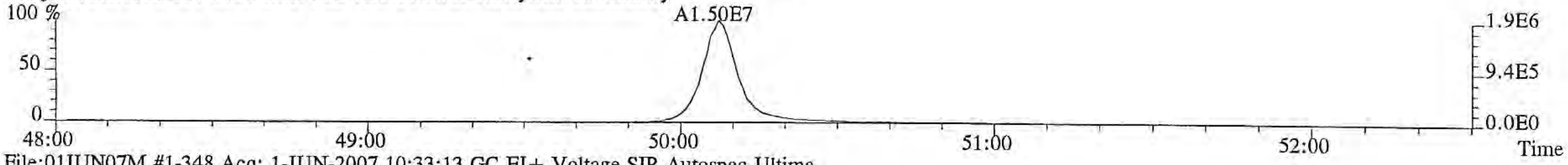
File:01JUN07M #1-541 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
479.7165 S:2 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



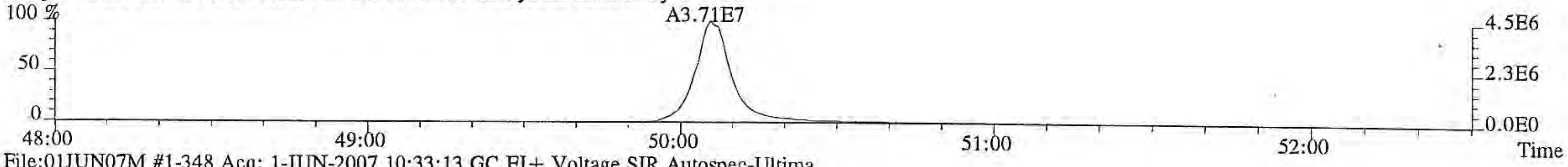
File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
441.7428 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



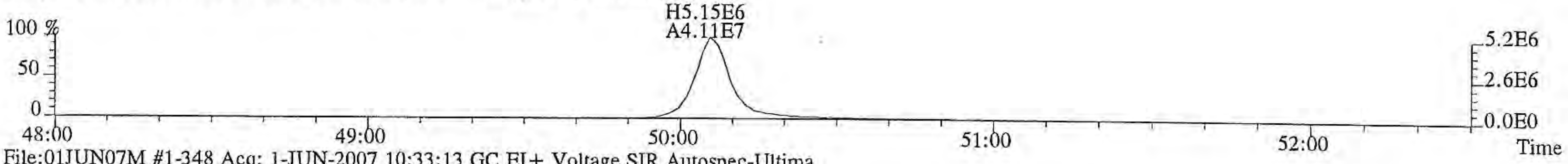
File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
443.7398 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



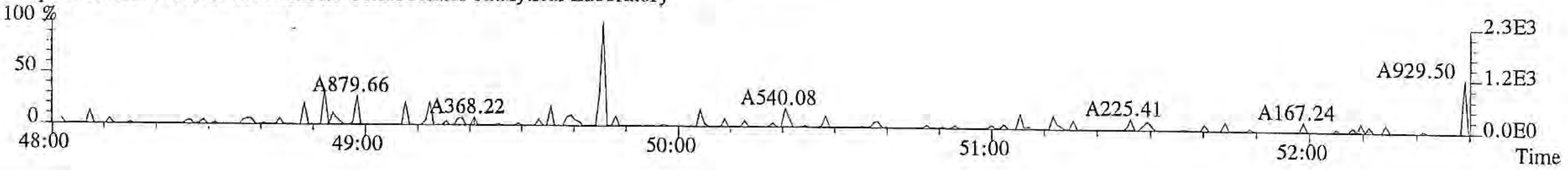
File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
453.7831 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
455.7801 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 10:33:13 GC EI+ Voltage SIR Autospec-Ultima
513.6775 S:2 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:1156-001-0001-OPR File Text:Frontier Analytical Laboratory



```
FAL ID: 4451-001-0001-SA      Filename: 01JUN07M   Sam:12  Acquired:  1-JUN-07 19:46:28  ICal: PCDDFAL3-4-17-07
Client ID: 07-4032-KQ93A                                      ConCal: ST060107M2     EndCal: ST060107M3
Results: 4457           GC Column: DB5      Amount: 10.12 NATO 1989 Tox:        11.8
                                                     WHO 1998 Tox:        10.3          WHO 2005 Tox:        10.6
                    Name        Resp     RA       RT      RRF        Conc    Qual    Fac    Noise        DL

          2,3,7,8-TCDD  1.25e+05  0.75 y  27:30     1.11      0.270      J   2.50      -           *
        1,2,3,7,8-PeCDD  6.22e+05  1.57 y  33:18     1.10       1.60      J   2.50      -           *
      1,2,3,4,7,8-HxCDD  8.02e+05  1.10 y  38:39     0.82       3.90          2.50      -           *
      1,2,3,6,7,8-HxCDD  3.27e+06  1.27 y  38:49     0.74       14.7          2.50      -           *
      1,2,3,7,8,9-HxCDD  1.79e+06  1.16 y  39:15     0.80       8.05          2.50      -           *
    1,2,3,4,6,7,8-HpCDD  6.01e+07  1.03 y  44:13     0.75        349          2.50      -           *
                   OCDD  3.53e+08  0.89 y  49:46     0.80       2390          2.50      -           *
                                                                      OK DB225
          2,3,7,8-TCDF  1.40e+06  0.75 y  26:45     0.85       2.04      F   2.50      -           *
        1,2,3,7,8-PeCDF  4.46e+05  1.59 y  31:35     0.78       1.05      J   2.50      -           *
        2,3,4,7,8-PeCDF  4.52e+05  1.60 y  32:55     0.76       1.13      J   2.50      -           *
      1,2,3,4,7,8-HxCDF  1.11e+06  1.31 y  37:16     1.02       3.45          2.50      -           *
      1,2,3,6,7,8-HxCDF  5.73e+05  1.24 y  37:27     0.92       1.50      J   2.50      -           *
      2,3,4,6,7,8-HxCDF  7.56e+05  1.32 y  38:24     0.93       2.39      J   2.50      -           *
      1,2,3,7,8,9-HxCDF  3.32e+05  1.20 y  39:53     0.92       1.30      J   2.50      -           *
    1,2,3,4,6,7,8-HpCDF  9.35e+06  1.03 y  42:20     1.10       34.8          2.50      -           *
    1,2,3,4,7,8,9-HpCDF  5.78e+05  0.95 y  45:08     0.99       2.08      J   2.50      -           *
                   OCDF  1.75e+07  0.88 y  50:08     0.77       98.0          2.50      -           *
                                                                                                         Rec
      13C-2,3,7,8-TCDD  8.20e+07  0.80 y  27:29     1.03        164                                     82.9
    13C-1,2,3,7,8-PeCDD  6.96e+07  1.60 y  33:16     1.15        124                                     63.0
   13C-1,2,3,4,7,8-HxCDD  4.98e+07  1.27 y  38:37     1.34        178                                     90.2
   13C-1,2,3,6,7,8-HxCDD  5.95e+07  1.28 y  38:47     1.35        211                                      107
 13C-1,2,3,4,6,7,8-HpCDD  4.52e+07  1.05 y  44:13     1.38        156                                     79.2
               13C-OCDD  7.34e+07  0.89 y  49:45     1.10        319                                     80.8

      13C-2,3,7,8-TCDF  1.61e+08  0.78 y  26:44     1.28        174                                     88.2
    13C-1,2,3,7,8-PeCDF  1.08e+08  1.59 y  31:33     1.10        136                                     68.7
    13C-2,3,4,7,8-PeCDF  1.04e+08  1.61 y  32:52     1.07        135                                     68.4
   13C-1,2,3,4,7,8-HxCDF  6.23e+07  0.51 y  37:14     1.56        191                                     96.8
   13C-1,2,3,6,7,8-HxCDF  8.18e+07  0.51 y  37:27     1.74        225                                      114
   13C-2,3,4,6,7,8-HxCDF  6.72e+07  0.53 y  38:23     1.65        195                                     98.7
   13C-1,2,3,7,8,9-HxCDF  5.49e+07  0.50 y  39:48     1.47        178                                     90.3
 13C-1,2,3,4,6,7,8-HpCDF  4.84e+07  0.44 y  42:19     1.42        163                                     82.5
 13C-1,2,3,4,7,8,9-HpCDF  5.57e+07  0.43 y  45:07     1.34        199                                      101
               13C-OCDF  9.13e+07  0.91 y  50:07     1.44        303                                     76.6

    37Cl-2,3,7,8-TCDD  2.29e+07          27:30     0.77       61.7                                     78.1

      13C-1,2,3,4-TCDD  9.59e+07  0.80 y  26:55       -        11.2
      13C-1,2,3,4-TCDF  1.42e+08  0.78 y  25:39       -        10.9
   13C-1,2,3,7,8,9-HxCDD  4.13e+07  1.26 y  39:14       -        5.64
                                                                      Fac    Noise        DL    #Hom
    Total Tetra-Dioxins  2.37e+07          24:30     1.11       51.2          2.50      -          *   12
    Total Penta-Dioxins  1.61e+07          30:20     1.10       41.4          2.50      -          *   10
     Total Hexa-Dioxins  4.60e+07          36:12     0.79        212          2.50      -          *   8
    Total Hepta-Dioxins  1.79e+08          42:51     0.75       1040          2.50      -          *   2

     Total Tetra-Furans  1.01e+07          23:10     0.85       14.7    D,M   2.50      -          *   23
 1st Fn. Tot Penta-Furans  7.21e+06          28:33     0.77       17.5    D,M   2.50      -          *   1    PeCDF
     Total Penta-Furans  5.39e+06          30:10     0.77       13.0    D,M   2.50      -          *   11   30.5
      Total Hexa-Furans  2.78e+07          35:20     0.95       87.3    D,M   2.50      -          *   10
     Total Hepta-Furans  3.57e+07          42:20     1.04        131          2.50      -          *   4
```

Analyst: ______ Date: 6/4/07

```
 Totals class: Total Tetra-Dioxins         Entry #: 38

        Run: 16       File: 01JUN07M         S: 12 I: 1  F: 1
    Acquired:  1-JUN-07 19:46:28

Total Concentration: 51.2              Unnamed Concentration: 50.945


   RT    ml Resp     m2 Resp RA           Resp   Concentration  Name

24:30   4.90e+06    6.37e+06 0.77 y   1.13e+07             24.4
24:48   2.93e+06    3.92e+06 0.75 y   6.84e+06             14.8
25:06   6.22e+04    8.02e+04 0.78 y   1.42e+05            0.308
25:52   1.81e+05    2.17e+05 0.83 y   3.98e+05            0.861
26:03   2.86e+05    3.83e+05 0.75 y   6.68e+05             1.45
26:11   5.34e+04    7.07e+04 0.76 y   1.24e+05            0.269
26:35   5.62e+04    7.17e+04 0.78 y   1.28e+05            0.277
26:56   1.33e+06    1.74e+06 0.77 y   3.07e+06             6.64
27:15   3.41e+05    4.53e+05 0.75 y   7.94e+05             1.72
27:30   5.33e+04    7.15e+04 0.75 y   1.25e+05            0.270  2,3,7,8-TCDD
27:48   3.53e+04    4.82e+04 0.73 y   8.35e+04            0.181
28:12   1.63e+04    2.09e+04 0.78 y   3.72e+04           0.0805
```

```
 Totals class: Total Penta-Dioxins         Entry #: 39

         Run: 16        File: 01JUN07M          S: 12 I: 1  F: 2
    Acquired:  1-JUN-07 19:46:28

Total Concentration: 41.4            Unnamed Concentration: 39.845


   RT    ml Resp     m2 Resp RA           Resp  Concentration  Name

30:20   2.32e+06    1.47e+06 1.58 y   3.79e+06           9.78
30:56   1.92e+05    1.29e+05 1.49 y   3.21e+05          0.829
31:33   2.83e+06    1.73e+06 1.63 y   4.56e+06           11.8
31:46   3.83e+05    2.44e+05 1.57 y   6.27e+05           1.62
31:56   2.54e+06    1.60e+06 1.58 y   4.14e+06           10.7
32:13   3.08e+05    2.02e+05 1.53 y   5.10e+05           1.32
32:41   7.96e+05    4.77e+05 1.67 y   1.27e+06           3.28
33:18   3.80e+05    2.42e+05 1.57 y   6.22e+05           1.60  1,2,3,7,8-PeCDD
33:24   6.82e+04    4.74e+04 1.44 y   1.16e+05          0.298
33:53   6.91e+04    3.93e+04 1.76 y   1.08e+05          0.280
```

```
  Totals class: Total Hexa-Dioxins          Entry #: 40

          Run: 16        File: 01JUN07M          S: 12 I: 1  F: 3
     Acquired:  1-JUN-07 19:46:28

 Total Concentration: 212            Unnamed Concentration: 184.937


    RT     ml Resp     m2 Resp RA          Resp   Concentration  Name

 36:12   1.00e+07     8.02e+06 1.25 y   1.80e+07            83.1
 37:07   6.05e+06     4.84e+06 1.25 y   1.09e+07            50.2
 37:33   5.43e+06     4.34e+06 1.25 y   9.77e+06            45.0
 37:44   6.04e+05     5.42e+05 1.12 y   1.15e+06            5.28
 38:39   4.20e+05     3.82e+05 1.10 y   8.02e+05            3.90  1,2,3,4,7,8-HxCDD
 38:49   1.83e+06     1.44e+06 1.27 y   3.27e+06            14.7  1,2,3,6,7,8-HxCDD
 39:06   1.71e+05     1.39e+05 1.24 y   3.10e+05            1.43
 39:15   9.60e+05     8.27e+05 1.16 y   1.79e+06            8.05  1,2,3,7,8,9-HxCDD
```

```
 Totals class: Total Hepta-Dioxins          Entry #: 41

        Run: 16       File: 01JUN07M           S: 12 I: 1  F: 4
    Acquired:  1-JUN-07 19:46:28

Total Concentration: 1040              Unnamed Concentration: 688.694


   RT     ml Resp     m2 Resp RA            Resp  Concentration  Name

42:51   6.02e+07    5.84e+07 1.03 y   1.19e+08              689
44:13   3.06e+07    2.96e+07 1.03 y   6.01e+07              349  1,2,3,4,6,7,8-HpCDD
```

```
  Totals class: Total Tetra-Furans          Entry #: 42

           Run: 16        File: 01JUN07M          S: 12 I: 1  F: 1
      Acquired:  1-JUN-07 19:46:28

 Total Concentration: 14.7            Unnamed Concentration: 12.642


    RT    ml Resp     m2 Resp RA          Resp   Concentration  Name

  23:10   9.56e+04   1.34e+05 0.71 y   2.30e+05          0.333
  23:31   9.01e+04   1.29e+05 0.70 y   2.19e+05          0.318
  23:55   4.77e+05   6.42e+05 0.74 y   1.12e+06           1.62
  24:18   3.52e+05   4.63e+05 0.76 y   8.15e+05           1.18
  24:32   3.71e+05   4.96e+05 0.75 y   8.67e+05           1.26
  24:51   2.35e+05   3.01e+05 0.78 y   5.35e+05          0.776
  24:56   7.67e+04   1.04e+05 0.74 y   1.80e+05          0.262
  25:05   1.08e+05   1.43e+05 0.76 y   2.51e+05          0.364
  25:26   1.45e+05   2.06e+05 0.70 y   3.51e+05          0.509
  25:33   2.22e+05   3.01e+05 0.74 y   5.23e+05          0.759
  25:40   3.32e+05   4.46e+05 0.75 y   7.79e+05           1.13
  26:02   3.79e+05   4.86e+05 0.78 y   8.66e+05           1.26
  26:15   8.39e+04   1.00e+05 0.84 y   1.84e+05          0.267
  26:23   6.60e+04   9.73e+04 0.68 y   1.63e+05          0.237
  26:39   1.75e+05   2.36e+05 0.74 y   4.10e+05          0.595
  26:45   5.99e+05   8.04e+05 0.75 y   1.40e+06           2.04  2,3,7,8-TCDF
  27:05   2.28e+05   3.03e+05 0.75 y   5.31e+05          0.771
  27:17   2.71e+04   3.70e+04 0.73 y   6.41e+04         0.0929
  27:35   1.58e+04   2.16e+04 0.73 y   3.74e+04         0.0543
  27:56   3.11e+04   4.09e+04 0.76 y   7.20e+04          0.104
  28:09   2.39e+04   3.49e+04 0.68 y   5.87e+04         0.0852
  28:34   1.25e+05   1.74e+05 0.72 y   2.99e+05          0.434
  28:40   7.17e+04   8.84e+04 0.81 y   1.60e+05          0.232
```

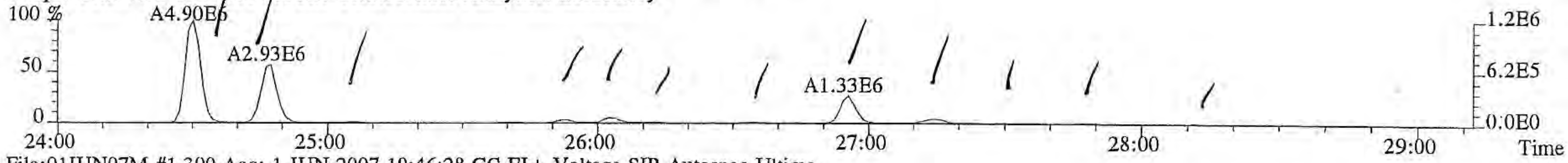
```
 Totals class: 1st Fn. Tot Penta-Furans     Entry #: 43

         Run: 16        File: 01JUN07M          S: 12 I: 1  F: 1
     Acquired:  1-JUN-07 19:46:28

Total Concentration: 17.5             Unnamed Concentration: 17.473


   RT     ml Resp     m2 Resp RA          Resp   Concentration  Name

28:33   4.43e+06    2.78e+06 1.59 y   7.21e+06            17.5
```

```
Totals class: Total Penta-Furans          Entry #: 44

       Run: 16        File: 01JUN07M           S: 12 I: 1  F: 2
    Acquired:  1-JUN-07 19:46:28

Total Concentration: 13.0            Unnamed Concentration: 10.865


   RT    ml Resp     m2 Resp RA           Resp   Concentration  Name

30:10   1.86e+05    1.14e+05 1.63 y   3.01e+05           0.728
30:20   1.18e+06    7.87e+05 1.50 y   1.96e+06            4.76
31:01   4.19e+05    2.74e+05 1.53 y   6.94e+05            1.68
31:20   1.21e+05    7.49e+04 1.62 y   1.96e+05           0.475
31:35   2.74e+05    1.73e+05 1.59 y   4.46e+05            1.05  1,2,3,7,8-PeCDF
31:48   6.99e+04    4.60e+04 1.52 y   1.16e+05           0.281
31:54   3.11e+05    1.90e+05 1.63 y   5.02e+05            1.21
32:06   5.68e+04    4.22e+04 1.35 y   9.90e+04           0.240
32:44   6.78e+04    5.03e+04 1.35 y   1.18e+05           0.286
32:55   2.78e+05    1.74e+05 1.60 y   4.52e+05            1.13  2,3,4,7,8-PeCDF
32:56   3.09e+05    1.89e+05 1.63 y   4.98e+05            1.21
```

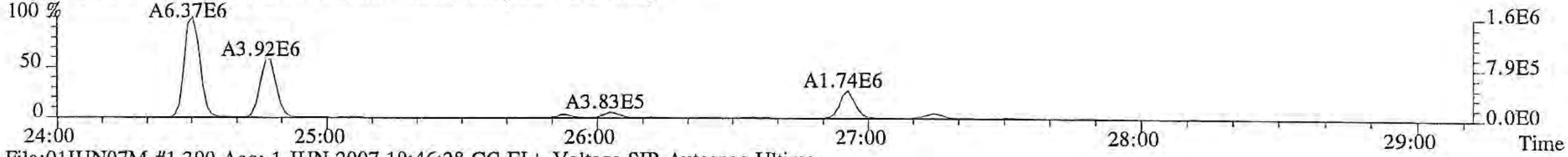
```
Totals class: Total Hexa-Furans          Entry #: 45

        Run: 16        File: 01JUN07M          S: 12 I: 1  F: 3
    Acquired:  1-JUN-07 19:46:28

Total Concentration: 87.3           Unnamed Concentration: 78.629


  RT     ml Resp      m2 Resp RA          Resp   Concentration  Name

35:20   1.63e+06    1.29e+06 1.26 y   2.91e+06            9.14
35:35   4.79e+06    3.80e+06 1.26 y   8.59e+06            27.0
36:10   1.24e+05    8.70e+04 1.42 y   2.11e+05           0.662
36:29   7.23e+06    5.74e+06 1.26 y   1.30e+07            40.7
37:05   8.62e+04    6.88e+04 1.25 y   1.55e+05           0.487
37:16   6.26e+05    4.79e+05 1.31 y   1.11e+06            3.45  1,2,3,4,7,8-HxCDF
37:27   3.17e+05    2.55e+05 1.24 y   5.73e+05            1.50  1,2,3,6,7,8-HxCDF
38:07   1.23e+05    9.72e+04 1.26 y   2.20e+05           0.691
38:24   4.30e+05    3.26e+05 1.32 y   7.56e+05            2.39  2,3,4,6,7,8-HxCDF
39:53   1.81e+05    1.51e+05 1.20 y   3.32e+05            1.30  1,2,3,7,8,9-HxCDF
```

```
 Totals class: Total Hepta-Furans         Entry #: 46

        Run: 16        File: 01JUN07M          S: 12 I: 1  F: 4
    Acquired:  1-JUN-07 19:46:28

Total Concentration: 131             Unnamed Concentration: 93.716

   RT    ml Resp      m2 Resp RA           Resp  Concentration  Name

42:20  4.73e+06    4.62e+06 1.03 y  9.35e+06             34.8  1,2,3,4,6,7,8-HpCDF
42:53  2.21e+05    2.14e+05 1.03 y  4.35e+05             1.58
43:09  1.28e+07    1.25e+07 1.03 y  2.53e+07             92.1
45:08  2.82e+05    2.96e+05 0.95 y  5.78e+05             2.08  1,2,3,4,7,8,9-HpCDF
```

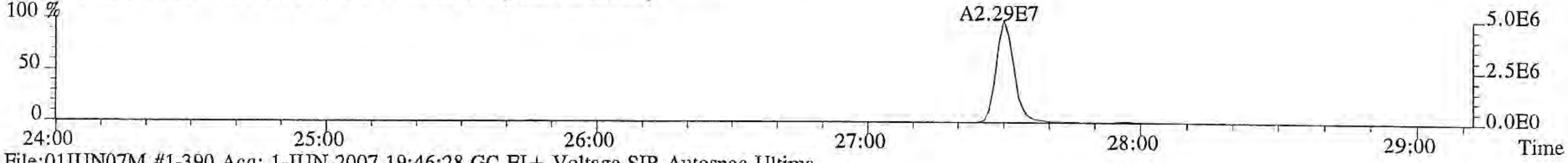
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
319.8965 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



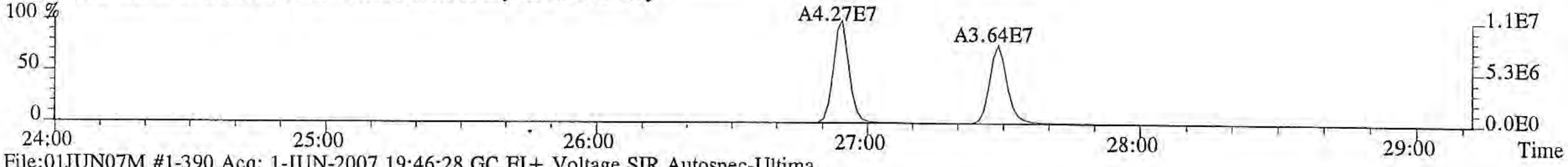
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
321.8936 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



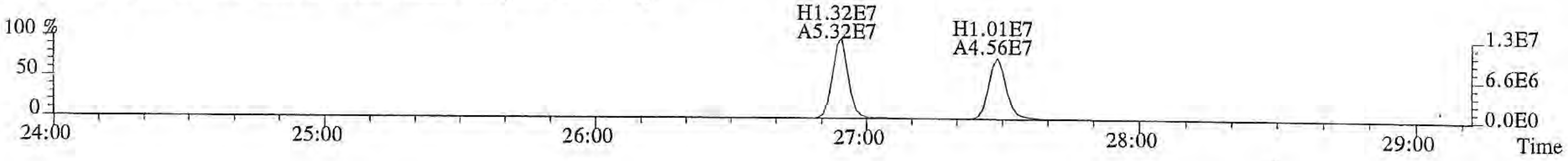
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
327.8847 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



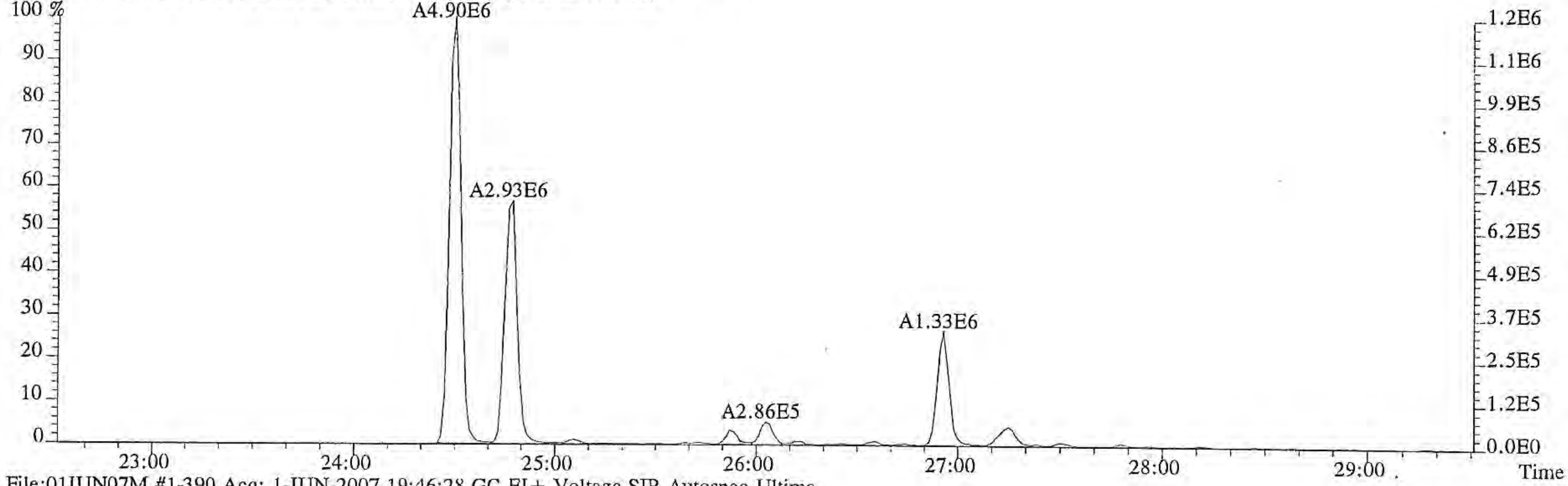
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
331.9368 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



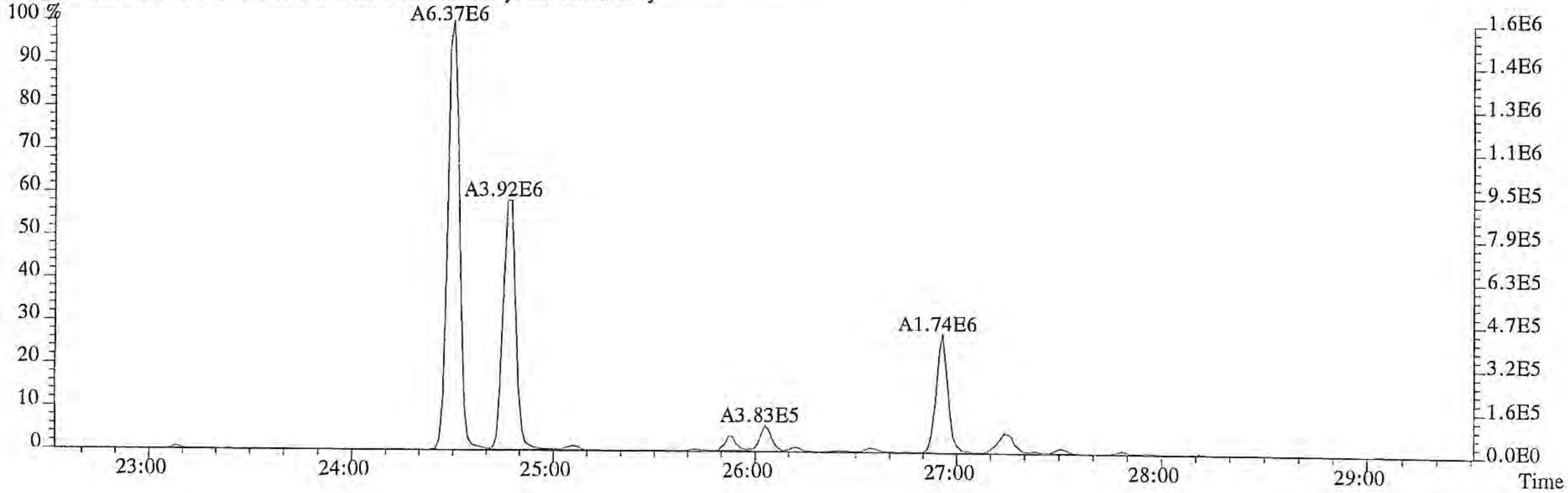
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
333.9339 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



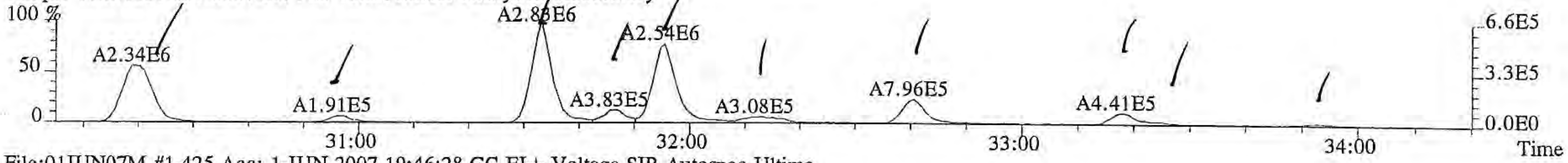
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
319.8965 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



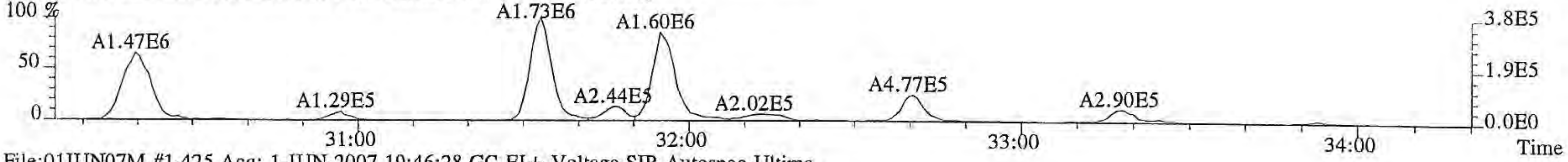
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
321.8936 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



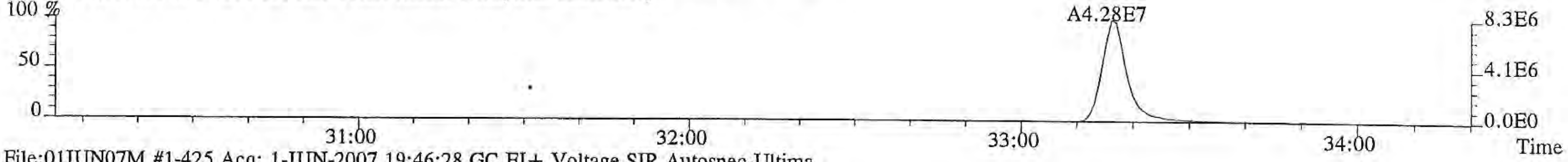
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
355.8546 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



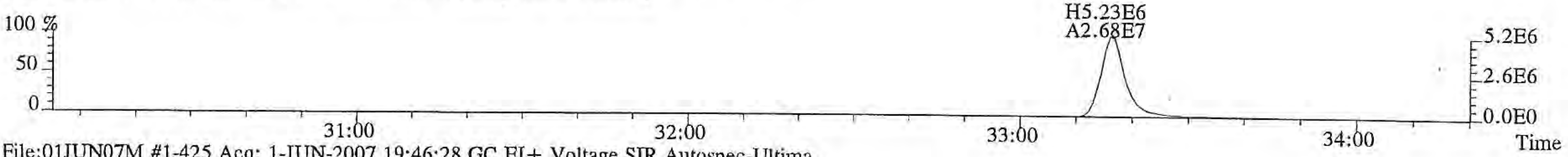
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
357.8517 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



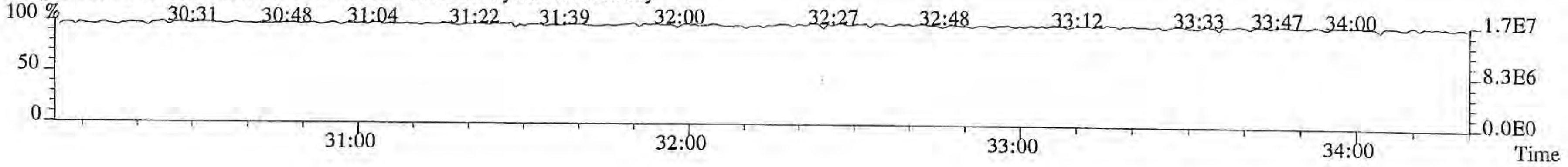
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
367.8949 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



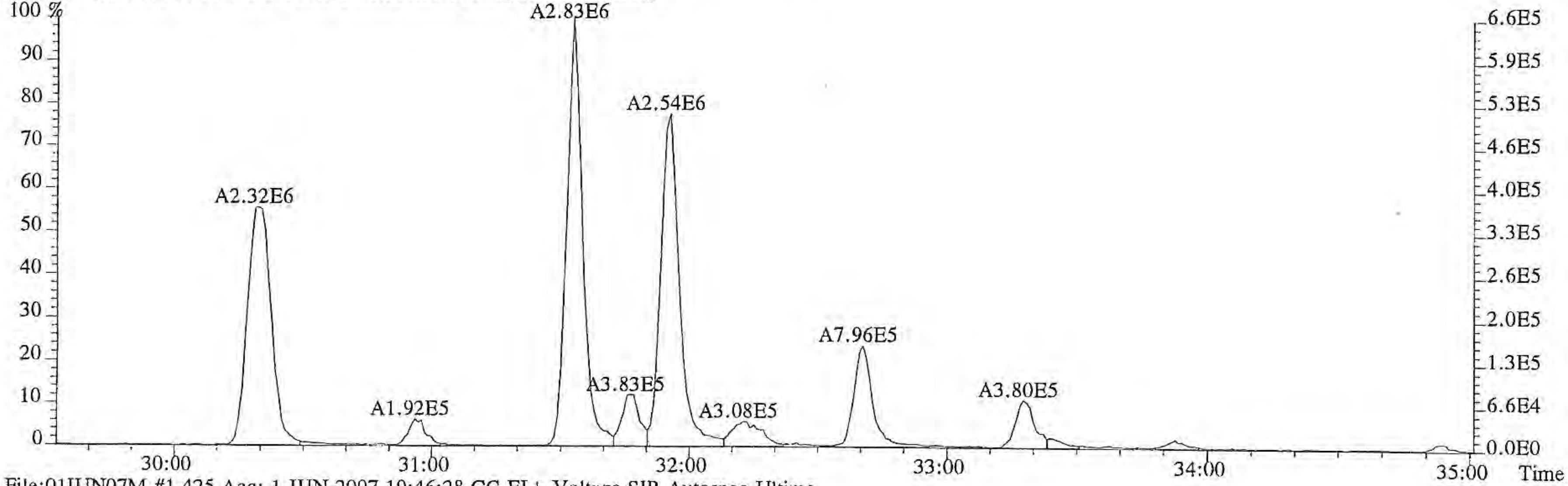
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
369.8919 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



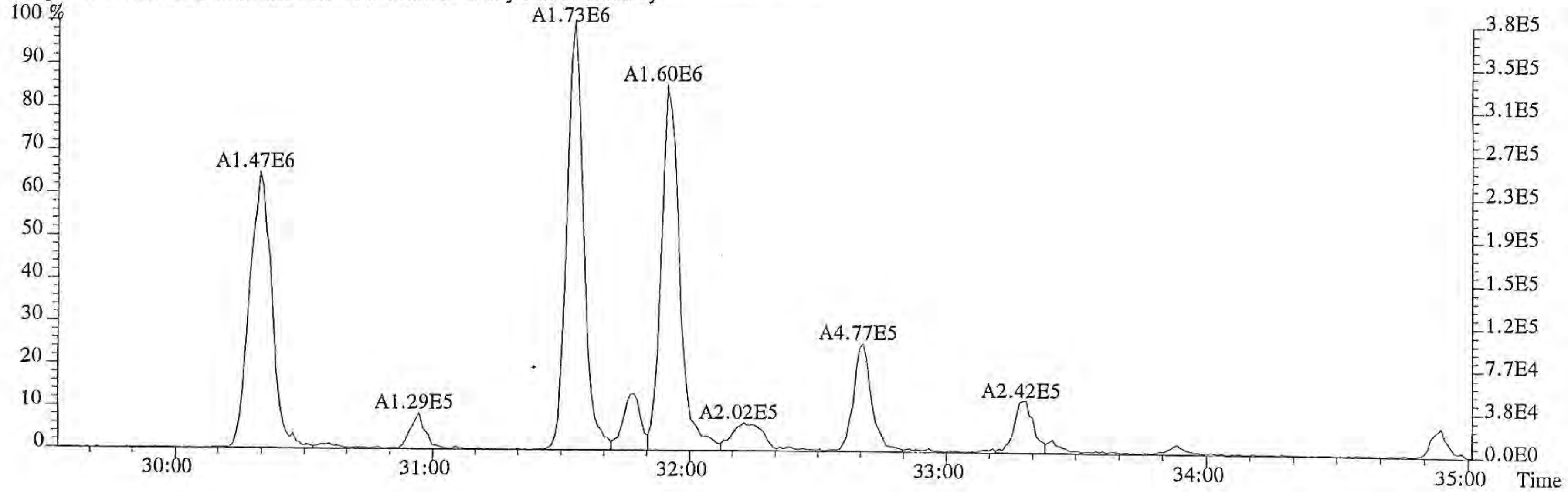
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
366.9792 S:12 F:2 Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



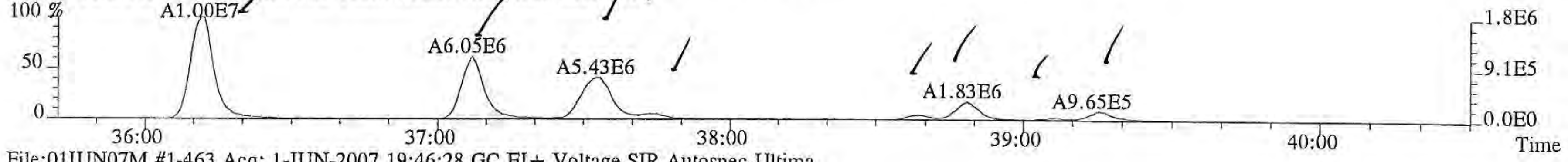
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
355.8546 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



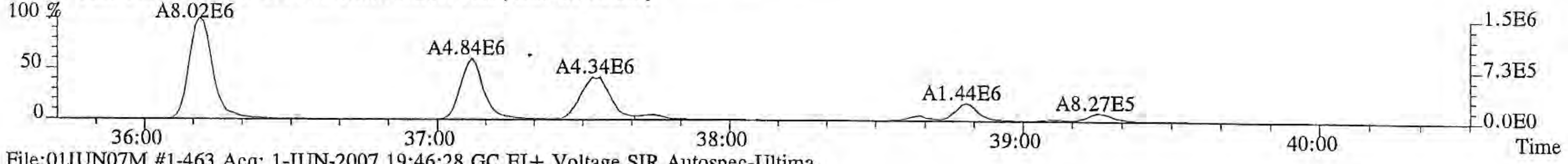
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
357.8517 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



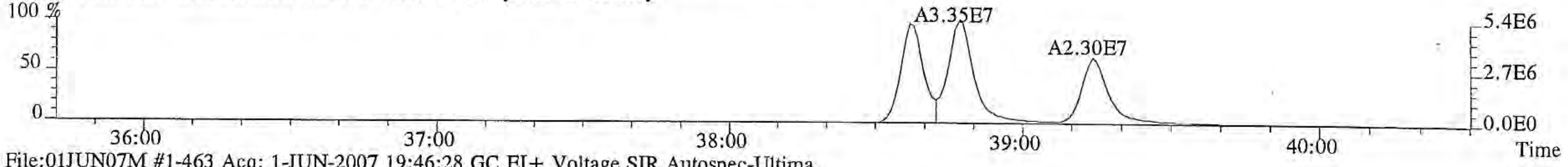
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
389.8156 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



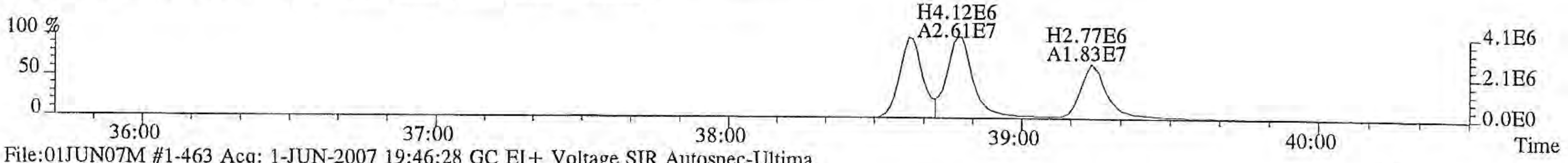
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
391.8127 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



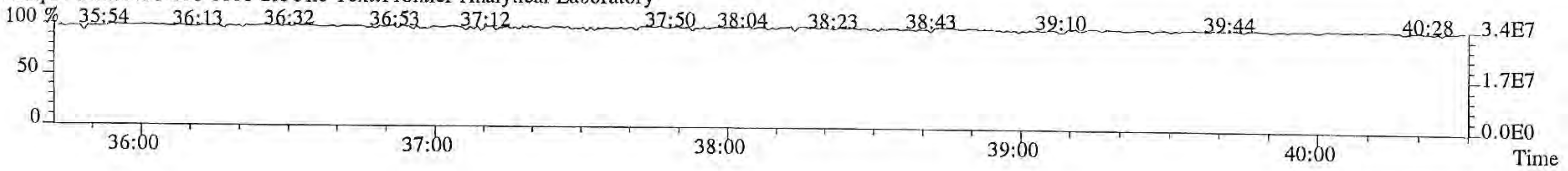
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
401.8559 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



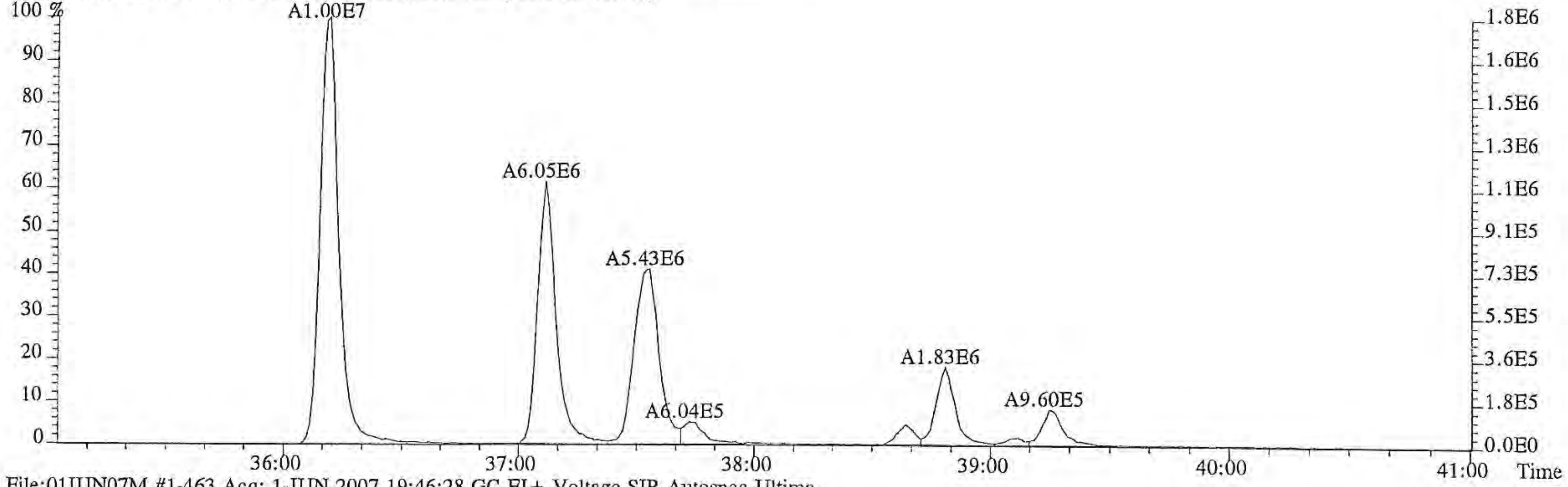
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
403.8530 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



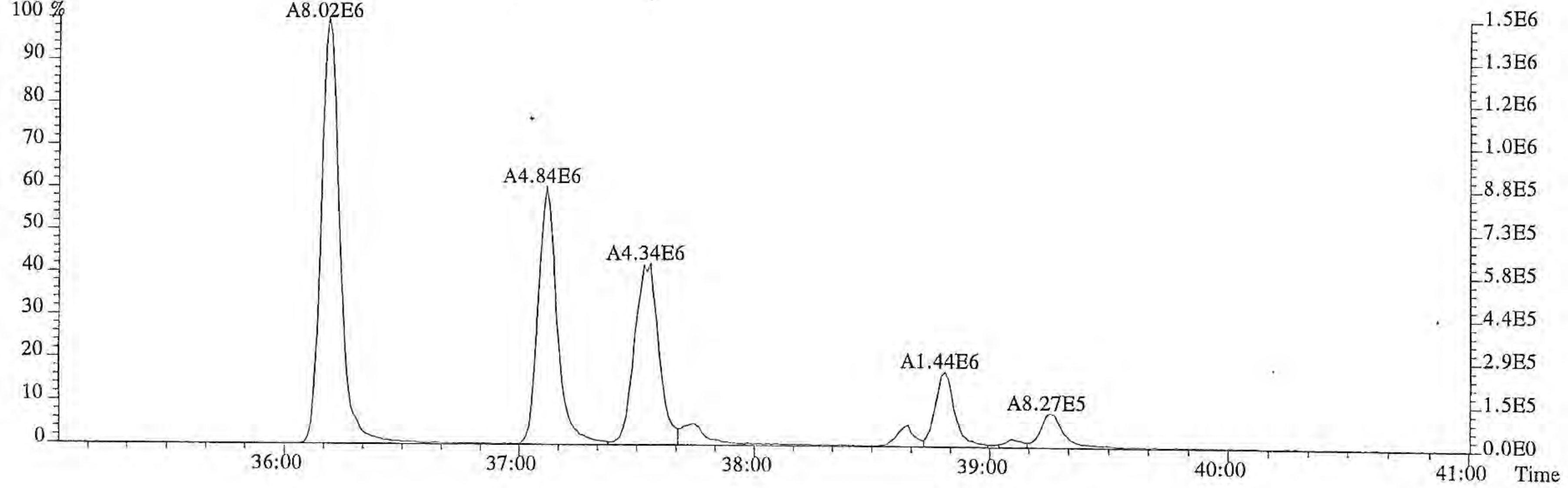
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
380.9760 S:12 F:3 Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



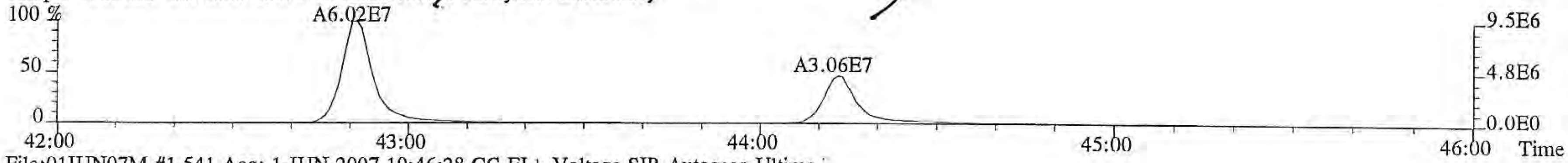
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
389.8156 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



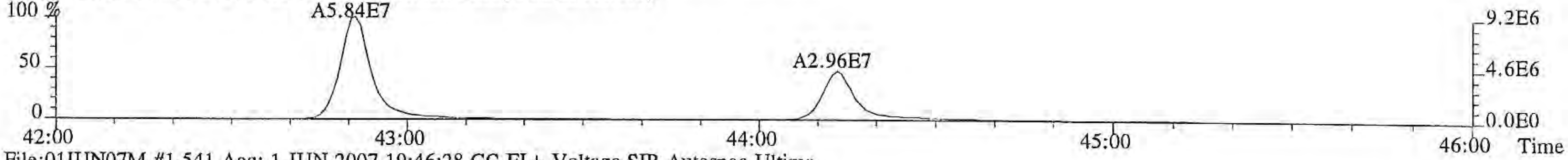
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
391.8127 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



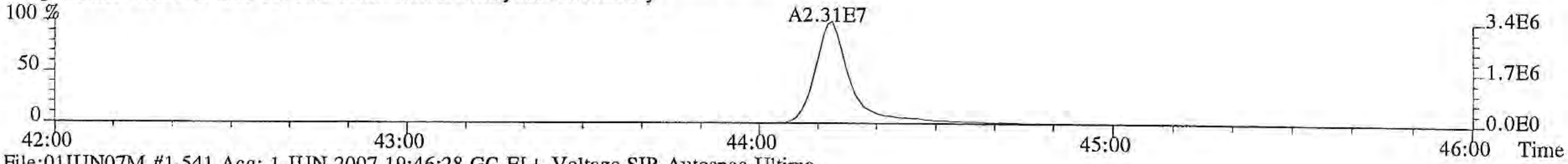
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
423.7767 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



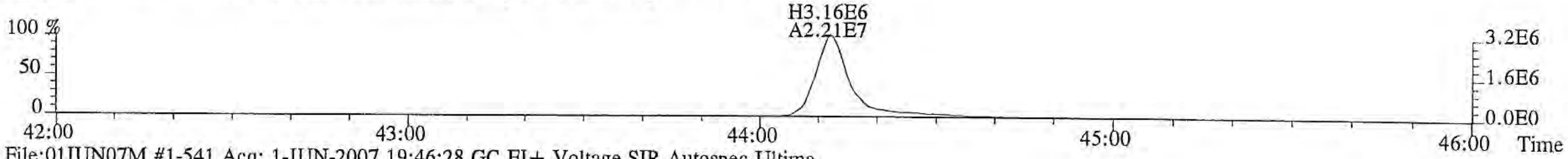
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
425.7737 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



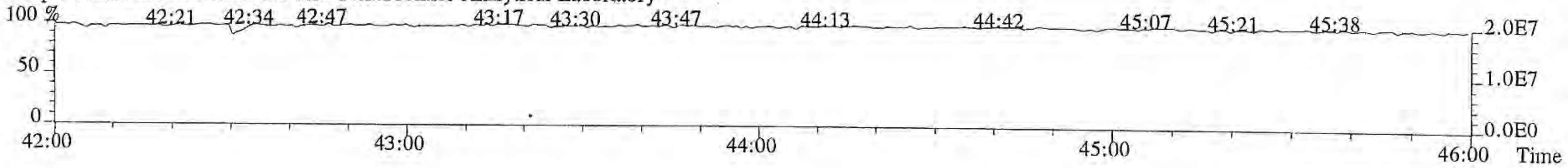
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
435.8169 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



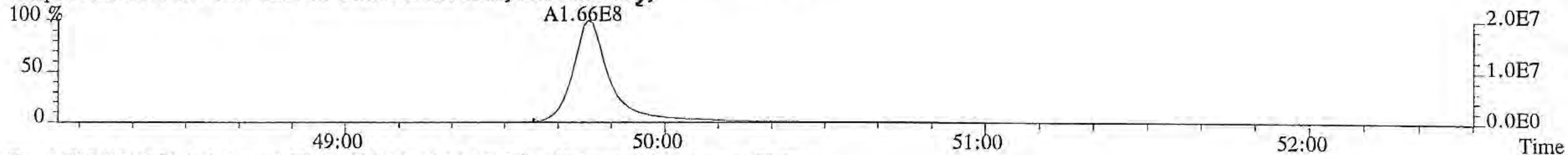
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
437.8140 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



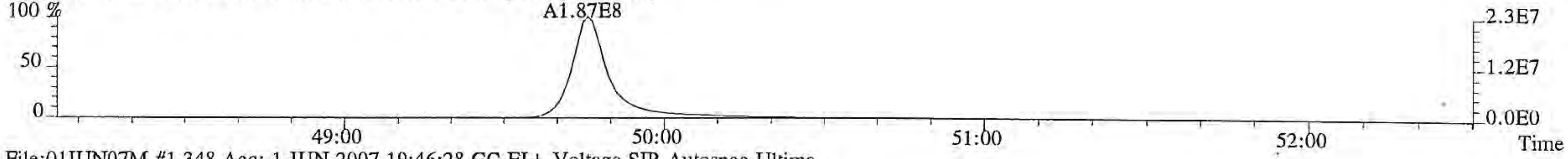
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
430.9728 S:12 F:4 Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



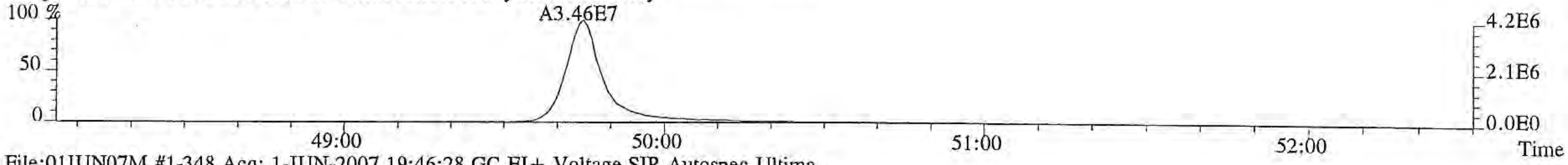
File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
457.7377 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
459.7348 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
469.7780 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



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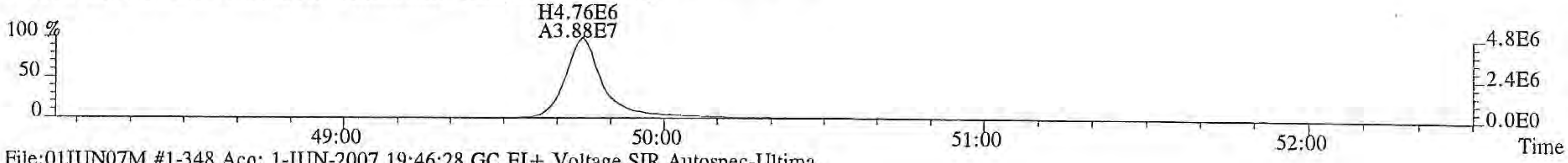
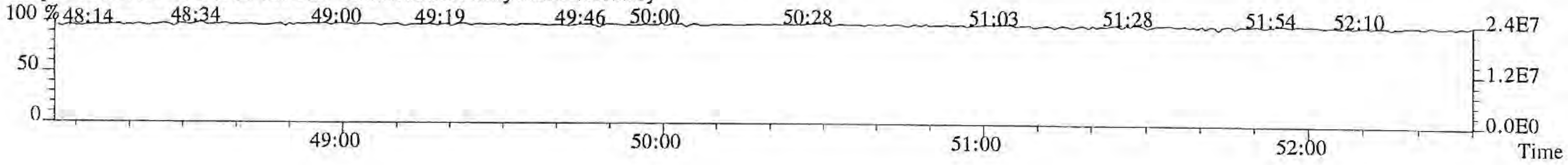
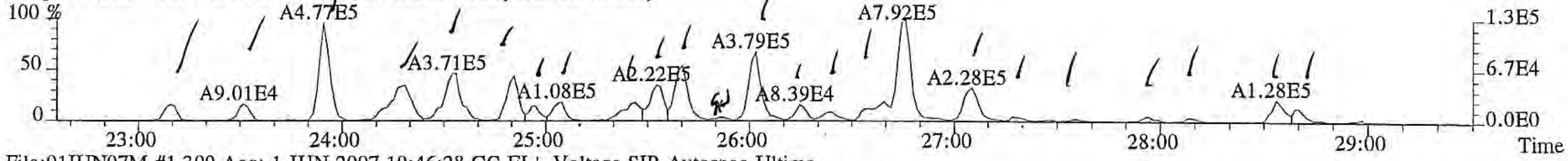
471.7750 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



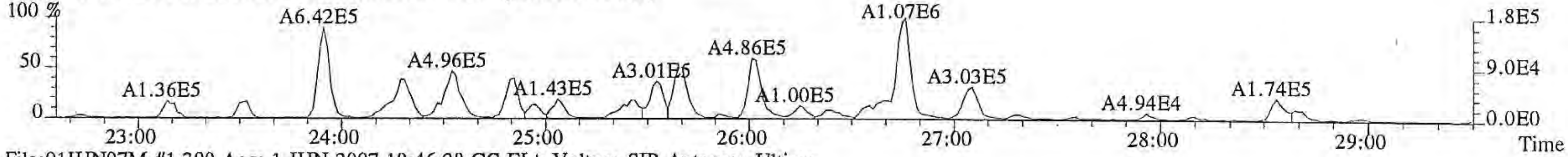
File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
454.9728 S:12 F:5 Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



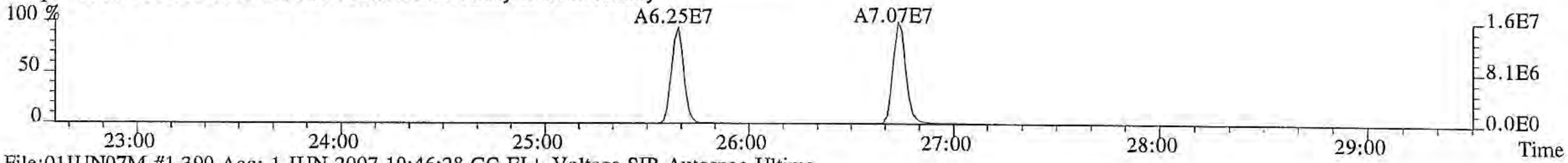
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
303.9016 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



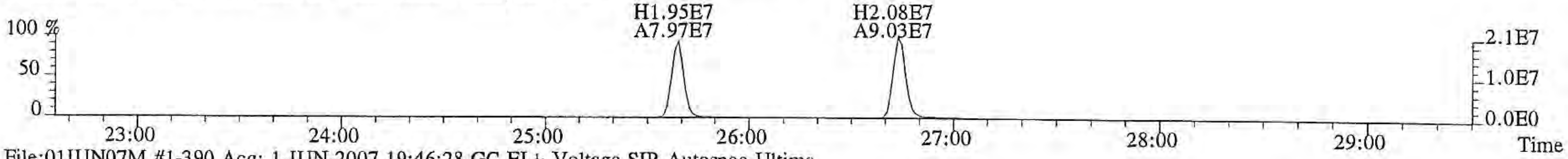
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
305.8987 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



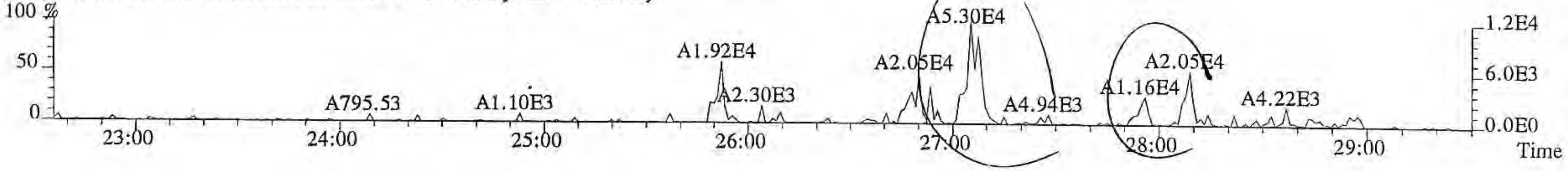
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
315.9419 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
317.9389 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
375.8364 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



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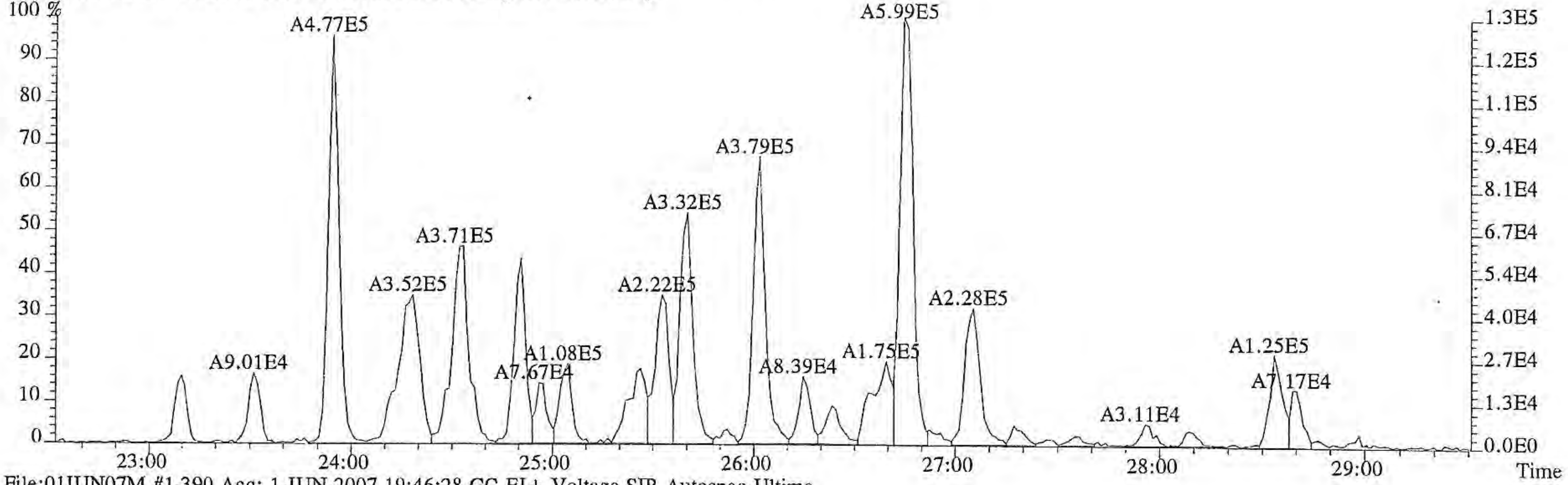
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
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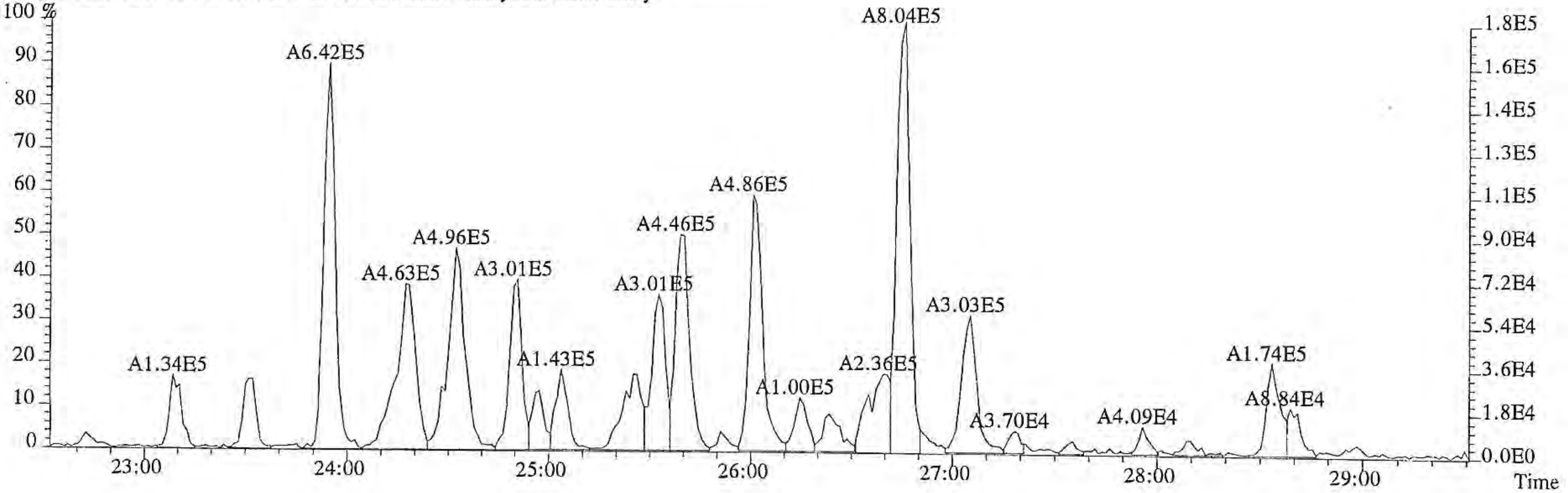
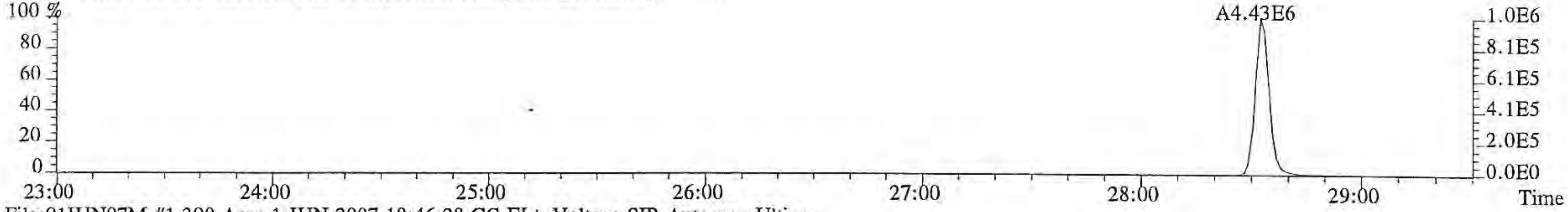
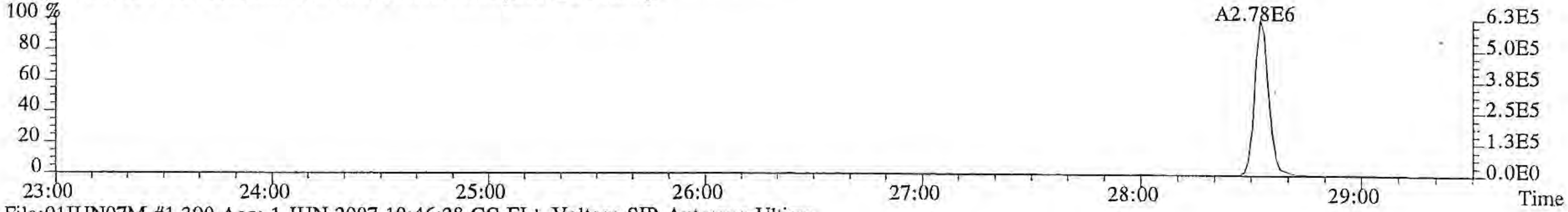
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



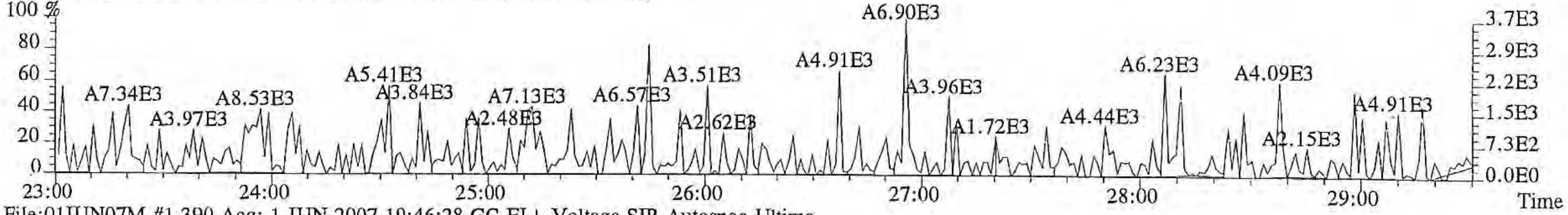
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
339.8597 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



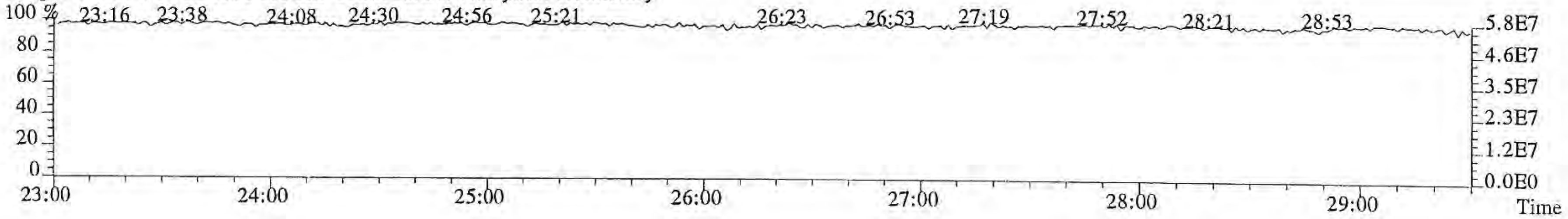
File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
341.8568 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
409.7974 S:12 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-390 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
330.9792 S:12 Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



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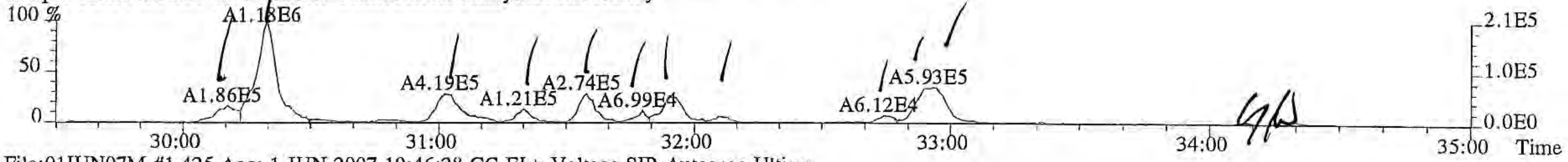
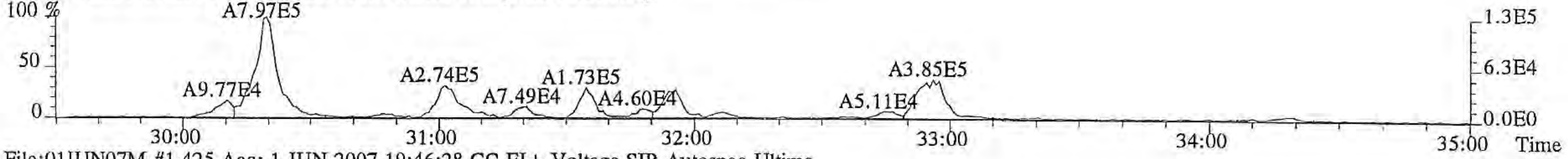
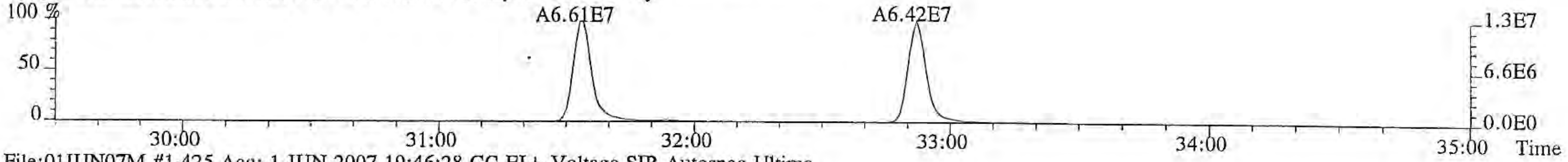
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



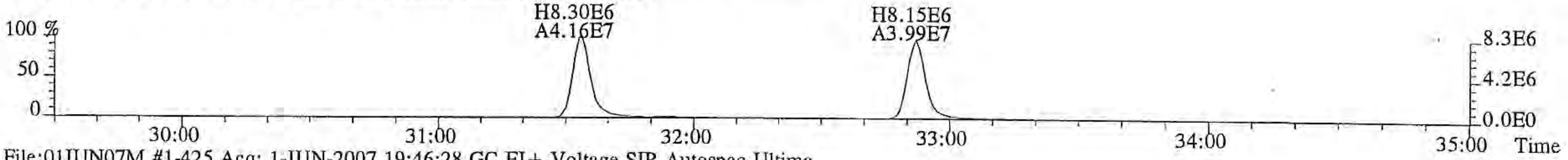
File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
341.8568 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
351.9000 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
353.8970 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
409.7974 S:12 F:2 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
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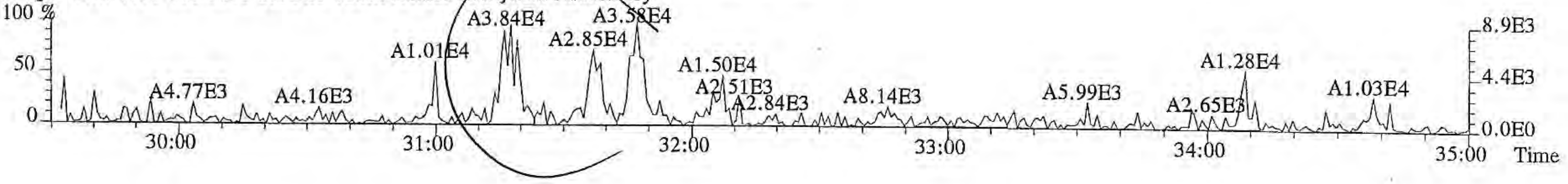

File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
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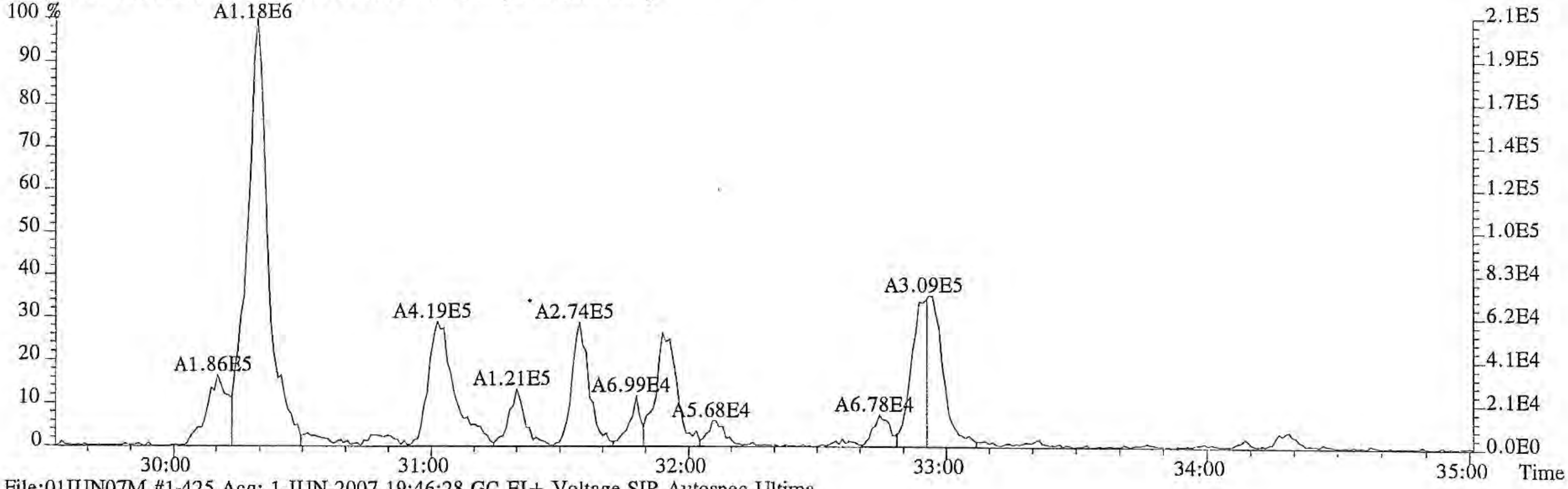
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-425 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
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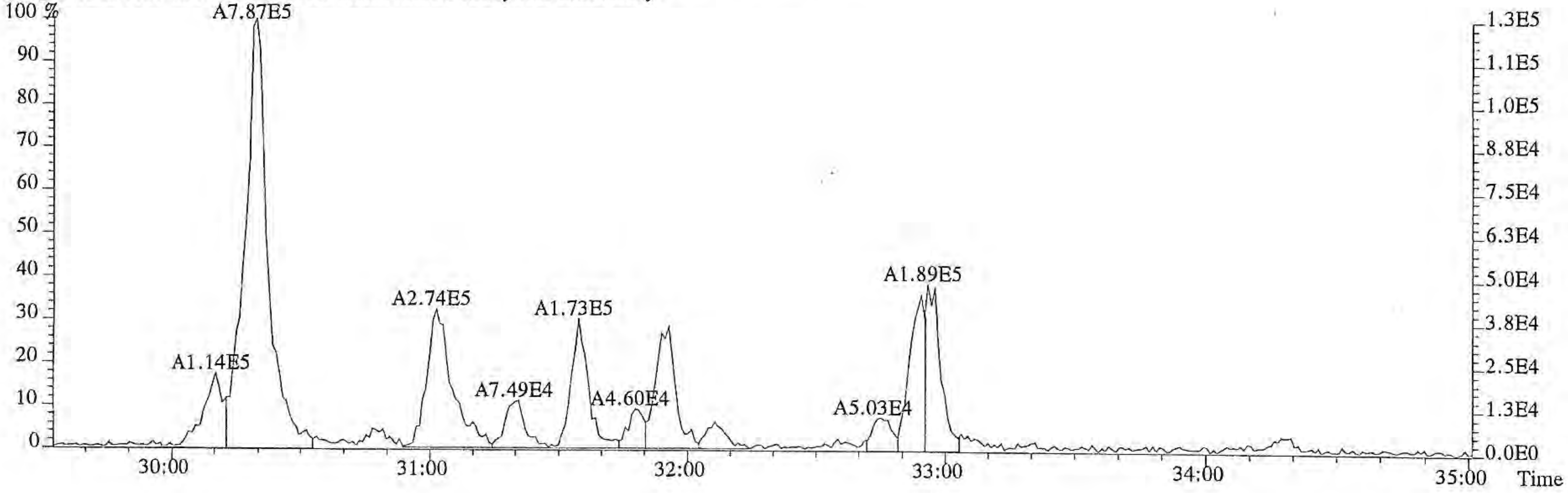
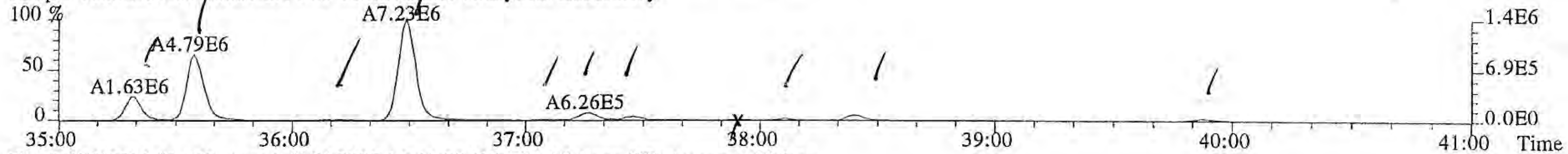
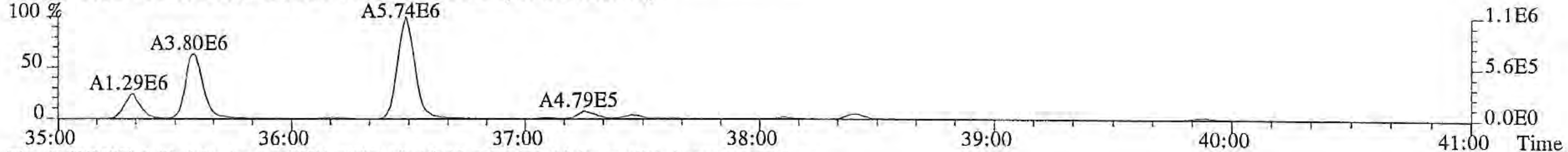
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



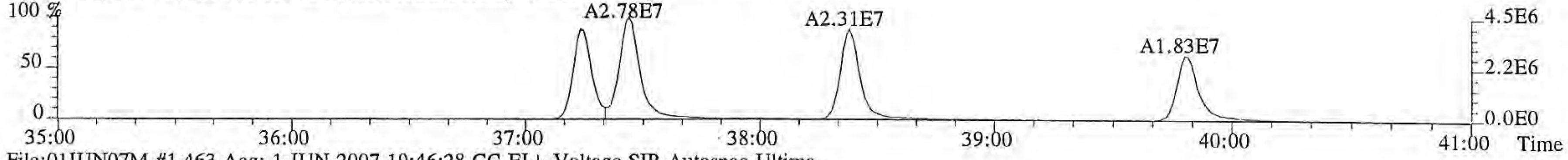
File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
373.8207 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
375.8178 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
383.8639 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
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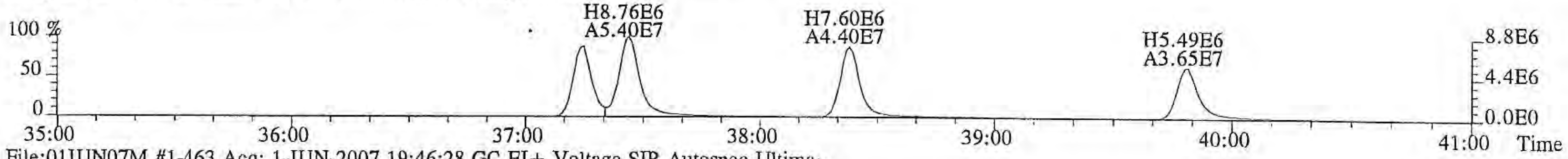
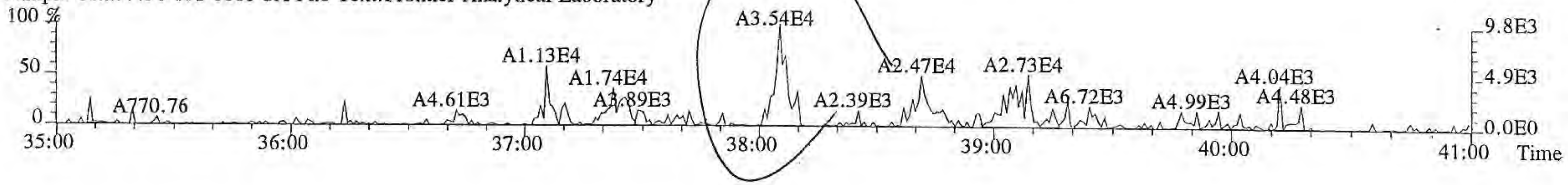
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
445.7555 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-463 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
373.8207 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
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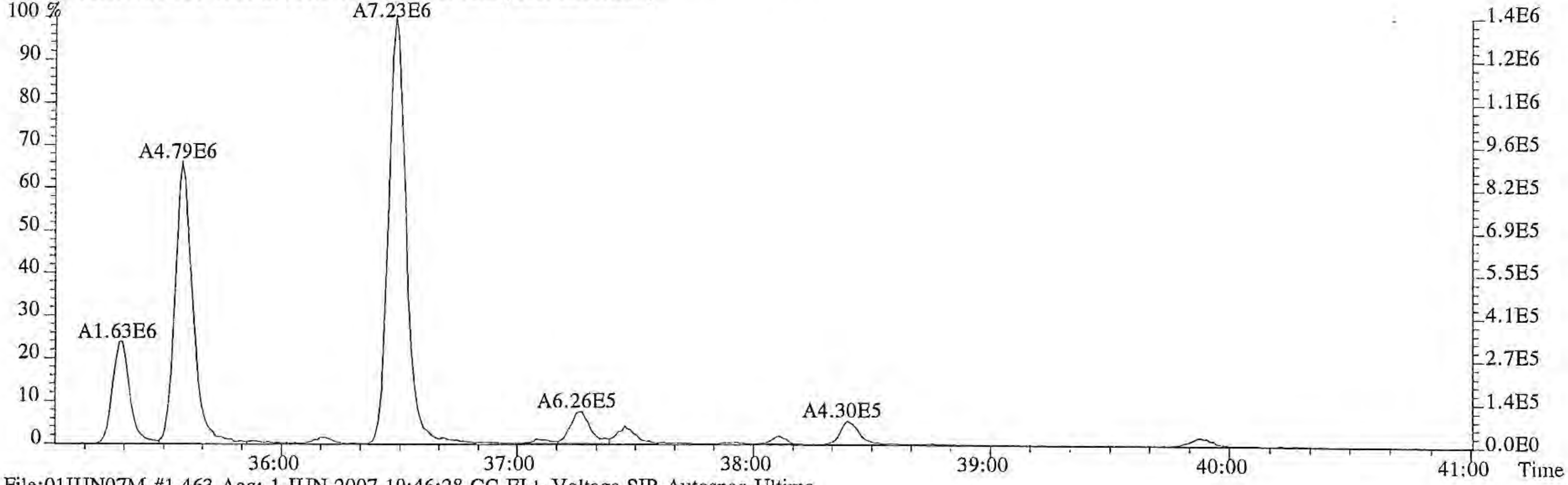

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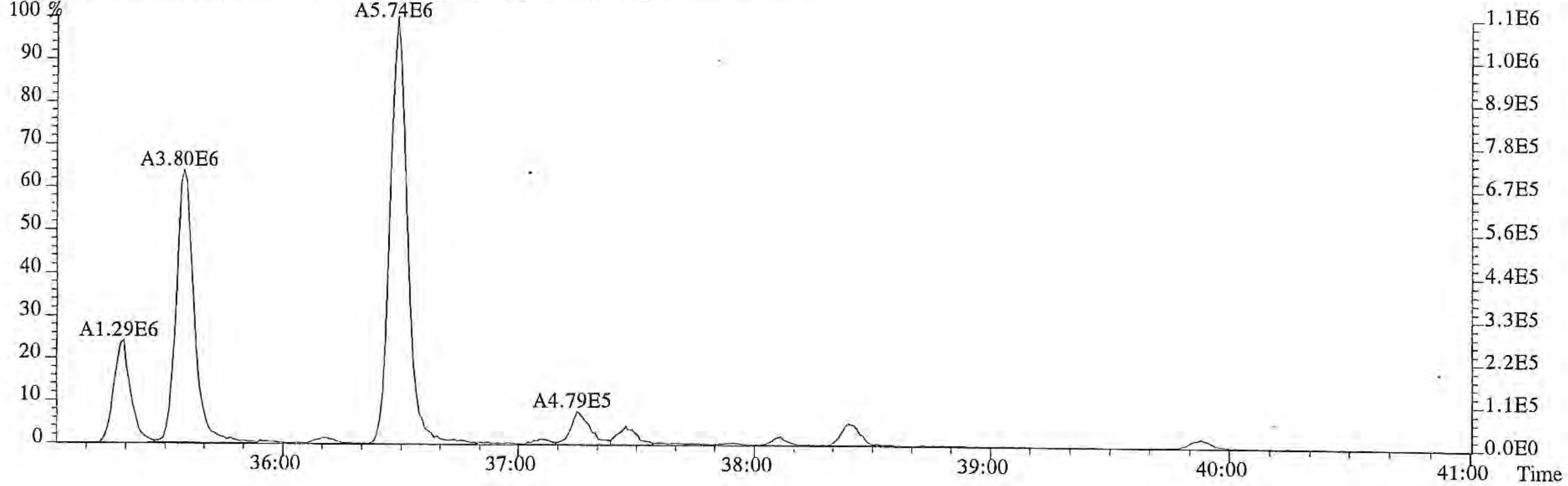
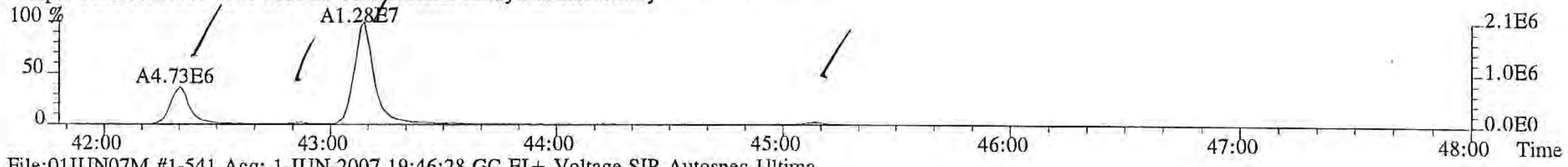
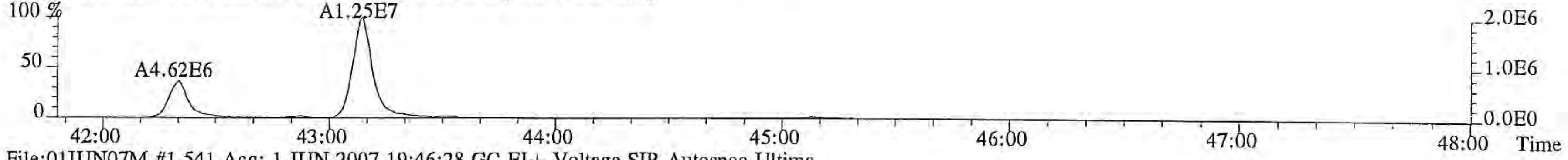
375.8178 S:12 F:3 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



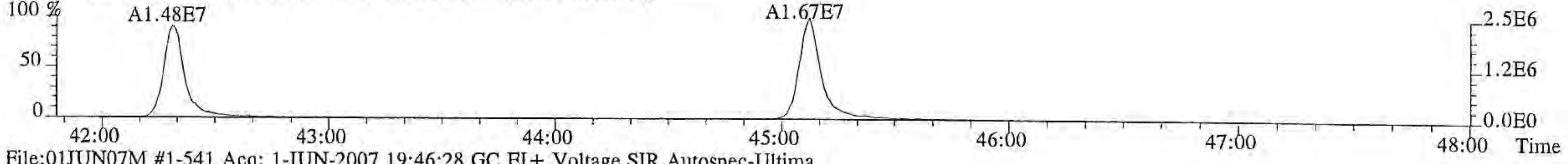
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
407.7818 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



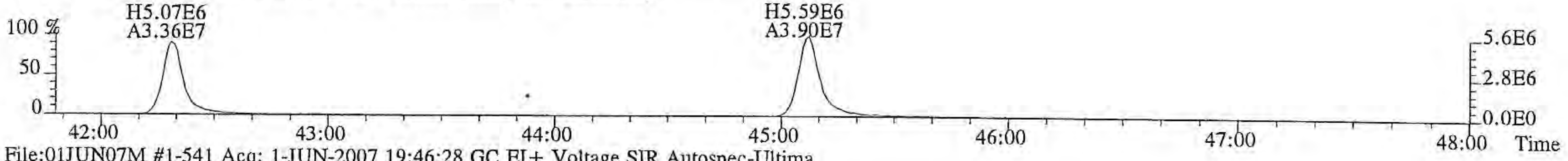
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
409.7788 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



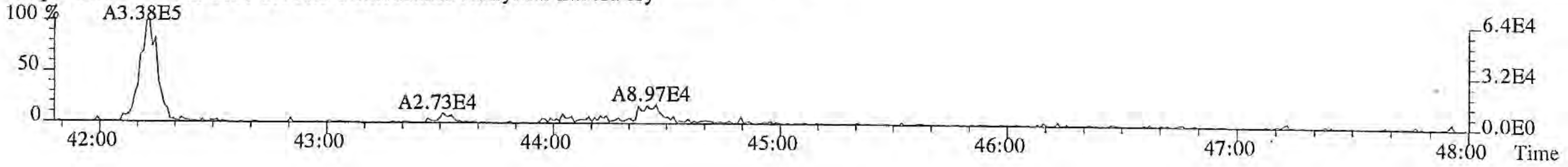
File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
417.8253 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
419.8220 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-541 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
479.7165 S:12 F:4 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



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FAL ID: 4451-001-0001-SA Filename: 04JUN07Z   Sam:5   Acquired:  4-JUN-07 11:22:09  ICal: tcdffal2-4-27-07
Client ID: 07-4032-KQ93A                          ConCal: ST060407Z1 EndCal: ST060407Z2
Results: 4444TCDF    GC Column: DB225   Amount: 10.12

                 Name      Resp    RA      RT     RRF       Conc    Qual    Fac   Noise       DL      #Hom

        2,3,7,8-TCDF  2.42e+06  0.69 y  19:45    0.95       2.48           2.50     -          -       1


                                                                                                          Rec
     13C-2,3,7,8-TCDF  2.02e+08  0.82 y  19:42    1.27        193                                        97.5
     13C-1,2,3,4-TCDF  1.63e+08  0.82 y  17:15     -         4.63
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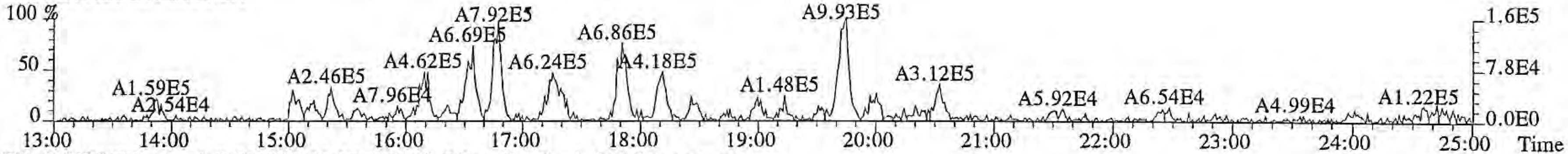
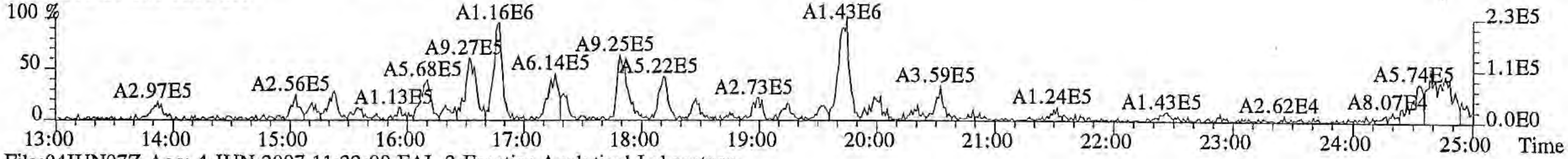
Analyst: ________ Date: 6/5/07

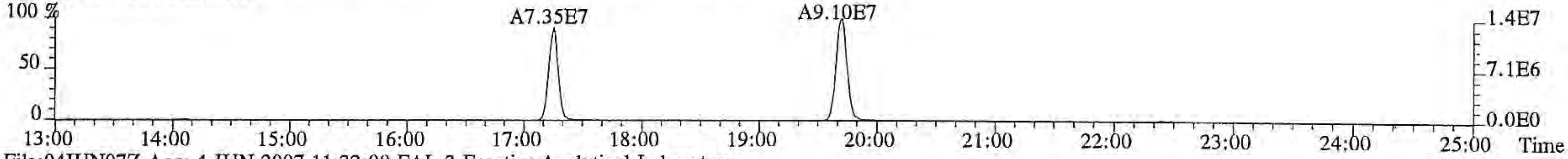
File:04JUN07Z Acq: 4-JUN-2007 11:22:09 FAL-2 Frontier Analytical Laboratory
303.9016 S:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:TCDF
FAL ID:4451-001-0001-SA



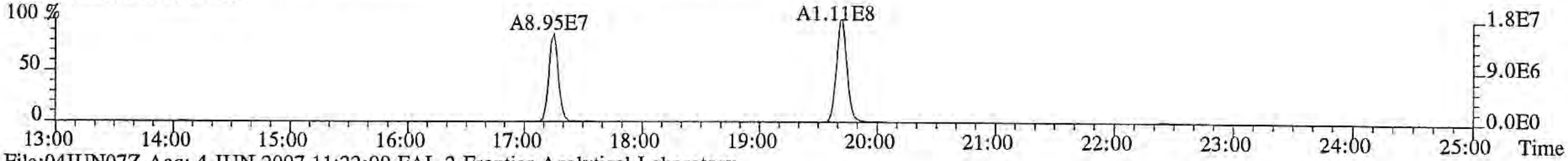
File:04JUN07Z Acq: 4-JUN-2007 11:22:09 FAL-2 Frontier Analytical Laboratory
305.8987 S:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:TCDF
FAL ID:4451-001-0001-SA



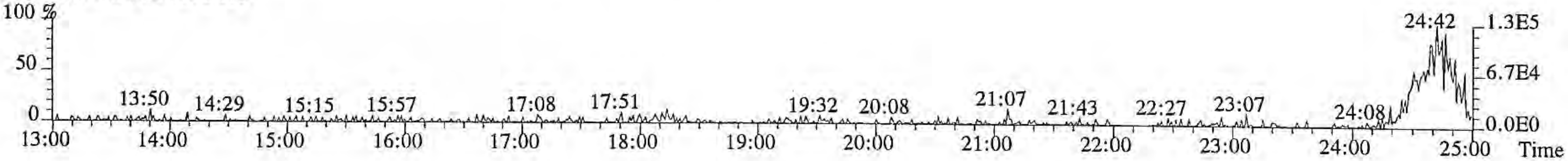
File:04JUN07Z Acq: 4-JUN-2007 11:22:09 FAL-2 Frontier Analytical Laboratory
315.9419 S:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:TCDF
FAL ID:4451-001-0001-SA



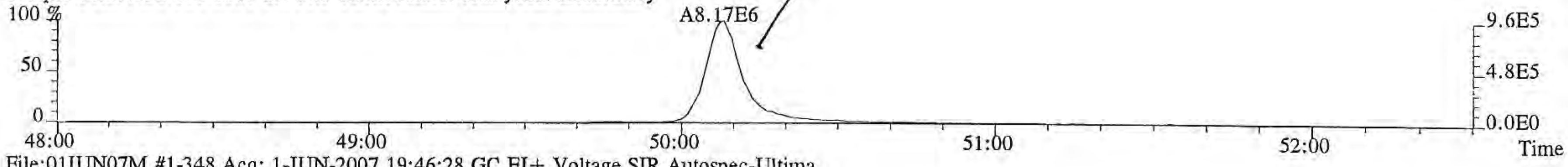
File:04JUN07Z Acq: 4-JUN-2007 11:22:09 FAL-2 Frontier Analytical Laboratory
317.9389 S:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:TCDF
FAL ID:4451-001-0001-SA



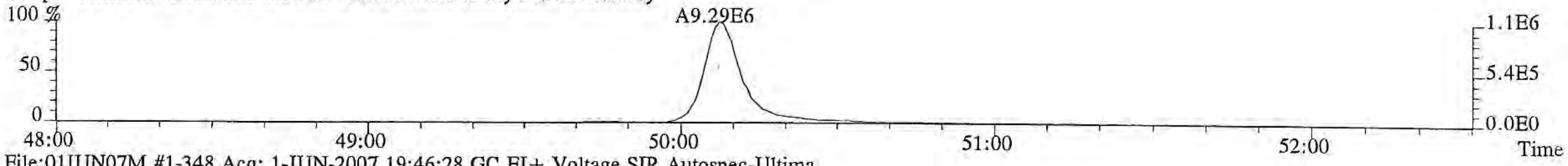
File:04JUN07Z Acq: 4-JUN-2007 11:22:09 FAL-2 Frontier Analytical Laboratory
375.8364 S:5 Exp:TCDF
FAL ID:4451-001-0001-SA



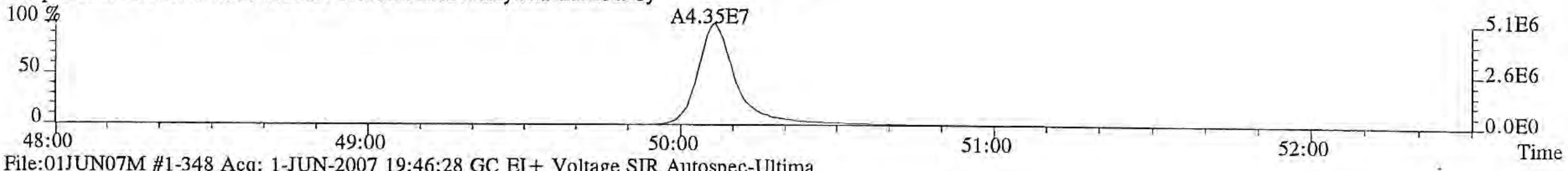
File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
441.7428 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



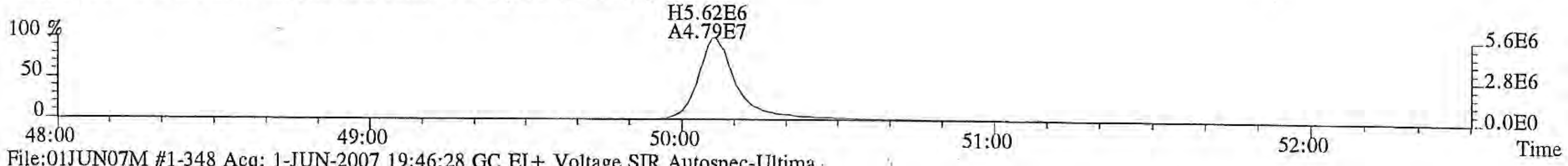
File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
443.7398 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



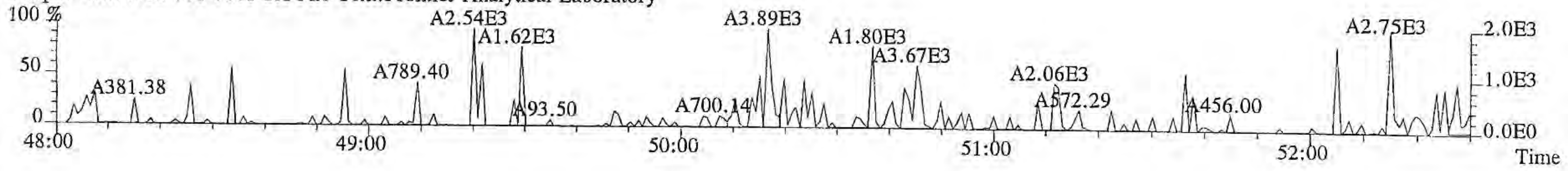
File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
453.7831 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
455.7801 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



File:01JUN07M #1-348 Acq: 1-JUN-2007 19:46:28 GC EI+ Voltage SIR Autospec-Ultima
513.6775 S:12 F:5 BSUB(10000,15,-3.0) PKD(5,5,3,0.10%,100.0,0.00%,F,F) Exp:PCDD
Sample Text:4451-001-0001-SA File Text:Frontier Analytical Laboratory



```
FAL ID: 4451-002-0001-SA      Filename: 01JUN07M   Sam:13  Acquired:  1-JUN-07 20:41:51  ICal: PCDDFAL3-4-17-07
Client ID: 07-4034-KQ93C                                    ConCal: ST060107M2     EndCal: ST060107M3
Results: 4457           GC Column: DB5      Amount: 10.21 NATO 1989 Tox:        7.28
                                                  WHO 1998 Tox:        5.96          WHO 2005 Tox:        6.24
                   Name        Resp     RA        RT      RRF       Conc     Qual    Fac    Noise       DL

           2,3,7,8-TCDD  8.68e+04  0.69 y  27:31      1.11      0.178       J   2.50      -          *
         1,2,3,7,8-PeCDD  3.92e+05  1.46 y  33:18      1.10      0.882       J   2.50      -          *
       1,2,3,4,7,8-HxCDD  5.88e+05  1.30 y  38:39      0.82       2.65           2.50      -          *
       1,2,3,6,7,8-HxCDD  2.04e+06  1.27 y  38:48      0.74       8.31           2.50      -          *
       1,2,3,7,8,9-HxCDD  1.06e+06  1.27 y  39:15      0.80       4.36           2.50      -          *
     1,2,3,4,6,7,8-HpCDD  3.88e+07  1.03 y  44:14      0.75        205           2.50      -          *
                   OCDD  3.27e+08  0.89 y  49:46      0.80       1910           2.50      -          *

           2,3,7,8-TCDF  1.12e+06  0.79 y  26:46      0.85       1.52       F   2.50      -          *
         1,2,3,7,8-PeCDF  2.79e+05  1.48 y  31:34      0.78      0.581       J   2.50      -          *
         2,3,4,7,8-PeCDF  2.24e+05  1.47 y  32:54      0.76      0.493       J   2.50      -          *
       1,2,3,4,7,8-HxCDF  7.26e+05  1.19 y  37:16      1.02       1.99       J   2.50      -          *
       1,2,3,6,7,8-HxCDF  4.05e+05  1.17 y  37:28      0.92      0.951       J   2.50      -          *
       2,3,4,6,7,8-HxCDF  4.83e+05  1.34 y  38:23      0.93       1.38       J   2.50      -          *
       1,2,3,7,8,9-HxCDF  2.07e+05  1.28 y  39:53      0.92      0.757       J   2.50      -          *
     1,2,3,4,6,7,8-HpCDF  5.27e+06  1.03 y  42:20      1.10       17.1           2.50      -          *
     1,2,3,4,7,8,9-HpCDF  3.95e+05  1.12 y  45:09      0.99       1.27       J   2.50      -          *
                   OCDF  1.04e+07  0.89 y  50:07      0.77       49.6           2.50      -          *
                                                                                                          Rec
       13C-2,3,7,8-TCDD  8.57e+07  0.79 y  27:29      1.03        163                                    83.2
     13C-1,2,3,7,8-PeCDD  7.90e+07  1.58 y  33:17      1.15        134                                    68.6
   13C-1,2,3,4,7,8-HxCDD  5.33e+07  1.27 y  38:37      1.34        177                                    90.5
   13C-1,2,3,6,7,8-HxCDD  6.51e+07  1.28 y  38:47      1.35        214                                     109
 13C-1,2,3,4,6,7,8-HpCDD  4.92e+07  1.06 y  44:12      1.38        158                                    80.7
               13C-OCDD  8.45e+07  0.89 y  49:45      1.10        341                                    87.1

       13C-2,3,7,8-TCDF  1.72e+08  0.79 y  26:44      1.28        173                                    88.1
     13C-1,2,3,7,8-PeCDF  1.21e+08  1.61 y  31:34      1.10        141                                    72.0
     13C-2,3,4,7,8-PeCDF  1.17e+08  1.62 y  32:53      1.07        141                                    72.1
   13C-1,2,3,4,7,8-HxCDF  7.03e+07  0.51 y  37:14      1.56        200                                     102
   13C-1,2,3,6,7,8-HxCDF  9.05e+07  0.51 y  37:26      1.74        232                                     118
   13C-2,3,4,6,7,8-HxCDF  7.39e+07  0.52 y  38:23      1.65        199                                     102
   13C-1,2,3,7,8,9-HxCDF  5.82e+07  0.51 y  39:49      1.47        176                                    89.7
 13C-1,2,3,4,6,7,8-HpCDF  5.50e+07  0.44 y  42:19      1.42        172                                    87.8
 13C-1,2,3,4,7,8,9-HpCDF  6.17e+07  0.43 y  45:07      1.34        204                                     104
               13C-OCDF  1.07e+08  0.89 y  50:07      1.44        328                                    83.8

     37Cl-2,3,7,8-TCDD  2.26e+07           27:31      0.77       57.8                                    73.8

       13C-1,2,3,4-TCDD  1.00e+08  0.79 y  26:54        -        11.5
       13C-1,2,3,4-TCDF  1.52e+08  0.79 y  25:39        -        11.5
   13C-1,2,3,7,8,9-HxCDD  4.41e+07  1.28 y  39:15        -        5.97
                                                                           Fac    Noise       DL   #Hom
     Total Tetra-Dioxins  2.46e+07           24:30      1.11       50.4           2.50      -          *   12
     Total Penta-Dioxins  1.64e+07           30:21      1.10       36.8           2.50      -          *   9
      Total Hexa-Dioxins  3.05e+07           36:12      0.79        128           2.50      -          *   8
     Total Hepta-Dioxins  1.13e+08           42:51      0.75        599           2.50      -          *   2

      Total Tetra-Furans  7.04e+06           23:10      0.85       9.49     D,M   2.50      -          *   20
 1st Fn. Tot Penta-Furans  3.65e+06           28:33      0.77       7.81     D,M   2.50      -          *   1    PeCDF
      Total Penta-Furans  3.45e+06           30:09      0.77       7.37     D,M   2.50      -          *   9    15.2
       Total Hexa-Furans  1.66e+07           35:19      0.95       47.0           2.50      -          *   10
      Total Hepta-Furans  2.09e+07           42:20      1.04       67.4           2.50      -          *   4
```

OK DB2005

Analyst: ______________   Date: 6/4/07

```
Totals class: Total Tetra-Dioxins         Entry #: 38

        Run: 17        File: 01JUN07M          S: 13 I: 1  F: 1
    Acquired:  1-JUN-07 20:41:51

Total Concentration: 50.4             Unnamed Concentration: 50.231


   RT     ml Resp     m2 Resp RA          Resp   Concentration  Name

24:30   5.14e+06    6.70e+06 0.77 y   1.18e+07            24.3
24:47   3.16e+06    4.12e+06 0.77 y   7.28e+06            14.9
25:05   4.41e+04    6.23e+04 0.71 y   1.06e+05           0.218
25:53   1.55e+05    1.86e+05 0.84 y   3.41e+05           0.698
26:03   2.70e+05    3.60e+05 0.75 y   6.30e+05            1.29
26:13   3.51e+04    4.85e+04 0.72 y   8.36e+04           0.171
26:36   3.73e+04    4.67e+04 0.80 y   8.40e+04           0.172
26:56   1.46e+06    1.86e+06 0.78 y   3.32e+06            6.81
27:15   2.99e+05    4.10e+05 0.73 y   7.09e+05            1.45
27:31   3.55e+04    5.13e+04 0.69 y   8.68e+04           0.178  2,3,7,8-TCDD  .
27:48   2.10e+04    2.46e+04 0.86 y   4.57e+04          0.0936
28:13   2.06e+04    2.87e+04 0.72 y   4.93e+04           0.101
```

```
Totals class: Total Penta-Dioxins          Entry #: 39

        Run: 17        File: 01JUN07M          S: 13 I: 1  F: 2
    Acquired:  1-JUN-07 20:41:51

Total Concentration: 36.8              Unnamed Concentration: 35.965


   RT     ml Resp     m2 Resp RA          Resp   Concentration  Name

30:21   2.41e+06    1.49e+06 1.62 y   3.90e+06            8.77
30:56   1.14e+05    6.78e+04 1.68 y   1.81e+05           0.408
31:34   3.11e+06    1.93e+06 1.61 y   5.04e+06            11.3
31:47   2.60e+05    1.66e+05 1.56 y   4.26e+05           0.960
31:55   2.82e+06    1.76e+06 1.60 y   4.59e+06            10.3
32:12   2.33e+05    1.60e+05 1.45 y   3.93e+05           0.884
32:40   8.31e+05    5.39e+05 1.54 y   1.37e+06            3.08
33:18   2.33e+05    1.59e+05 1.46 y   3.92e+05           0.882  1,2,3,7,8-PeCDD
33:23   5.12e+04    3.83e+04 1.34 y   8.96e+04           0.202
```

```
 Totals class: Total Hexa-Dioxins          Entry #: 40

         Run: 17        File: 01JUN07M          S: 13 I: 1  F: 3
     Acquired:  1-JUN-07 20:41:51

Total Concentration: 128            Unnamed Concentration: 113.143


   RT     ml Resp     m2 Resp RA            Resp   Concentration  Name

36:12   4.28e+06    3.38e+06 1.27 y   7.66e+06            32.3
37:07   6.62e+06    5.21e+06 1.27 y   1.18e+07            49.9
37:32   3.65e+06    2.84e+06 1.28 y   6.49e+06            27.3
37:43   3.69e+05    2.73e+05 1.35 y   6.42e+05            2.71
38:39   3.32e+05    2.56e+05 1.30 y   5.88e+05            2.65  1,2,3,4,7,8-HxCDD
38:48   1.14e+06    8.98e+05 1.27 y   2.04e+06            8.31  1,2,3,6,7,8-HxCDD
39:06   1.29e+05    9.63e+04 1.34 y   2.26e+05           0.952
39:15   5.91e+05    4.67e+05 1.27 y   1.06e+06            4.36  1,2,3,7,8,9-HxCDD
```

```
 Totals class: Total Hepta-Dioxins         Entry #: 41

        Run: 17        File: 01JUN07M         S: 13 I: 1  F: 4
    Acquired:  1-JUN-07 20:41:51

Total Concentration: 599          Unnamed Concentration: 393.296


   RT    ml Resp     m2 Resp RA          Resp  Concentration  Name

42:51  3.78e+07   3.65e+07 1.04 y  7.43e+07            393
44:14  1.97e+07   1.91e+07 1.03 y  3.88e+07            205  1,2,3,4,6,7,8-HpCDD
```

```
 Totals class: Total Hepta-Furans         Entry #: 46

        Run: 17       File: 01JUN07M          S: 13 I: 1  F: 4
    Acquired:  1-JUN-07 20:41:51

Total Concentration: 67.4           Unnamed Concentration: 48.955


   RT    ml Resp     m2 Resp RA          Resp  Concentration  Name

42:20  2.68e+06   2.60e+06 1.03 y  5.27e+06             17.1  1,2,3,4,6,7,8-HpCDF
42:51  1.17e+05   1.22e+05 0.95 y  2.39e+05            0.770
43:09  7.68e+06   7.29e+06 1.05 y  1.50e+07             48.2
45:09  2.08e+05   1.86e+05 1.12 y  3.95e+05             1.27  1,2,3,4,7,8,9-HpCDF
```

Analytical Resources, Incorporated
Analytical Chemists and Consultants

RECEIVED
AUG 27 2002
LANDAU ASSOCIATES, INC.

August 26, 2002

Ms. Shannon Dunn
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall Ave. Landfill; 001020.220
ARI Job No: EQ21

Dear Shannon,

Please find enclosed original chain of custody (COC) and analytical results for the project referenced above. Analytical Resources, Inc. (ARI) accepted four water samples on August 8, 2002. The samples were received in good condition and there were no discrepancies between the COC and containers' labels.

The samples were analyzed for PCBs referencing US EPA method 8082, diesel and motor oil range hydrocarbons referencing WDOE method NWTPH-Dx with acid/si cleanup, total and dissolved metals referencing US EPA methods 6010B and 7421, and general chemistry parameters as referenced specifically on the reports.

No analytical complications were noted. A copy of this report and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Mary Lou Fox

Mary Lou Fox
Project Manager
206-695-6211
marylou@arilabs.com

MLF/mlf
Enclosure
cc: File EQ21

Landau Associates

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Lake Oswego)** (503) 443-6010
☐ ____

EQ21

Chain-of-Custody Record 02-10451 02-10457

Date 8/8/02
Page 1 of 1

Project Name Cornwall Ave Land fill Project No. 010020.220
Project Location/Event Bellingham
Sampler's Name Ken Reid
Project Contact Shannon Dunn
Send Results To Shannon Dunn

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	NWTPH-Dx	PCB	Fecal Coliform	Total Metals	Diss Metals	TOC	Total Cyanide	Ammonia	TSS	Turbidity				Observations/Comments
S-1	8/8/02	1115	water	12	X	✓	✓	✓	✓	✓	✓	✓	✓	✓				
S-2		1215		12	X	✓	✓	✓	✓	✓	✓	✓	✓	✓				
S-3		1245		10		✓	✓	✓	✓	✓	✓	✓	✓	✓				
MW-6		1455		1			X											

Special Shipment/Handling or Storage Requirements On Ice

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name Ken Reid	Printed Name ERIC BRANSON	Printed Name	Printed Name
Company Landau Assoc	Company ARI	Company	Company
Date 8/8/02 Time 10:30	Date 8/8/02 Time 0845	Date ____ Time ____	Date ____ Time ____

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

5.5, 6.5

Rev 4/01

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: Method Blank

Lab Sample ID: EQ21MB
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: NA
Date Received: NA

Data Release Authorized:
Reported: 08/16/02

Date extracted: 08/09/02
Date analyzed: 08/15/02 04:02
Instrument ID: ECD3
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No

Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	0.050	U
53469-21-9	Aroclor 1242	0.050	U
12672-29-6	Aroclor 1248	0.050	U
11097-69-1	Aroclor 1254	0.050	U
11096-82-5	Aroclor 1260	0.050	U
11104-28-2	Aroclor 1221	0.10	U
11141-16-5	Aroclor 1232	0.050	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	107%
Tetrachlorometaxylene	86.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: S-1

Lab Sample ID: EQ21A
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/16/02

Date extracted: 08/09/02
Date analyzed: 08/15/02 05:44
Instrument ID: ECD3
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No

Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	**Aroclor 1242**	**0.14**
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	93.5%
Tetrachlorometaxylene	78.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: S-2

Lab Sample ID: EQ21B
LIMS ID: 02-10452
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/16/02

Date extracted: 08/09/02
Date analyzed: 08/15/02 06:19
Instrument ID: ECD3
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No

Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	**Aroclor 1242**	**0.16**
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	88.5%
Tetrachlorometaxylene	74.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: S-3

Lab Sample ID: EQ21C
LIMS ID: 02-10453
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/16/02

Date extracted: 08/09/02
Date analyzed: 08/15/02 06:53
Instrument ID: ECD3
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No

Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	103%
Tetrachlorometaxylene	84.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Lab Sample ID: EQ21SB
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220

Data Release Authorized:
Reported: 08/16/02

LABORATORY CONTROL SAMPLE RECOVERY
Date extracted: 08/09/02

CONSTITUENT	SPIKE VALUE	SPIKE ADDED	% RECOVERY	RPD
LABORATORY CONTROL SAMPLE				
Aroclor 1242	0.418	0.504	82.9%	
LAB CONTROL DUPLICATE				
Aroclor 1242	0.413	0.504	81.9%	1.2%

Aroclor Surrogate Recoveries

LCS-Decachlorobiphenyl	112%
LCS-Tetrachlorometaxylene	88.5%
LCSD-Decachlorobiphenyl	109%
LCSD-Tetrachlorometaxylene	93.0%

Values reported in ug/L

WATER AROCLOR SURROGATE SUMMARY

Matrix: Water

QC Report No: EQ21
Project: Cornwall Ave. Landfill
001020.220

LIMS ID	Lab ID	Client ID	TCMX	#	DCBP	#	TOT OUT
02-10451MB	080902MB	Method Blank	86.5%		107%		0
02-10451LCS	080902LCS	Lab Control	88.5%		112%		0
02-10451LCS	080902LCSD	Lab Control Dup	93.0%		109%		0
02-10451	EQ21A	S-1	78.5%		93.5%		0
02-10452	EQ21B	S-2	74.0%		88.5%		0
02-10453	EQ21C	S-3	84.0%		103%		0

	Control QC LIMITS	Sample QC LIMITS
(TCMX) = Tetrachloro-m-xylene	(48-93)	(50-91)
(DCBP) = Decachlorobiphenyl	(53-126)	(30-128)

\# Column to be used to flag recovery values

* Values outside of required QC limits

D Surrogate Compound diluted out

**TOTAL DIESEL RANGE HYDROCARBONS
NWTPHD Range C12 to C24 by GC/FID
and Motor Oil
Silica and Acid-Cleaned**

LIMS ID: 02-10451
Matrix: Water

Data Release Authorized:
Reported: 08/21/02

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Received: 08/09/02

Lab ID	Sample ID	Date Analyzed	Dilution Factor	Diesel Range	*HC ID	Motor Oil Range	Surrogate Recovery
EQ21MB	Method Blank	08/12/02	1:1	0.25 U	---	0.50 U	94.0%
EQ21A	S-1	08/12/02	1:1	0.25 U	---	0.50 U	99.0%
EQ21B	S-2	08/12/02	1:1	0.25 U	---	0.50 U	88.0%

Surrogate is O-Terphenyl.

* ID indicates, in the opinion of the analyst, the petroleum product with the best pattern match. 'NO' indicates that there was not a good match for any of the requested products.
Values reported in ppm (mg/L).
Diesel quantitation on total peaks in the range from C12 to C24.
Motor Oil quantitation on total peaks in the Motor Oil Standard range.

Data Qualifiers

U	Compound not detected at the given detection limit.
E	Value detected above linear range of instrument. Dilution required.
J	Indicates an estimated value below the calculated detection limit.
S	No value reported due to saturation of the detector. Dilution required.
D	Indicates the surrogate was not detected because of dilution of the extract.
E	Indicates a value above the linear range of the detector. Dilution required.
NR	Indicates no recovery due to matrix interference.

TOTAL DIESEL RANGE HYDROCARBONS
NWTPHD Range C12 to C24 by GC/FID
Acid-Cleaned

ANALYTICAL
RESOURCES
INCORPORATED

Lab Sample ID: 080902LCS	QC Report No:	EQ21-Landau Associates, Inc.
LIMS ID: 02-10451	Project:	Cornwall Ave. Landfill
Matrix: Water		001020.220

Data Release Authorized:
Reported: 08/21/02

LABORATORY CONTROL SAMPLE RECOVERY REPORT
Date analyzed: 08/12/02

CONSTITUENT	SPIKE FOUND	SPIKE ADDED	% RECOVERY
Diesel Range Hydrocarbons	2.58	3.00	86.0%

TPHd Surrogate Recovery

LCS o-Terphenyl	90.0%

Values reported in parts per million (mg/L)

TOTAL ACID & SILICA CLEANED DIESEL HYDROCARBONS SUMMARY

Matrix: Water

QC Report No: EQ21

LIMS ID	Lab ID	Client ID	O-TerPh	TOT OUT
02-10451	080902MB	Method Blank	94%	0
02-10451	080902LCS	Lab Control	90%	0
02-10451	EQ21A	S-1	99%	0
02-10452	EQ21B	S-2	88%	0

	Control QC LIMITS	Sample QC LIMITS
(O-TerP) = O-Terphenyl	(30-150)	(30-150)

\# Column to be used to flag recovery values

* Values outside of required QC limits

D System Monitoring Compound diluted out

TOTAL DIESEL RANGE HYDROCARBONS-EXTRACTION REPORT

ANALYTICAL RESOURCES INCORPORATED

ARI Job: EQ21
Matrix: Water
Project: Cornwall Ave. Landfill
001020.220
Date Received: 08/09/02

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
02-10451-080902MB1	Method Blank	500 mL	1.00 mL	08/09/02
02-10451-080902LCS1	Lab Control	500 mL	1.00 mL	08/09/02
02-10451-080902LCSD1	Lab Control Dup	500 mL	1.00 mL	08/09/02
02-10451-EQ21A	S-1	500 mL	1.00 mL	08/09/02
02-10452-EQ21B	S-2	500 mL	1.00 mL	08/09/02

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: Method Blank

Lab Sample ID: EQ21MB
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: NA
Date Received: NA

Data Release Authorized:
Reported: 08/20/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	08/12/02	6010B	08/15/02	7440-50-8	Copper	0.002	0.002 U
3020A	08/12/02	7421	08/14/02	7439-92-1	Lead	0.001	0.001 U
3010A	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

ANALYTICAL
RESOURCES
INCORPORATED

INORGANICS ANALYSIS DATA SHEET **Sample No: S-1**
TOTAL METALS

Lab Sample ID: EQ21A
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/20/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	08/12/02	6010B	08/15/02	**7440-50-8**	**Copper**	0.004	**0.005**
3020A	08/12/02	7421	08/20/02	7439-92-1	Lead	0.001	0.001 U
3010A	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.01	0.01 U

U Analyte undetected at given RL

RL Reporting Limit

FORM-I

INORGANICS ANALYSIS DATA SHEET **Sample No: S-2**
TOTAL METALS

Lab Sample ID: EQ21B
LIMS ID: 02-10452
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/20/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	08/12/02	6010B	08/15/02	**7440-50-8**	**Copper**	0.004	**0.007**
3020A	08/12/02	7421	08/14/02	**7439-92-1**	**Lead**	0.001	**0.002**
3010A	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.01	0.01 U

U	Analyte undetected at given RL
RL	Reporting Limit

INORGANICS ANALYSIS DATA SHEET **Sample No: S-3**
TOTAL METALS

Lab Sample ID: EQ21C
LIMS ID: 02-10453
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/20/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	08/12/02	6010B	08/15/02	**7440-50-8**	**Copper**	0.004	**0.005**
3020A	08/12/02	7421	08/14/02	**7439-92-1**	**Lead**	0.001	**0.002**
3010A	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.01	0.01 U

U Analyte undetected at given RL

RL Reporting Limit

FORM-I

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Lab Sample ID: EQ21LCS
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220

Data Release Authorized:
Reported: 08/20/02

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Spike mg/L	Spike Added	% Recovery	Q
Copper	0.476	0.500	95.2%	
Lead	0.106	0.100	106%	
Zinc	0.468	0.500	93.6%	

'Q' codes: N = control limit not met

Control Limits: 80-120%

INORGANIC ANALYSIS DATA SHEET
DISSOLVED METALS

Sample No: **Method Blank**

Lab Sample ID: EQ21MB
LIMS ID: 02-10455
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: NA
Date Received: NA

Data Release Authorized:
Reported: 08/20/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	08/12/02	6010B	08/15/02	7440-50-8	Copper	0.002	0.002 U
7000A	08/12/02	7421	08/14/02	7439-92-1	Lead	0.001	0.001 U
6010B	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.006	0.006 U

U	Analyte undetected at given RL
RL	Reporting Limit

INORGANIC ANALYSIS DATA SHEET **Sample No: S-1**
DISSOLVED METALS

Lab Sample ID: EQ21E
LIMS ID: 02-10455
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/20/02

Prep Meth	**Prep Date**	**Analysis Method**	**Analysis Date**	**CAS Number**	**Analyte**	**RL**	**mg/L**	
6010B	08/12/02	6010B	08/15/02	7440-50-8	Copper	0.004	0.004	U
7000A	08/12/02	7421	08/14/02	**7439-92-1**	**Lead**	0.001	**0.001**	
6010B	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.01	0.01	U

U Analyte undetected at given RL

RL Reporting Limit

FORM-I

INORGANIC ANALYSIS DATA SHEET **Sample No: S-2**
DISSOLVED METALS

Lab Sample ID: EQ21F
LIMS ID: 02-10456
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/20/02

Prep Meth	**Prep Date**	**Analysis Method**	**Analysis Date**	**CAS Number**	**Analyte**	**RL**	**mg/L**
6010B	08/12/02	6010B	08/15/02	**7440-50-8**	**Copper**	0.004	**0.005**
7000A	08/12/02	7421	08/20/02	7439-92-1	Lead	0.001	0.001 U
6010B	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.01	0.01 U

U	Analyte undetected at given RL
RL	Reporting Limit

FORM-I

INORGANIC ANALYSIS DATA SHEET
DISSOLVED METALS

Sample No: S-3

Lab Sample ID: EQ21G
LIMS ID: 02-10457
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized:
Reported: 08/20/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	08/12/02	6010B	08/15/02	7440-50-8	Copper	0.004	0.004 U
7000A	08/12/02	7421	08/14/02	**7439-92-1**	**Lead**	0.001	**0.002**
6010B	08/12/02	6010B	08/15/02	7440-66-6	Zinc	0.01	0.01 U

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

ANALYTICAL RESOURCES INCORPORATED

Lab Sample ID: EQ21LCS
LIMS ID: 02-10455
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220

Data Release Authorized:
Reported: 08/20/02

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Spike mg/L	Spike Added	% Recovery	Q
Copper	0.492	0.500	98.4%	
Lead	0.020	0.020	100%	
Zinc	0.488	0.500	97.6%	

'Q' codes: N = control limit not met
NA = Not applicable - analyte not spiked

Control Limits: 80-120%

FORM-VII

QA Report - Method Blank Analysis

QC Report No: EQ21-Landau Associates, Inc.
Matrix: Water
Project: Cornwall Ave. Landfill
001020.220
Date Received: NA
Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

METHOD BLANK RESULTS
CONVENTIONALS

Analysis Date & Batch	Constituent	Units	Result
08/09/02 08092#1	Total Suspended Solids	mg/L	< 1.0 U
08/09/02 08092#1	Turbidity	NTU	< 0.05 U
08/16/02 08162#1	Total Cyanide	mg/L	< 0.005 U
08/20/02 08202#1	N-Ammonia	mg-N/L	< 0.010 U
08/14/02 08142#1	Total Organic Carbon	mg/L	< 1.5 U
08/10/02 08102#1	Fecal Coliform	CFU/100 mL	< 1 U

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: S-1

Lab Sample ID: EQ21A
LIMS ID: 02-10451
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Total Suspended Solids	08/09/02 08092#1	EPA 160.2	1.1	mg/L	6.6
Turbidity	08/09/02 08092#1	EPA 180.1	0.05	NTU	2.4
Total Cyanide	08/16/02 08162#1	EPA 335.2	0.005	mg/L	< 0.005 U
N-Ammonia	08/20/02 08202#1	EPA 350.1M	0.20	mg-N/L	6.9
Total Organic Carbon	08/14/02 08142#1	EPA 415.1	1.5	mg/L	4.6
Fecal Coliform	08/10/02 08102#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL Analytical reporting limit
U Undetected at reported detection limit

Report for EQ21 received 08/09/02

ANALYTICAL
RESOURCES
INCORPORATED

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: S-2

Lab Sample ID: EQ21B
LIMS ID: 02-10452
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Total Suspended Solids	08/09/02 08092#1	EPA 160.2	1.0	mg/L	6.3
Turbidity	08/09/02 08092#1	EPA 180.1	0.05	NTU	39
Total Cyanide	08/16/02 08162#1	EPA 335.2	0.005	mg/L	< 0.005 U
N-Ammonia	08/20/02 08202#1	EPA 350.1M	0.20	mg-N/L	6.3
Total Organic Carbon	08/14/02 08142#1	EPA 415.1	1.5	mg/L	4.4
Fecal Coliform	08/10/02 08102#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL	Analytical reporting limit
U	Undetected at reported detection limit

Report for EQ21 received 08/09/02

ANALYTICAL
RESOURCES
INCORPORATED

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: S-3

Lab Sample ID: EQ21C
LIMS ID: 02-10453
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Total Suspended Solids	08/09/02 08092#1	EPA 160.2	1.0	mg/L	5.2
Turbidity	08/09/02 08092#1	EPA 180.1	0.05	NTU	2.1
Total Cyanide	08/16/02 08162#1	EPA 335.2	0.005	mg/L	< 0.005 U
N-Ammonia	08/20/02 08202#1	EPA 350.1M	0.10	mg-N/L	1.1
Total Organic Carbon	08/14/02 08142#1	EPA 415.1	1.5	mg/L	< 1.5 U
Fecal Coliform	08/10/02 08102#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL	Analytical reporting limit
U	Undetected at reported detection limit

Report for EQ21 received 08/09/02

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: MW-6

Lab Sample ID: EQ21D
LIMS ID: 02-10454
Matrix: Water

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 08/08/02
Date Received: 08/09/02

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Fecal Coliform	08/10/02 08102#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL Analytical reporting limit
U Undetected at reported detection limit

Report for EQ21 received 08/09/02

MICROBIOLOGICAL BENCHSHEET (Membrane Filtration)

PARAMETER:	FECAL COLIFORM
METHOD:	MF
MEDIA:	MFC BROTH
INCUBATION:	44.5C, 24HR

Calculations:
Dilution Factor: **enter as sample volume / final volume (i.e. " =10/100")**
cfu/100 ml = ((count / vol filtered) x 100)/dilution factor
count: if max of all count data < 1, count =1, otherwise count = Σ count data
if Σcount > 200, "count err!" message, remove high counts or overide sum formula as necessary
volume filtered: selected by analyst, sum all volumes having count data (enter "=" then click on the mL filtered row!)
If count = "TNTC" or "CONF", you may manually enter (overide the formulas) in the count or volume column as necessary
Any single count within the ideal range stands by itself, overide formulas for any ideal range count data

DATE SAMPLED:	8.8.02
DATE RC'D:	8.9.02
DATE FILTERED:	8.9.02
ANALYST:	EW

Ideal ranges for accurate counting
Total Coliform : 20 - 80 Colonies
Fecal Coliform : 20 - 60 Colonies
Fecal Streptococci : 20-100 colonies

SAMPLE ID	Sampled		Filtered		Dilution Factor	Count Data mL filtered						COUNT	Total Volume Filtered	cfu/100mL	
	DATE	TIME	DATE	TIME		5	95				100				
BLANK	-	-	8.9.02	10:00	1.00						0	1	100	<	1
EQ21A1	8.8.02	11:15	↓	↓		0	0					1			
B1	↓	12:15				0	0					1			
C1		12:45				0	0					1			
D1		14:55				0	0					1			
												1			
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												1			

READ SAT @ 10:00 AM

Zeroed:
✓ 8-10-02
SM.

✓ ewp 8/12/02

QA Report - Laboratory Control Samples

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Received: NA

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

LABORATORY CONTROL SAMPLES
CONVENTIONALS

Constituent	Units	Measured Value	True Value	Recovery
Laboratory Control Sample				
Turbidity	NTU	17.3	17.4	99.4%
Date analyzed: 08/09/02	Batch ID: 08092#1			
Laboratory Control Sample				
Total Cyanide	mg/L	0.133	0.150	88.7%
Date analyzed: 08/16/02	Batch ID: 08162#1			

QA Report - Standard Reference Material Analysis

QC Report No: EQ21-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Received: NA

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

STANDARD REFERENCE MATERIAL ANALYSIS
CONVENTIONALS

Constituent	Units	Value	True Value	Recovery
ERA 16042				
N-Ammonia	mg-N/L	0.743	0.800	92.9%
Date analyzed: 08/20/02	Batch ID: 08202#1			
ERA #0206-02-02				
Total Organic Carbon	mg/L	19.3	20.0	96.5%
Date analyzed: 08/14/02	Batch ID: 08142#1			

ANALYTICAL
RESOURCES
INCORPORATED

QA Report - Replicate Analysis

QC Report No: EQ21-Landau Associates, Inc.
Matrix: Water
Project: Cornwall Ave. Landfill
001020.220
Date Received: 08/09/02

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

DUPLICATE ANALYSIS RESULTS
CONVENTIONALS

Constituent	Units	Sample Value	Duplicate Value	RPD
ARI ID: 02-10451, EQ21 A	**Client Sample ID: S-1**			
Turbidity	NTU	2.4	2.2	8.7%
Total Cyanide	mg/L	< 0.005 U	< 0.005 U	NA
N-Ammonia	mg-N/L	6.9	6.8	1.5%
Total Organic Carbon	mg/L	4.6	4.9	6.3%

RPD Limits +/- 20%

QA Report - Matrix Spike/Matrix Spike Duplicate Analysis

QC Report No: EQ21-Landau Associates, Inc.
Matrix: Water
Project: Cornwall Ave. Landfill
001020.220
Date Received: 08/09/02

Data Release Authorized: asp
Reported: 08/23/02 Amy S. Phillips

MATRIX SPIKE QA/QC REPORT
CONVENTIONALS

Constituent	Units	Sample Value	Spike Value	Spike Added	Recovery
ARI ID: 02-10451, EQ21 A Client Sample ID: S-1					
Total Cyanide	mg/L	< 0.005	0.128	0.147	87.1%
N-Ammonia	mg-N/L	6.9	12.9	5.00	120%
Total Organic Carbon	mg/L	4.6	25.6	20.0	105%

MS/MSD Recovery Limits: 75 - 125 %

Analytical Resources, Incorporated
Analytical Chemists and Consultants

RECEIVED
JUL 2 2002
LANDAU ASSOCIATES, INC.

July 2, 2002

Ms. Shannon Dunn
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall Ave; 001020.200
ARI Job No: EL51

Dear Shannon,

Please find enclosed a carbon copy of the original chain of custody (COC) and analytical results for the project referenced above. Analytical Resources, Inc. (ARI) accepted four seven sediment samples on June 11, 2002. The samples were received in good condition and there were no discrepancies between the COC and containers' labels.

The samples were analyzed for total metals referencing US EPA methods 6010B/7421/7471A, bis(2-ethylhexyl)phthalate referencing US EPA method 8270, PCBs referencing US EPA method 8082, and TOC referencing Plumb, 1981. Pete Rude (Landau Associates) canceled the request for grain size analysis by telephone on 6/12/02. Quality control analyses are included for your review, including batch matrix QC for the bis(2-ethylhexyl)phthalate, PCBs, and total metals analyses. The total metals matrix spike and sample duplicate reported under LIMS ID 02-7482 is applicable to the ICP and lead analyses. The total metals matrix spikes and sample duplicates reported under LIMS IDs 02-7599 and 02-7623 are applicable for the mercury analysis.

Samples **SRI-SED-5**, **SRI-SED-6**, and **SRI-SED-9**, were analyzed and reported at a two times dilution because the initial analyses of these samples without dilution showed surrogate recoveries above the QC limit due to suppression of the internal standard.

No further analytical complications were noted. A copy of this report and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Mary Lou Fox

Mary Lou Fox
Project Manager
206-695-6211
marylou@arilabs.com

MLF/mlf
Enclosure
cc: File EL51

3.5

Landau Associates

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Lake Oswego)** (503) 443-6010
☐ ____________

Chain-of-Custody Record

Date ____________

Page ______ of ______

Project Name CORNWALL AVE

Project No. 001020.200

Project Location/Event SRI-SED

Sampler's Name SMD/NMJ

Project Contact SHANNON DUNN

Send Results To SHANNON DUNN

Turnaround Time
☐ Standard
☐ Accelerated
☐ ____________

Sample I.D.	Date	Time	Matrix	No. of Containers	CU,Pb,Ag,ZN EPA 6010, 7[illegible]	BIS(2-ETHYLHEXYL) PHTHALATE EPA 8270	PCBs, EPA 8082	GRAIN SIZE PLUMB [illegible]	TOC EPA 9060	TOTAL SOLIDS PSE[illegible]	Hg						Observations/Comments
SRI-SED-1	6-10-02	11:05	SED	6	X	X	X	X	X	X							
SRI-SED-2	↓	11:35	↓	4	X	X	X	X	X	X							
SRI-SED-3		12:10		4	X	X	X	X	X	X	X						
SRI-SED-4		12:25		4	X	X	X	X	X	X							
SRI-SED-5		12:50		4	X	X	X	X	X	X	X						
SRI-SED-6		13:05		4	X	X	X	X	X	X							
SRI-SED-9		11:40		4	X	X	X	X	X	X							

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature Eric Branson	Signature	Signature
Printed Name SHANNON DUNN	Printed Name ERIC BRANSON	Printed Name	Printed Name
Company LANDAU	Company ARI	Company	Company
Date 6-11-02 Time 8:40	Date 6/11/02 Time 1630	Date ______ Time ______	Date ______ Time ______

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 4/01

ORGANICS ANALYSIS DATA SHEET
PSDDA Semivolatiles by GC/MS
Page 1 of 1
Lab Sample ID: EL51A
LIMS ID: 02-7765
Matrix: Sediment
Data Release Authorized:
Reported: 06/26/02

Sample No: SRI-SED-1

ANALYTICAL RESOURCES INCORPORATED

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/24/02 16:57
Instrument: NT1
GPC Cleanup: NO

Sample Amount: 25.4 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 1:1
Percent Moisture: 61.3%
pH: 14.0

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	220

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	121%

ORGANICS ANALYSIS DATA SHEET
PSDDA Semivolatiles by GC/MS
Page 1 of 1
Lab Sample ID: EL51B
LIMS ID: 02-7766
Matrix: Sediment
Data Release Authorized:
Reported: 06/26/02

Sample No: SRI-SED-2

ANALYTICAL RESOURCES INCORPORATED

QC Report No: EL51-Landau Associates, Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/24/02 17:40
Instrument: NT1
GPC Cleanup: NO

Sample Amount: 25.4 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 1:1
Percent Moisture: 61.6%
pH: 12.0

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	160

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	89.8%

ORGANICS ANALYSIS DATA SHEET		Sample No:	SRI-SED-3
PSDDA Semivolatiles by GC/MS			
Page 1 of 1			
Lab Sample ID:	EL51C	QC Report No:	EL51-Landau Associates,Inc.
LIMS ID:	02-7767	Project:	Cornwall Ave. 001020.200
Matrix:	Sediment		
Data Release Authorized:		Date Sampled:	06/10/02
Reported:	06/26/02	Date Received:	06/11/02

ANALYTICAL RESOURCES INCORPORATED

Date extracted:	06/18/02	Sample Amount:	25.6 g-dry-wt
Date analyzed:	06/24/02 18:22	Final Extract Volume:	0.5 mL
Instrument:	NT1	Dilution Factor:	1:1
GPC Cleanup:	NO	Percent Moisture:	59.2%
		pH:	7.4

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	160

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	104%

ORGANICS ANALYSIS DATA SHEET
PSDDA Semivolatiles by GC/MS
Page 1 of 1

Sample No: SRI-SED-4

ANALYTICAL RESOURCES INCORPORATED

Lab Sample ID:	EL51D	QC Report No:	EL51-Landau Associates, Inc.
LIMS ID:	02-7768	Project:	Cornwall Ave. 001020.200
Matrix:	Sediment		
Data Release Authorized:		Date Sampled:	06/10/02
Reported:	06/26/02	Date Received:	06/11/02

Date extracted:	06/18/02	Sample Amount:	25.2 g-dry-wt
Date analyzed:	06/24/02 19:05	Final Extract Volume:	0.5 mL
Instrument:	NT1	Dilution Factor:	1:1
GPC Cleanup:	NO	Percent Moisture:	58.8%
		pH:	5.6

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	390

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	123%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by GC/MS
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

Sample No: Batch Sample
QC Batch: EL51
Date Received: 06/10/02

Data Release Authorized:
Reported: 07/01/02

MATRIX SPIKE/SPIKE DUPLICATE RECOVERY
Date extracted: 06/17/02
Date analyzed: 06/19/02

CONSTITUENT		SAMPLE VALUE	SPIKE VALUE	SPIKE ADDED	% RECOVERY	RPD
Phenol	<	39.2	542.	735	73.7%	
Pentachlorophenol	<	97.9	590.	735	80.3%	
MATRIX SPIKE DUPLICATE						
Phenol	<	39.2	524.	734	71.4%	3.2%
Pentachlorophenol	<	97.9	533.	734	72.6%	10%

Values reported in ug/kg-dry-weight

FORM-III

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: SRI-SED-1

Lab Sample ID: EL51A
LIMS ID: 02-7765
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates, Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 15:21
Instrument ID: ECD1
Sample Amount: 25.5 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 14.

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 61.3%

Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	20	U
53469-21-9	Aroclor 1242	20	U
12672-29-6	**Aroclor 1248**	**130**	
11097-69-1	**Aroclor 1254**	**130**	
11096-82-5	Aroclor 1260	42	Y
11104-28-2	Aroclor 1221	39	U
11141-16-5	Aroclor 1232	20	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	86.8%
Tetrachlorometaxylene	64.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: SRI-SED-2

Lab Sample ID: EL51B
LIMS ID: 02-7766
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 15:49
Instrument ID: ECD1
Sample Amount: 25.5 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 12.

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 61.6%

Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	20	U
53469-21-9	Aroclor 1242	20	U
12672-29-6	Aroclor 1248	32	Y
11097-69-1	**Aroclor 1254**	**31**	
11096-82-5	Aroclor 1260	20	U
11104-28-2	Aroclor 1221	39	U
11141-16-5	Aroclor 1232	20	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	79.8%
Tetrachlorometaxylene	70.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: SRI-SED-3

Lab Sample ID: EL51C
LIMS ID: 02-7767
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 16:17
Instrument ID: ECD1
Sample Amount: 25.3 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 7.4

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 59.2%

. Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	20	U
53469-21-9	Aroclor 1242	20	U
12672-29-6	Aroclor 1248	31	Y
11097-69-1	**Aroclor 1254**	**28**	
11096-82-5	Aroclor 1260	20	U
11104-28-2	Aroclor 1221	39	U
11141-16-5	Aroclor 1232	20	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	78.2%
Tetrachlorometaxylene	72.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL
RESOURCES
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ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: SRI-SED-4

Lab Sample ID: EL51D
LIMS ID: 02-7768
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 16:45
Instrument ID: ECD1
Sample Amount: 25.2 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 5.6

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 58.8%

Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	20 U
53469-21-9	Aroclor 1242	20 U
12672-29-6	**Aroclor 1248**	**75**
11097-69-1	**Aroclor 1254**	**84**
11096-82-5	Aroclor 1260	32 Y
11104-28-2	Aroclor 1221	40 U
11141-16-5	Aroclor 1232	20 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	78.8%
Tetrachlorometaxylene	69.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: SRI-SED-3

Lab Sample ID: EL51C
LIMS ID: 02-7767
Matrix: Sediment

QC Report No: EL51-Landau Associates, Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 38.4%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	**Copper**	0.5	**63.2**
3050B	06/13/02	7421	06/18/02	**7439-92-1**	**Lead**	1	**22**
CLP	06/14/02	7471A	06/17/02	**7439-97-6**	**Mercury**	0.1	**0.4**
3050B	06/13/02	6010B	06/18/02	7440-22-4	Silver	0.7	0.7 U
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	**Zinc**	1	**126**

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: SRI-SED-4

Lab Sample ID: EL51D
LIMS ID: 02-7768
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 38.5%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	Copper	0.5	104
3050B	06/13/02	7421	06/21/02	**7439-92-1**	Lead	2	56
3050B	06/13/02	6010B	06/18/02	**7440-22-4**	Silver	0.8	0.8
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	Zinc	2	215

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET **Sample No: SRI-SED-5**
TOTAL METALS

Lab Sample ID: EL51E
LIMS ID: 02-7769
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 36.4%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	**Copper**	0.5	**69.9**
3050B	06/13/02	7421	06/18/02	**7439-92-1**	**Lead**	1	**33**
CLP	06/14/02	7471A	06/17/02	**7439-97-6**	**Mercury**	0.1	**0.7**
3050B	06/13/02	6010B	06/18/02	7440-22-4	Silver	0.8	0.8 U
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	**Zinc**	2	**151**

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: SRI-SED-6

Lab Sample ID: EL51F
LIMS ID: 02-7770
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 37.3%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	**Copper**	0.5	126
3050B	06/13/02	7421	06/20/02	**7439-92-1**	**Lead**	3	57
3050B	06/13/02	6010B	06/18/02	7440-22-4	Silver	0.8	0.8 U
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	**Zinc**	2	175

U Analyte undetected at given RL

RL Reporting Limit

FORM-I

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: SRI-SED-9

Lab Sample ID: EL51G
LIMS ID: 02-7771
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 36.4%

Prep Meth	**Prep Date**	**Analysis Method**	**Analysis Date**	**CAS Number**	**Analyte**	**RL**	**mg/kg-dry**
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	**Copper**	0.5	**81.4**
3050B	06/13/02	7421	06/20/02	**7439-92-1**	**Lead**	1	**34**
3050B	06/13/02	6010B	06/18/02	**7440-22-4**	**Silver**	0.8	**0.8**
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	**Zinc**	2	**139**

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

ANALYTICAL
RESOURCES
INCORPORATED

Lab Sample ID: EL51LCS
LIMS ID: 02-7767
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200

Data Release Authorized:
Reported: 06/24/02

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike mg/kg-dry	Spike Added	% Recovery	Q
Copper	6010B	47.7	50.0	95.4%	
Lead	7421	9.6	10.0	96.0%	
Mercury	7471A	1.07	1.00	107%	
Silver	6010B	50.6	50.0	101%	
Zinc	6010B	50.2	50.0	100%	

'Q' codes: N = control limit not met

Control Limits: 80-120%

FORM-VII

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-1

Lab Sample ID: EL51A
LIMS ID: 02-7765
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/21/02 Dr. M.A. Perkins

Analyte	Analysis Date/Batch	Method	Dilution Factor	RL	Units	Result
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	38.9
Total Organic Carbon	06/18/02 06182#1	Plumb,1981		0.0050	Percent	3.1

RL	Analytical reporting limit
U	Undetected at reported detection limit
B	Analyte found in method blank above detection

Report for EL51 received 06/11/02

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-2

Lab Sample ID: EL51B
LIMS ID: 02-7766
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/21/02 Dr. M.A. Perkins

Analyte	Analysis Date/Batch	Method	Dilution Factor	RL	Units	Result
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	36.9
Total Organic Carbon	06/18/02 06182#1	Plumb,1981		0.0050	Percent	3.1

RL	Analytical reporting limit
U	Undetected at reported detection limit
B	Analyte found in method blank above detection

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-3

Lab Sample ID: EL51C
LIMS ID: 02-7767
Matrix: Sediment

QC Report No: EL51-Landau Associates, Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized: MP
Reported: 06/21/02 Dr. M.A. Perkins

Analyte	Analysis Date/Batch	Method	Dilution Factor	RL	Units	Result
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	39.5
Total Organic Carbon	06/18/02 06182#1	Plumb, 1981		0.0050	Percent	2.9

RL Analytical reporting limit
U Undetected at reported detection limit
B Analyte found in method blank above detection

ANALYTICAL
RESOURCES
INCORPORATED

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-4

Lab Sample ID: EL51D
LIMS ID: 02-7768
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/21/02 Dr. M. A. Perkins

Analyte	Analysis Date/Batch	Method	Dilution Factor	RL	Units	Result
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	38.6
Total Organic Carbon	06/18/02 06182#1	Plumb,1981		0.0050	Percent	3.6

RL Analytical reporting limit
U Undetected at reported detection limit
B Analyte found in method blank above detection

ANALYTICAL RESOURCES INCORPORATED

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-5

Lab Sample ID: EL51E
LIMS ID: 02-7769
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/21/02 Dr. M.A. Perkins

Analyte	Analysis Date/Batch	Method	Dilution Factor	RL	Units	Result
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	37.8
Total Organic Carbon	06/18/02 06182#1	Plumb,1981		0.0050	Percent	3.7

RL	Analytical reporting limit
U	Undetected at reported detection limit
B	Analyte found in method blank above detection

Report for EL51 received 06/11/02

ORGANICS ANALYSIS DATA SHEET
PSDDA Semivolatiles by GC/MS
Page 1 of 1
Lab Sample ID: EL51E
LIMS ID: 02-7769
Matrix: Sediment
Data Release Authorized:
Reported: 06/26/02

Sample No: SRI-SED-5

ANALYTICAL RESOURCES INCORPORATED

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/25/02 13:43
Instrument: NT1
GPC Cleanup: NO

Sample Amount: 25.5 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 1:2
Percent Moisture: 62.2%
pH: 12.0

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	290

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	92.6%

ORGANICS ANALYSIS DATA SHEET
PSDDA Semivolatiles by GC/MS
Page 1 of 1
Lab Sample ID: EL51F
LIMS ID: 02-7770
Matrix: Sediment
Data Release Authorized:
Reported: 06/26/02

Sample No: SRI-SED-6

ANALYTICAL RESOURCES INCORPORATED

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/25/02 15:08
Instrument: NT1
GPC Cleanup: NO

Sample Amount: 25.2 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 1:2
Percent Moisture: 61.4%
pH: 11.0

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	300

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	93.8%

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-6

Lab Sample ID: EL51F
LIMS ID: 02-7770
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/21/02 Dr. M.A. Perkins

Analyte	**Analysis Date/Batch**	**Method**	**Dilution Factor**	**RL**	**Units**	**Result**
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	40.1
Total Organic Carbon	06/18/02 06182#1	Plumb,1981		0.0050	Percent	4.2

RL	Analytical reporting limit
U	Undetected at reported detection limit
B	Analyte found in method blank above detection

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: SRI-SED-9

Lab Sample ID: EL51G
LIMS ID: 02-7771
Matrix: Sediment

Data Release Authorized: MP
Reported: 06/21/02 Dr. M.A. Perkins

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Analyte	Analysis Date/Batch	Method	Dilution Factor	RL	Units	Result
Total Solids	06/12/02 06122#1	EPA 160.3 SM 2540 B		0.01	Percent	37.5
Total Organic Carbon	06/18/02 06182#1	Plumb,1981		0.0050	Percent	2.8

RL Analytical reporting limit
U Undetected at reported detection limit
B Analyte found in method blank above detection

Report for EL51 received 06/11/02

ORGANICS ANALYSIS DATA SHEET
PSDDA Semivolatiles by GC/MS
Page 1 of 1

Sample No: SRI-SED-9

ANALYTICAL RESOURCES INCORPORATED

Lab Sample ID: EL51G
LIMS ID: 02-7771
Matrix: Sediment
Data Release Authorized:
Reported: 06/26/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/25/02 16:34
Instrument: NT1
GPC Cleanup: NO

Sample Amount: 25.1 g-dry-wt
Final Extract Volume: 0.5 mL
Dilution Factor: 1:2
Percent Moisture: 60.9%
pH: 15.0

CAS Number	Analyte	ug/kg
117-81-7	bis(2-Ethylhexyl)phthalate	130

Semivolatiles Surrogate Recovery	
d14-p-Terphenyl	82.9%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by GC/MS
Page 1 of 1

ANALYTICAL
RESOURCES
INCORPORATED

Lab Sample ID: EL51LCS
LIMS ID: 02-7765
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200

Data Release Authorized:
Reported: 06/26/02

LABORATORY CONTROL SAMPLE
Date extracted: 06/18/02
Date analyzed: 06/25/02

CONSTITUENT	SPIKE VALUE	SPIKE ADDED	% RECOVERY
Phenol	475	750	63.3%
2-Chlorophenol	494	750	65.9%
1,4-Dichlorobenzene	293	500	58.6%
N-Nitroso-Di-N-Propylamine	279	500	55.8%
1,2,4-Trichlorobenzene	316	500	63.2%
4-Chloro-3-methylphenol	553	750	73.7%
Acenaphthene	346	500	69.2%
4-Nitrophenol	673	750	89.7%
2,4-Dinitrotoluene	413	500	82.6%
Pentachlorophenol	628	750	83.7%
Pyrene	386	500	77.2%

Lab Control Surrogate Recovery

d14-p-Terphenyl	87.9%

Values reported in ug/kg-dry-weight

FORM-III

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

ANALYTICAL RESOURCES INCORPORATED

Sample No: SRI-SED-9

Lab Sample ID: EL51G
LIMS ID: 02-7771
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 18:09
Instrument ID: ECD1
Sample Amount: 25.2 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 15.

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 60.9%

Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	20 U
53469-21-9	Aroclor 1242	20 U
12672-29-6	Aroclor 1248	42 Y
11097-69-1	**Aroclor 1254**	**62**
11096-82-5	Aroclor 1260	20 U
11104-28-2	Aroclor 1221	40 U
11141-16-5	Aroclor 1232	20 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	71.0%
Tetrachlorometaxylene	66.2%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: SRI-SED-1

Lab Sample ID: EL51A
LIMS ID: 02-7765
Matrix: Sediment

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 37.2%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	**Copper**	0.5	**88.3**
3050B	06/13/02	7421	06/18/02	**7439-92-1**	**Lead**	3	**51**
3050B	06/13/02	6010B	06/18/02	**7440-22-4**	**Silver**	0.8	**0.9**
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	**Zinc**	2	**156**

U Analyte undetected at given RL

RL Reporting Limit

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INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: SRI-SED-2

Lab Sample ID: EL51B
LIMS ID: 02-7766
Matrix: Sediment

QC Report No: EL51-Landau Associates, Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Data Release Authorized:
Reported: 06/24/02

Percent Total Solids: 36.1%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry
3050B	06/13/02	6010B	06/18/02	**7440-50-8**	**Copper**	0.5	**68.9**
3050B	06/13/02	7421	06/18/02	**7439-92-1**	**Lead**	1	**30**
3050B	06/13/02	6010B	06/18/02	7440-22-4	Silver	0.8	0.8 U
3050B	06/13/02	6010B	06/18/02	**7440-66-6**	**Zinc**	2	**142**

U Analyte undetected at given RL

RL Reporting Limit

FORM-I

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

ANALYTICAL RESOURCES INCORPORATED

Sample No: SRI-SED-5

Lab Sample ID: EL51E
LIMS ID: 02-7769
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 17:13
Instrument ID: ECD1
Sample Amount: 25.4 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 12.

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 62.2%

Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	20	U
53469-21-9	Aroclor 1242	20	U
12672-29-6	Aroclor 1248	46	Y
11097-69-1	**Aroclor 1254**	**46**	
11096-82-5	Aroclor 1260	21	Y
11104-28-2	Aroclor 1221	39	U
11141-16-5	Aroclor 1232	20	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	67.8%
Tetrachlorometaxylene	64.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

ANALYTICAL
RESOURCES
INCORPORATED

Sample No: SRI-SED-6

Lab Sample ID: EL51F
LIMS ID: 02-7770
Matrix: Sediment

Data Release Authorized:
Reported: 06/25/02

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Sampled: 06/10/02
Date Received: 06/11/02

Date extracted: 06/18/02
Date analyzed: 06/20/02 17:41
Instrument ID: ECD1
Sample Amount: 25.4 g-dry-wt
Final Ext Vol: 5.0 mL
pH: 11.

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1
Percent Moisture: 61.4%

Reported in Total ug/kg Dry Weight

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	20	U
53469-21-9	Aroclor 1242	20	U
12672-29-6	Aroclor 1248	150	Y
11097-69-1	**Aroclor 1254**	**110**	
11096-82-5	Aroclor 1260	32	Y
11104-28-2	Aroclor 1221	39	U
11141-16-5	Aroclor 1232	20	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	84.0%
Tetrachlorometaxylene	70.2%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
NV	Indicates no value reportable - see additional analyses.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

QA Report - Standard Reference Material Analysis

QC Report No: EL51-Landau Associates,Inc.
Project: Cornwall Ave.
001020.200
Date Received: NA

Data Release Authorized
Reported: 06/21/02 Dr. M.A. Perkins

STANDARD REFERENCE MATERIAL ANALYSIS
CONVENTIONALS

Constituent	Units	Value	True Value	Recovery
NIST #8704				
Total Carbon	Percent	3.27	3.35	97.6%

Date analyzed: 06/18/02 Batch ID: 06182#1

QA Report - Replicate Analysis

QC Report No: EL51-Landau Associates,Inc.

Matrix: Sediment

Project: Cornwall Ave.
001020.200

Date Received: 06/11/02

Data Release Authorized:
Reported: 06/21/02 Dr. M.A. Perkins

REPLICATE ANALYSIS RESULTS
CONVENTIONALS

Constituent	Units	Sample Value	Replicate Value(s)	RPD/RSD
ARI ID: 02-7765, EL51 A	**Client Sample ID: SRI-SED-1**			
Total Solids	Percent	38.9	38.1	RPD: 2.1%
Total Organic Carbon	Percent	3.1	3.3 3.8	RSD: 10.6%

RPD Limits +/- 20%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

RECEIVED
JUL 22 2002
LANDAU ASSOCIATES, INC.

July 22, 2002

Mr. Tim Syverson
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall Ave. Landfill; 001020.220
ARI Job No: EN15

Dear Tim,

Please find enclosed original chain of custody (COC) and analytical results for the project referenced above. Analytical Resources, Inc. (ARI) accepted three samples on July 1, 2002. The samples were received in good condition and there were no discrepancies between the COC and containers' labels. The **MW-6-3.0** soil sample and **TP-18** product sample were placed on hold per the client's request. Only the **TP-13** product, floating on top of the water phase of TP-13 was analyzed.

The **TP-13** product sample was analyzed for PAHs referencing US EPA method 8270, diesel and oil range hydrocarbons referencing WDOE method NWTPH-Dx, BTEX compounds referencing US EPA method 8021Bm, and PCBs referencing US EPA method 8082.

No analytical complications were noted. A copy of this report and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Mary Lou Fox

Mary Lou Fox
Project Manager
206-695-6211
marylou@arilabs.com

MLF/mlf
Enclosure
cc: File EN15

15.0 c

ENIS

Landau Associates

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Lake Oswego)** (503) 443-6010
☐

Date 7/1/02
Page 1 of 1

Chain-of-Custody Record

Project Name Cornwall Ave. Landfill
Project No. 001020220
Project Location/Event Bellingham
Sampler's Name KJR (Ken Reid)
Project Contact Tim Syverson
Send Results To " "

Turnaround Time
☒ Standard
☐ Accelerated
☐

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	PAH's 8270	Solvents 8020	BTEX	Lead 610	HCID	TPH	~~SVOCs 8270~~						Observations/Comments
TP-13	6/26/02	945	H_2O	5	X				X								ID floating product off top of H_2
MW-6-3.0	6/27/02	1445	Soil	1		X		X	X								
TP-18	6/26/02	1500	Product	1	X				X								ID product

Please call us w/ ?'s !!

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by
Signature
Ken Reid
Printed Name
Landau Assoc.
Company
Date 7/1/02 Time 1115

Received by
Signature
Joshua L. Kennerly
Printed Name
AFI
Company
Date 7/1/02 Time 14:35

Relinquished by
Signature
Printed Name
Company
Date Time

Received by
Signature
Printed Name
Company
Date Time

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 4/01

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PNAs by GC/MS

Sample No: TP-13

Lab Sample ID: EN15A
LIMS ID: 02-8726
Matrix: Product
Data Release Authorized:
Reported: 07/18/02

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 06/26/02
Date Received: 07/01/02

Date extracted: 07/08/02
Date analyzed: 07/14/02 23:36
Instrument: FINN4
GPC Cleanup: NO
Alumina: 1:10

Sample Amount: 2.00 g-as-rec
Final Extract Volume: 10. mL
Conc/Dilution Factor: 1:20
Moisture: NA
pH: NA

CAS Number	Analyte	ug/kg
91-20-3	**Naphthalene**	**2,200,000**
91-57-6	**2-Methylnaphthalene**	**18,000,000** E
208-96-8	Acenaphthylene	100,000 U
83-32-9	**Acenaphthene**	**670,000**
86-73-7	**Fluorene**	**720,000**
85-01-8	**Phenanthrene**	**1,900,000**
120-12-7	Anthracene	100,000 U
206-44-0	Fluoranthene	100,000 U
129-00-0	**Pyrene**	**120,000**
56-55-3	Benzo(a)anthracene	100,000 U
218-01-9	Chrysene	100,000 U
205-99-2	Benzo(b)fluoranthene	100,000 U
207-08-9	Benzo(k)fluoranthene	100,000 U
50-32-8	Benzo(a)pyrene	100,000 U
193-39-5	Indeno(1,2,3-cd)pyrene	100,000 U
53-70-3	Dibenz(a,h)anthracene	100,000 U
191-24-2	Benzo(g,h,i)perylene	100,000 U
132-64-9	**Dibenzofuran**	**280,000**

Base/Neutral Surrogate Recovery	
d14-p-Terphenyl	53.6%
d10-Diphenyl	65.6%

ORGANICS ANALYSIS DATA SHEET
PNAs by GC/MS

Sample No: TP-13
DILUTION

Lab Sample ID: EN15ADL
LIMS ID: 02-8726
Matrix: Product
Data Release Authorized:
Reported: 07/18/02

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 06/26/02
Date Received: 07/01/02

Date extracted: 07/08/02
Date analyzed: 07/15/02 0:07
Instrument: FINN4
GPC Cleanup: NO
Alumina: 1:10

Sample Amount: 2.00 g-as-rec
Final Extract Volume: 10. mL
Conc/Dilution Factor: 1:120
Moisture: NA
pH: NA

CAS Number	Analyte	ug/kg
91-20-3	**Naphthalene**	**2,300,000**
91-57-6	**2-Methylnaphthalene**	**17,000,000**
208-96-8	Acenaphthylene	600,000 U
83-32-9	**Acenaphthene**	**680,000**
86-73-7	**Fluorene**	**730,000**
85-01-8	**Phenanthrene**	**1,700,000**
120-12-7	Anthracene	600,000 U
206-44-0	Fluoranthene	600,000 U
129-00-0	Pyrene	600,000 U
56-55-3	Benzo(a)anthracene	600,000 U
218-01-9	Chrysene	600,000 U
205-99-2	Benzo(b)fluoranthene	600,000 U
207-08-9	Benzo(k)fluoranthene	600,000 U
50-32-8	Benzo(a)pyrene	600,000 U
193-39-5	Indeno(1,2,3-cd)pyrene	600,000 U
53-70-3	Dibenz(a,h)anthracene	600,000 U
191-24-2	Benzo(g,h,i)perylene	600,000 U
132-64-9	Dibenzofuran	600,000 U

Base/Neutral Surrogate Recovery	
d14-p-Terphenyl	D
d10-Diphenyl	D

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

ANALYTICAL
RESOURCES
INCORPORATED

Sample No: TP-13

Lab Sample ID: EN15A
LIMS ID: 02-8726
Matrix: Product

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 06/26/02
Date Received: 07/01/02

Data Release Authorized: VS
Reported: 07/11/02

Date analyzed: 07/02/02

Volume Purged: 5.0 mL
Dilution: 1:100

Reported in ppb (ug/L)

CAS Number	Analyte	Value
71-43-2	Benzene	100 U
108-88-3	Toluene	100 U
100-41-4	Ethylbenzene	3,700
	m,p-Xylene	12,000
95-47-6	o-Xylene	6,700

BETX Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	98.9%

Data Qualifiers

U	Indicates compound was analyzed for, but not detected at the given detection limit.
J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
B	Found in associated method blank.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

ANALYTICAL RESOURCES INCORPORATED

Lab Sample ID: EN15LCS
LIMS ID: 02-8726
Matrix: Product

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220

Data Release Authorized: VS
Reported: 07/11/02

LCS/LCSDUPLICATE ANALYSIS

Date Analyzed: 07/02/02

CONSTITUENT	SPIKE FOUND	SPIKE ADDED	% REC	% RPD
Lab Control Sample				
Benzene	23.5	25.0	94.0%	
Toluene	23.8	25.0	95.2%	
Ethylbenzene	24.4	25.0	97.6%	
m,p-Xylene	48.0	50.0	96.0%	
o-Xylene	24.0	25.0	96.0%	
Lab Control Duplicate				
Benzene	24.8	25.0	99.2%	5.4%
Toluene	25.2	25.0	101%	5.7%
Ethylbenzene	26.1	25.0	104%	6.7%
m,p-Xylene	50.6	50.0	101%	5.3%
o-Xylene	25.1	25.0	100%	4.5%

BETX SURROGATE REC	LCS	LCSD
Trifluorotoluene	97.3%	98.9%
Bromobenzene	99.1%	101%

Values reported in parts per billion (ug/L)

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

ANALYTICAL RESOURCES INCORPORATED

Sample No: TP-13

Lab Sample ID: EN15A
LIMS ID: 02-8726
Matrix: Product

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 06/26/02
Date Received: 07/01/02

Data Release Authorized:
Reported: 07/18/02

Date extracted: 07/03/02
Date analyzed: 07/04/02

Sample Amount: 2.00 g-as-rec
Final Ext Vol: 20 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/kg as received (ppb)

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	1,000 U
53469-21-9	Aroclor 1242	1,000 U
12672-29-6	Aroclor 1248	1,000 U
11097-69-1	Aroclor 1254	1,000 U
11096-82-5	Aroclor 1260	1,000 U
11104-28-2	Aroclor 1221	2,000 U
11141-16-5	Aroclor 1232	1,000 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	12.8%
Tetrachlorometaxylene	99.2%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

FORM-1 PCB

TOTAL DIESEL RANGE HYDROCARBONS
WA TPHd Range C12 to C24 by GC/FID

ANALYTICAL
RESOURCES
INCORPORATED

Lab Sample ID: EN15LCS
LIMS ID: 02-8726
Matrix: Product

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220

Data Release Authorized:
Reported: 07/18/02

LABORATORY CONTROL SAMPLE RECOVERY REPORT
Analyzed: 07/09/02

CONSTITUENT	SPIKE FOUND	SPIKE ADDED	% RECOVERY	RPD
Diesel Range Hydrocarbons	126000	150000	84.0%	
Diesel Range Hydrocarbons	127000	150000	84.7%	0.8%

Values reported in ppm (mg/kg) as received.

TPHD SURROGATE RECOVERY SUMMARY

Matrix: Product

QC Report No: EN15-Landau Associates
Project: Cornwall Ave. Landfill
001020.220

Client ID	O-TER	TOT OUT
070302MBS	81.3%	0
070302LCS	70.6%	0
070302LCSD	69.4%	0
TP-13	56.8%	0
TP-13 DL	50.0%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(61-112)	(34-113)

Prep Method: DL
Log Number Range: 02-8726 to 02-8726

Analytical Resources, Incorporated
Analytical Chemists and Consultants

RECEIVED
JUL 29 2002
LANDAU ASSOCIATES, INC.

July 29, 2002

Ms. Shannon Dunn
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall Ave. Landfill; 001020.220
ARI Job No: EN82

Dear Shannon,

Please find enclosed original chain of custody (COC) and analytical results for the project referenced above. Analytical Resources, Inc. (ARI) accepted three water samples on July 11, 2002. The samples were received in good condition and there were no discrepancies between the COC and containers' labels.

The samples were analyzed for PCBs referencing US EPA method 8082, diesel and motor oil range hydrocarbons referencing WDOE method NWTPH-Dx with acid/si cleanup, total and dissolved metals referencing US EPA methods 6010B and 7421, and general chemistry parameters as referenced specifically on the reports.

In the NWTPH-Dx analysis, the leading continuing calibration (C-Cal) showed motor oil above the QC limit. None of the samples showed any detections in the analysis, so no elevation of sample values could have occurred. No corrective action was necessary.

The conventionals lab supervisor noted that sample **S-1** tested positive for sulfide interference in the total cyanide analysis. The sample was treated to remove the interference, but stilled showed interference in the analysis. The client was consulted and the sample was re-analyzed at a five times dilution, yielding a reporting limit of .025 mg/L. A matrix spike was performed on the sample for this analysis and showed a low recovery of 68.9%. The conventionals lab supervisor also noted that this was most likely due to the high level of sulfide interference. Recovery of cyanide in the laboratory control sample (LCS) for this analysis was good and no further corrective action was taken.

Landau Associates
Cornwall Ave. Landfill; 001020.220
ARI Job Number: EN82
Page 2

No further analytical complications were noted. A copy of this report and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Mary Lou Fox

Mary Lou Fox
Project Manager
206-695-6211
marylou@arilabs.com

MLF/mlf
Enclosure
cc: File EN82

EN82

Landau Associates

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Lake Oswego)** (503) 443-6010
☐ ____

Chain-of-Custody Record

Date 7/11/02
Page 1 of 1
5.5, 4.5

Project Name Cornwall Ave Landfill Project No. 001020.220
Project Location/Event Bellingham, WA
Sampler's Name Ken Reid, Nate Joyce
Project Contact Shannon Dunn
Send Results To Shannon Dunn

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	NWTPH-Dx	PCB's (8082-Mod)	FECAL COLIFORM (SM 9222D)	TOTAL+DISSOLVED METALS* (6010/60[illegible])	TOC (415.1)	TOTAL CYANIDE (33[illegible])	AMMONIA (350.1)	TSS (160.2)	TURBIDITY (180.1)	Observations/Comments
S-1	7/10/02	1135	H2O	11	X	X	X	X	X	X	X	X	X	METALS FOR S-1 IS UNPRESERVED. PORTION OF SAMPLE NEEDS TO BE FILTERED (0.45 µm). TOTAL + DISSOLVED NEEDS TO BE PRESERVED
S-2	↓	1210	↓	12	A	X	X	X	X	X	X	X	X	
S-3	↓	1310	↓	12		X	X	X	X	X	X	X	X	

*METALS = Cu, Pb, Zn

A = ARCHIVE

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name SHANNON DUNN	Printed Name Deborah Johnson	Printed Name	Printed Name
Company LAI	Company ARI	Company	Company
Date 7-11-02 Time 8:45	Date 7/11/02 Time 8:45	Date Time	Date Time

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

Rev 4/01

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: S-1

Lab Sample ID: EN82A
LIMS ID: 02-8999
Matrix: Water

QC Report No: EN82-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/22/02

Date extracted: 07/15/02
Date analyzed: 07/16/02 15:41
Instrument ID: ECD1
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	0.077	Y
53469-21-9	Aroclor 1242	0.050	U
12672-29-6	Aroclor 1248	0.050	U
11097-69-1	Aroclor 1254	0.050	U
11096-82-5	Aroclor 1260	0.050	U
11104-28-2	Aroclor 1221	0.19	Y
11141-16-5	Aroclor 1232	0.050	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	91.5%
Tetrachlorometaxylene	66.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: S-2

Lab Sample ID: EN82B
LIMS ID: 02-9000
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/22/02

Date extracted: 07/15/02
Date analyzed: 07/16/02 16:09
Instrument ID: ECD1
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No

Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.082 Y
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.20 Y
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	90.0%
Tetrachlorometaxylene	67.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: S-3

Lab Sample ID: EN82C
LIMS ID: 02-9001
Matrix: Water

QC Report No: EN82-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/22/02

Date extracted: 07/15/02
Date analyzed: 07/16/02 16:37
Instrument ID: ECD1
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.062 Y

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	89.5%
Tetrachlorometaxylene	64.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

FORM-1 PCB

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: **Method Blank**

Lab Sample ID: EN82MB
LIMS ID: 02-8999
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: NA
Date Received: NA

Data Release Authorized:
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	07/15/02	6010B	07/17/02	7440-50-8	Copper	0.002	0.002 U
3020A	07/15/02	7421	07/17/02	7439-92-1	Lead	0.001	0.001 U
3010A	07/15/02	6010B	07/17/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: S-1

Lab Sample ID: EN82A
LIMS ID: 02-8999
Matrix: Water

QC Report No: EN82-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	07/15/02	6010B	07/17/02	7440-50-8	Copper	0.002	0.002 U
3020A	07/15/02	7421	07/17/02	7439-92-1	Lead	0.001	0.001 U
3010A	07/15/02	6010B	07/17/02	7440-66-6	Zinc	0.006	0.006 U

U	Analyte undetected at given RL
RL	Reporting Limit

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample No: S-2

Lab Sample ID: EN82B
LIMS ID: 02-9000
Matrix: Water

QC Report No: EN82-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	07/15/02	6010B	07/17/02	7440-50-8	Copper	0.002	0.002 U
3020A	07/15/02	7421	07/17/02	7439-92-1	Lead	0.001	0.001 U
3010A	07/15/02	6010B	07/17/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

INORGANICS ANALYSIS DATA SHEET Sample No: S-3
TOTAL METALS

Lab Sample ID: EN82C
LIMS ID: 02-9001
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
3010A	07/15/02	6010B	07/17/02	7440-50-8	Copper	0.002	0.002 U
3020A	07/15/02	7421	07/17/02	7439-92-1	Lead	0.001	0.001 U
3010A	07/15/02	6010B	07/17/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

INORGANIC ANALYSIS DATA SHEET
DISSOLVED METALS

Sample No: Method Blank

Lab Sample ID: EN82MB
LIMS ID: 02-9002
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: NA
Date Received: NA

Data Release Authorized:
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	07/15/02	6010B	07/15/02	7440-50-8	Copper	0.002	0.002 U
7000A	07/15/02	7421	07/15/02	7439-92-1	Lead	0.001	0.001 U
6010B	07/15/02	6010B	07/15/02	7440-66-6	Zinc	0.006	0.006 U

U	Analyte undetected at given RL
RL	Reporting Limit

INORGANIC ANALYSIS DATA SHEET
DISSOLVED METALS

Sample No: **Method Blank**

Lab Sample ID: EN82MB
LIMS ID: 02-9003
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: NA
Date Received: NA

Data Release Authorized:
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	07/15/02	6010B	07/15/02	7440-50-8	Copper	0.002	0.002 U
7000A	07/15/02	7421	07/15/02	7439-92-1	Lead	0.001	0.001 U
6010B	07/15/02	6010B	07/15/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

INORGANIC ANALYSIS DATA SHEET
DISSOLVED METALS

Sample No: S-1

Lab Sample ID: EN82D
LIMS ID: 02-9002
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	07/15/02	6010B	07/15/02	7440-50-8	Copper	0.002	0.002 U
7000A	07/15/02	7421	07/15/02	7439-92-1	Lead	0.002	0.002 U
6010B	07/15/02	6010B	07/15/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

ANALYTICAL
RESOURCES
INCORPORATED

INORGANIC ANALYSIS DATA SHEET **Sample No: S-2**
DISSOLVED METALS

Lab Sample ID: EN82E
LIMS ID: 02-9003
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	07/15/02	6010B	07/15/02	7440-50-8	Copper	0.002	0.002 U
7000A	07/15/02	7421	07/15/02	7439-92-1	Lead	0.002	0.002 U
6010B	07/15/02	6010B	07/15/02	**7440-66-6**	**Zinc**	0.006	**0.008**

U Analyte undetected at given RL

RL Reporting Limit

FORM-I

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: S-2

Lab Sample ID: EN82B
LIMS ID: 02-9000
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized: asp
Reported: 07/25/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Total Suspended Solids	07/12/02 07122#1	EPA 160.2	1.0	mg/L	5.0
Turbidity	07/11/02 07112#1	EPA 180.1	0.05	NTU	12
Total Cyanide	07/22/02 07222#1	EPA 335.2	0.005	mg/L	< 0.005 U
N-Ammonia	07/22/02 07222#2	EPA 350.1M	0.25	mg-N/L	6.4
Total Organic Carbon	07/16/02 07162#1	EPA 415.1	1.5	mg/L	3.4
Fecal Coliform	07/11/02 07112#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL	Analytical reporting limit
U	Undetected at reported detection limit

Report for EN82 received 07/11/02

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: S-3

Lab Sample ID: EN82C
LIMS ID: 02-9001
Matrix: Water

QC Report No: EN82-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized: asp
Reported: 07/25/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Total Suspended Solids	07/12/02 07122#1	EPA 160.2	1.0	mg/L	4.2
Turbidity	07/11/02 07112#1	EPA 180.1	0.05	NTU	26
Total Cyanide	07/22/02 07222#1	EPA 335.2	0.005	mg/L	0.008
N-Ammonia	07/22/02 07222#2	EPA 350.1M	0.20	mg-N/L	1.3
Total Organic Carbon	07/16/02 07162#1	EPA 415.1	1.5	mg/L	2.1
Fecal Coliform	07/11/02 07112#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL	Analytical reporting limit
U	Undetected at reported detection limit

Report for EN82 received 07/11/02

INORGANIC ANALYSIS DATA SHEET
DISSOLVED METALS

Sample No: S-3

Lab Sample ID: EN82F
LIMS ID: 02-9004
Matrix: Water

QC Report No: EN82-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized
Reported: 07/18/02

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L
6010B	07/15/02	6010B	07/15/02	7440-50-8	Copper	0.002	0.002 U
7000A	07/15/02	7421	07/15/02	7439-92-1	Lead	0.002	0.002 U
6010B	07/15/02	6010B	07/15/02	7440-66-6	Zinc	0.006	0.006 U

U Analyte undetected at given RL

RL Reporting Limit

ANALYTICAL
RESOURCES
INCORPORATED

Final Report
Laboratory Analysis of Conventional Parameters

Sample No: S-1

Lab Sample ID: EN82A
LIMS ID: 02-8999
Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/10/02
Date Received: 07/11/02

Data Release Authorized:
Reported: 07/25/02 Amy S. Phillips

Analyte	Analysis Date & Batch	Method	RL	Units	Result
Total Suspended Solids	07/12/02 07122#1	EPA 160.2	1.0	mg/L	6.8
Turbidity	07/11/02 07112#1	EPA 180.1	0.05	NTU	3.4
Total Cyanide	07/23/02 07232#1	EPA 335.2	0.025	mg/L	< 0.025 U
N-Ammonia	07/22/02 07222#2	EPA 350.1M	0.25	mg-N/L	8.3
Total Organic Carbon	07/16/02 07162#1	EPA 415.1	1.5	mg/L	5.8
Fecal Coliform	07/11/02 07112#1	SM 9222 D	1	CFU/100 mL	< 1 U

Fecal Coliform analysis performed by membrane filtration technique.

RL	Analytical reporting limit
U	Undetected at reported detection limit

Report for EN82 received 07/11/02

QA Report - Laboratory Control Samples

ANALYTICAL RESOURCES INCORPORATED

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Received: NA

Data Release Authorized: asp
Reported: 07/25/02 Amy S. Phillips

LABORATORY CONTROL SAMPLES
CONVENTIONALS

Constituent	Units	Measured Value	True Value	Recovery
Laboratory Control Sample				
Turbidity	NTU	17.3	17.4	99.4%

Date analyzed: 07/11/02 Batch ID: 07112#1

QA Report - Standard Reference Material Analysis

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Received: NA

Data Release Authorized: asp
Reported: 07/25/02 Amy S. Phillips

STANDARD REFERENCE MATERIAL ANALYSIS
CONVENTIONALS

Constituent	Units	Value	True Value	Recovery
ERA #05032				
Total Cyanide	mg/L	0.155	0.150	103%
Date analyzed: 07/23/02 Batch ID: 07232#1				
SPEX #20-22AS				
N-Ammonia	mg-N/L	0.832	0.800	104%
Date analyzed: 07/22/02 Batch ID: 07222#2				
ERA #0206-02-02				
Total Organic Carbon	mg/L	20.0	20.0	100%
Date analyzed: 07/16/02 Batch ID: 07162#1				
ERA #05032				
Total Cyanide	mg/L	0.162	0.150	108%
Date analyzed: 07/22/02 Batch ID: 07222#1				

QA Report - Replicate Analysis

Matrix: Water

QC Report No: EN82-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Received: 07/11/02

Data Release Authorized: asp
Reported: 07/25/02 Amy S. Phillips

DUPLICATE ANALYSIS RESULTS
CONVENTIONALS

Constituent	Units	Sample Value	Duplicate Value	RPD
ARI ID: 02-8999, EN82 A	**Client Sample ID: S-1**			
Turbidity	NTU	3.4	3.6	5.7%
Total Cyanide	mg/L	< 0.025 U	< 0.025 U	NA
N-Ammonia	mg-N/L	8.3	8.2	1.2%
Total Organic Carbon	mg/L	5.8	5.4	7.1%
ARI ID: 02-9000, EN82 B	**Client Sample ID: S-2**			
Total Cyanide	mg/L	< 0.005 U	< 0.005 U	NA

RPD Limits +/- 20%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

RECEIVED
AUG - 2 2002
LANDAU ASSOCIATES

August 1, 2002

Ms. Shannon Dunn
Landau Associates, Inc.
130 2nd Avenue South
Edmonds, WA 98020

RE: Client Project: Cornwall Ave. Landfill; 001020.220
ARI Job No: EO60

Dear Shannon,

Please find enclosed original chain of custody (COC) and analytical results for the project referenced above. Analytical Resources, Inc. (ARI) accepted ten water samples and a trip blank on July 19, 2002. The samples were received in good condition and there were no discrepancies between the COC and containers' labels. Ken Reid (Landau Associates, Inc.) contacted ARI regarding fecal coliform analyses being requested on the COC, but no fecal coliform analyses being needed.

The samples were analyzed for BTEX referencing US EPA method 8021Bmod, PCBs referencing US EPA method 8082, and diesel and motor oil range hydrocarbons referencing WDOE method NWTPH-Dx with acid/si cleanup.

Recoveries of the tetrachlorometaxylene surrogate were slightly above the QC limit in the PCB analysis of sample MW-9 and the PCB method blank. Because recoveries of the decachlorobiphenyl surrogate were good in these analyses, no corrective action was necessary.

No further analytical complications were noted. A copy of this report and all associated data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Mary Lou Fox

Mary Lou Fox
Project Manager
206-695-6211
marylou@arilabs.com

MLF/mlf
Enclosure
cc: File EO60

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Landau Associates

☒ Seattle (Edmonds) (425) 778-0907
☐ Tacoma (253) 926-2493
☐ Spokane (509) 327-9737
☐ Portland (Lake Oswego) (503) 443-6010
☐ 02-9449 02-9459

E 060

Chain-of-Custody Record 17, 20, 19.5

Date 7/17/02
Page 1 of 1

Project Name Coswell Ave Landfill Project No. 001020.220
Project Location/Event Bellingham WA
Sampler's Name Ken Reid
Project Contact Shannon Dunn
Send Results To " "

Testing Parameters

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____________

Sample I.D.	Date	Time	Matrix	No. of Containers	PCB'S (8082-Mod)	NWTPH-Dx	BTEX (8021)	Fecal Coli (SM 9222D)									Observations/Comments
MW-1	7/17/07	1135	Water	8	X	X	X	X									
2	7/16/02	1430		3	X			X									
3	7/16/02	1335		8	X	X	X	X									
4	7/17/02	1100		3	X			X									
5	7/16/02	1130		8	X	X	X	X									
6	7/16/02	1030		5		X	X										
7	7/17/02	900		8	X	X	X	X									
8	7/16/02	1235		8	X	X	X	X									
9	7/17/02	1300		8	X	X	X	X									
10	7/17/02	955		8	X	X	X	X									
MW-1 MS/MSD	7/17/02	1135	Water	12	X	X	X										

Special Shipment/Handling or Storage Requirements on ice

Method of Shipment Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name Ken Reid	Printed Name Deborah Johnson	Printed Name	Printed Name
Company Landau	Company ARI	Company	Company
Date 7/17/02 Time 1800	Date 7/19/02 Time 1615	Date Time	Date Time

WHITE COPY - Project File YELLOW COPY - Laboratory PINK COPY - Client Representative

Rev 4/01

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-1

Lab Sample ID: EO60A
LIMS ID: 02-9449
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/23/02 22:30
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	99.0%
Tetrachlorometaxylene	73.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-1
MATRIX SPIKE

Lab Sample ID: EO60AMS
LIMS ID: 02-9449
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/23/02 23:05
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	---
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	97.0%
Tetrachlorometaxylene	77.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-1
MATRIX SPIKE DUP

Lab Sample ID: EO60AMSD
LIMS ID: 02-9449
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized: pk
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/23/02 23:39
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	---
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	94.0%
Tetrachlorometaxylene	75.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-2

Lab Sample ID: EO60B
LIMS ID: 02-9450
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/16/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/23/02 20:10
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.12 Y
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	73.0%
Tetrachlorometaxylene	75.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

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ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-3

Lab Sample ID: EO60C
LIMS ID: 02-9451
Matrix: Water

QC Report No: EO60-Landau Associates, Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/16/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 00:14
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.16 Y
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	NR
Tetrachlorometaxylene	83.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

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ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-4

Lab Sample ID: EO60D
LIMS ID: 02-9452
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 00:49
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	78.5%
Tetrachlorometaxylene	69.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

FORM-1 PCB

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-5

Lab Sample ID: EO60E
LIMS ID: 02-9453
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/16/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 01:24
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.13 Y
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	84.0%
Tetrachlorometaxylene	NR

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-7

Lab Sample ID: E060G
LIMS ID: 02-9455
Matrix: Water

QC Report No: E060-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 01:59
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value	
12674-11-2	Aroclor 1016	0.050	U
53469-21-9	Aroclor 1242	0.050	U
12672-29-6	Aroclor 1248	0.050	U
11097-69-1	**Aroclor 1254**	**0.053**	
11096-82-5	Aroclor 1260	0.050	U
11104-28-2	Aroclor 1221	0.10	U
11141-16-5	Aroclor 1232	0.050	U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	99.5%
Tetrachlorometaxylene	79.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-8

Lab Sample ID: EO60H
LIMS ID: 02-9456
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/16/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 02:34
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.12 Y
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	NR
Tetrachlorometaxylene	68.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-9

Lab Sample ID: EO60I
LIMS ID: 02-9457
Matrix: Water

QC Report No: EO60-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 03:09
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.050 U
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	99.5%
Tetrachlorometaxylene	93.5%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD

Sample No: MW-10

Lab Sample ID: E060J
LIMS ID: 02-9458
Matrix: Water

QC Report No: E060-Landau Associates,Inc.
Project: Cornwall Ave. Landfill
001020.220
Date Sampled: 07/17/02
Date Received: 07/19/02

Data Release Authorized:
Reported: 07/29/02

Date extracted: 07/22/02
Date analyzed: 07/24/02 03:43
Instrument ID: ECD4
Sample Amount: 1000 mL
Final Ext Vol: 0.50 mL

GPC Cleanup: No
Florisil Cleanup: No
Acid Cleanup: Yes
Sulfur Cleanup: Yes
Conc/Dilution Factor: 1:1

Reported in Total ug/L

CAS Number	Analyte	Value
12674-11-2	Aroclor 1016	0.050 U
53469-21-9	Aroclor 1242	0.080 Y
12672-29-6	Aroclor 1248	0.050 U
11097-69-1	Aroclor 1254	0.050 U
11096-82-5	Aroclor 1260	0.050 U
11104-28-2	Aroclor 1221	0.10 U
11141-16-5	Aroclor 1232	0.050 U

PCB-Aroclor Surrogate Recovery

Decachlorobiphenyl	74.0%
Tetrachlorometaxylene	59.0%

Data Qualifiers

J	Indicates an estimated value when that result is less than the calculated detection limit.
E	Indicates a value above the linear range of the detector. Dilution Required
S	Indicates no value reported due to saturation of the detector.
D	Indicates the surrogate was diluted out.
U	Indicates compound was analyzed for, but not detected at the given detection limit.
B	Found in associated method blank
NA	Indicates compound was not analyzed.
NR	Indicates no recovery due to interferences.
Y	Indicates a raised reporting limit due to matrix interferences. The analyte may be present at or below the listed concentration, but in the opinion of the analyst, confirmation was inadequate.

Avocet Environmental Testing
1500 North State Street, Suite 200
Bellingham, WA 98225
(360) 734-9033

AVOCET
ENVIRONMENTAL TESTING

Client	**Landau Associates**
Contact Name	Ken Reid
Chain of Custody	3170
Date Sampled	07/16/02
Date Received	07/16/02
Date Analyzed	07/16/02
Date Reported	07/19/02
Project	**Cornwall Avenue Landfill**
Matrix	Surface Water
Analyst	MA

Sample Identification	Log Number	Test Performed	Method	**Sample Result**	Units
MW-2	05788541	Fecal Coliform	sm9222D	**14**	fecal coliform/100ml
MW-3	05788542	Fecal Coliform	sm9222D	**14**	fecal coliform/100ml
MW-5	05788543	Fecal Coliform	sm9222D	**19,000**	fecal coliform/100ml
MW-8	05788544	Fecal Coliform	sm9222D	**<2**	fecal coliform/100ml

< = Less Than

Laboratory Supervisor

LANDAU ASSOCIATES, INC.
Edmonds, WA (206) 778-0907
FAX (206)778-6409

Chain-of-Custody Record

No 3170

Date 7/16/02
Page 1 of 1

Project Cornwall Ave. Landfill Job No. 001020.220
Client Port of Bellingham
Project Location Bellingham, WA
Sampler's Name Ken Reid

Testing Parameters

Turnaround Time
☒ Standard
☐ Accelerated

Sample Number	Time ~~Date~~	Date ~~Time~~	Matrix	No. of Containers	Fecal Coliform (SM9222D)	Observations/Comments
MW-2	1430	7/16/02	H2O	1	X	05788541
MW-3	1335	↓	↓	1	X	8542
MW-5	1130	↓	↓	1	X	8543
MW-8	1235	↓	↓	1	X	8544

Special Shipment/Handling or Storage Requirements

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature C Dolan	Signature	Signature
Printed Name Ken Reid	Printed Name Claudette Dolan	Printed Name	Printed Name
Company Landau Assoc	Company Avocet	Company	Company
Date 7/16/02 Time 1500	Date 7/16/02 Time 1500	Date Time	Date Time

3/91

WHITE COPY - Project File YELLOW COPY - Laboratory PINK COPY - Client Representative

Avocet Environmental Testing
1500 North State Street, Suite 200
Bellingham, WA 98225
(360) 734-9033

AVOCET
ENVIRONMENTAL TESTING

Client	**Landau Associates**
Contact Name	Ken Reid
Chain of Custody	NA
Date Sampled	07/17/02
Date Received	07/17/02
Date Analyzed	07/17/02
Date Reported	07/19/02
Project	**Cornwall Avenue Landfill**
Matrix	Surface Water
Analyst	CB

Sample Identification	Log Number	Test Performed	Method	**Sample Result**	Units
MW-1	05788577	Fecal Coliform	sm9222D	**<1**	fecal coliform/100ml
MW-4	05788578	Fecal Coliform	sm9222D	**820**	fecal coliform/100ml
MW-7	05788579	Fecal Coliform	sm9222D	**<1**	fecal coliform/100ml
MW-9	05788580	Fecal Coliform	sm9222D	**1**	fecal coliform/100ml
MW-10	05788581	Fecal Coliform	sm9222D	**41**	fecal coliform/100ml

< = Less Than

CB
Laboratory Supervisor

Landau Associates

☒ **Seattle (Edmonds)** (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland (Lake Oswego)** (503) 443-6010
☐

Date 7/17/02
Page 1 of 1

Chain-of-Custody Record

Project Name Cornwall Ave. Landfill Project No. 001020.220
Project Location/Event Bellingham, WA
Sampler's Name Ken Reid
Project Contact Shannon Dunn
Send Results To Shannon Dunn

Turnaround Time
☒ Standard
☐ Accelerated
☐

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	Fecal / Coliform (SM 9222D)												Observations/Comments
MW-1	7/17/02	1135	Water	1	X												05788577
MW-4		1100		1	X												8578
MW-7		900		1	X												8579
MW-9		1300		1	X												8580
MW-10		955		1	X												8581

Special Shipment/Handling or Storage Requirements on ice

Method of Shipment

Relinquished by	Received by	Relinquished by	Received by
Signature Ken Reid	Signature Emily Fullner	Signature	Signature
Printed Name Ken Reid	Printed Name Emily Fullner	Printed Name	Printed Name
Company Landau	Company Nucet	Company	Company
Date 7/17/02 Time 1330	Date 7/17/02 Time 1330	Date Time	Date Time

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Rev 4/01

Landau
Associates
Environmental and Geotechnical Services

TECHNICAL MEMORANDUM

TO: Larry Beard, Project Manager, Landau Associates, Inc.

FROM: Shannon Dunn, Landau Associates, Inc.

DATE: August 21, 2002

RE: **CORNWALL AVENUE LANDFILL**
SUPPLEMENTAL REMEDIAL INVESTIGATION
LABORATORY DATA QUALITY EVALUATION

This memorandum provides the results of a data quality evaluation of 10 groundwater, 6 seep samples, 1 product, and 7 sediment samples collected between June 10 and July 17, 2002. A data quality evaluation was performed for analysis of:

- Total and dissolved metals by U.S. Environmental Protection Agency (EPA) methods 6010 and 7000 series
- Polychlorinated biphenyls (PCBs) by EPA method 8082
- Bis(2-ethylhexyl)phthalate (BEP) by EPA method 8270
- Total organic carbon (TOC) by Plumb and by EPA method 415.1
- Diesel and motor oil range total petroleum hydrocarbon (TPH) by NWTPH-Dx
- Total suspended solids (TSS) by EPA method 160.2
- Turbidity by EPA method 180.1
- Total cyanide by EPA method 335.2
- Ammonia by EPA method 350.1M
- Fecal Coliform by SM9222D
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA method 8021B
- Polycyclic aromatic hydrocarbons (PAHs) by EPA method 8270
- Total solids by EPA method 160.3

The analyses were performed by Analytical Resources, Inc., (ARI) located in Seattle, Washington, except for some of the fecal coliform analyses were performed by Avocet Environmental Testing (Avocet) of Bellingham, Washington. This data quality evaluation covers ARI data packages EL51, EN15, EN82, and EO60 and Avocet data packages 3170. This data quality evaluation was performed in accordance with the quality assurance procedures described in Appendix A of the *Draft Work Plan Supplemental Remedial Investigation Cornwall Avenue Landfill, Bellingham, Washington* (Landau Associates 2002), and with applicable portions of the EPA *Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review* (1994a,b).

The evaluation considered the following items:

- Chain-of custody records
- Holding times
- Laboratory and method blank results
- Field blank results
- Surrogate recoveries
- Laboratory matrix spikes and matrix spike duplicates (MS/MSD) (including the laboratory control samples)
- MS/MSD and laboratory duplicate relative percent difference (RPD)
- Field duplicate RPDs
- Quantitation limits
- Conclusions and completeness.

Data validation qualifiers were added to the sample results based on the evaluation of the data quality. The absence of a data quality qualifier indicates that the data are acceptable without qualification. Data validation qualifiers are summarized in Table 1.

CHAIN-OF-CUSTODY RECORDS

Chain-of-custody records accompanied each data package. The laboratory received all the samples in good condition and all analyses requested were performed.

HOLDING TIMES

For all the samples, the time between sample collection, extraction, and analysis was determined to be within EPA and method-specified holding times. No qualification of the data was required.

LABORATORY AND METHOD BLANKS

Method blanks were analyzed with each batch of samples and for each analysis. No contamination was detected in any of the method blanks. No qualification of the data was necessary.

FIELD BLANKS

One field blank, a trip blank, was analyzed with the groundwater samples. No contamination was detected in the trip blank. No qualification of the data was required.

SURROGATE SPIKE RECOVERIES

Surrogate spikes were run for BEP, PAHs, PCBs, diesel and motor oil TPH, and BTEX. All of the surrogate recoveries were within laboratory control limits with the following exceptions:

- The percent recoveries of the surrogates associated with the diesel and motor oil range TPH analysis of the diluted sample TP-13 were below the laboratory control limits as a result of sample dilution. No qualifiers were assigned as TPH surrogate recoveries in the original sample were within control limits.
- There was no calculated recovery of the tetrachloro-m-xylene surrogate in sample MW-5 and of the decachlorobiphenyl surrogate in samples MW-3 and MW-8 for the PCB analysis as a result of matrix interference. No qualifiers were assigned as the remaining surrogate recoveries in these samples were within laboratory control limits.
- The tetrachloro-m-xylene surrogate recovery for PCB analysis in sample MW-9 was above laboratory control limits. No qualifiers were assigned as the remaining surrogate recovery was within laboratory control limits.

LABORATORY CONTROL SAMPLE (BLANK SPIKE) RESULTS

Laboratory control samples were performed for all analyses except total solids, TSS, and fecal coliform. All recoveries were within the specified control limits. No qualification of the data was necessary.

MATRIX SPIKE/ MATRIX SPIKE DUPLICATE SAMPLES

Matrix spike and matrix spike duplicate (MS/MSD) samples were performed with each organic analysis and an MS was performed with each inorganic analysis for the following analyses: all sediment analyses except for total solids; total cyanide, ammonia, and TOC for the seep samples; and BTEX, PCBs, and diesel and motor oil range TPH for the groundwater samples. All of the MS/MSDs were performed on project samples except for BEP, PCBs, and total metals MS/MSDs for sediment samples. Recoveries for the MS/MSDs were within the current laboratory control limits, except as indicated in Table 1 and as discussed below:

- MS recoveries for total cyanide in the seep sample were below laboratory control limtis. Sample S-1 sampled July 10, 2002, on was qualified as estimated (UJ).

RELATIVE PERCENT DIFFERENCES

Laboratory duplicate and MS/MSD RPDs were within the current laboratory control limits. No qualification of the data was required.

FIELD DUPLICATES

One field duplicate sediment sample was collected and analyzed for. Field duplicate RPDs were within project control limits (50%), except as indicated in Table 1 and as discussed below:

- Field duplicate RPD for Aroclor 1254 was above project control limits. Sediment samples SRI-SED-2 and SRI-SED-9 was qualified as estimated (J) for Aroclor 1254.

REPORTING LIMITS

Laboratory reporting limits were within project specified limits with the following exceptions:

- Reporting limits for PCBs were above project specified reporting limits in some samples
- Lead, silver, and zinc reporting limits were above project specified reporting limits in some samples
- Total cyanide reporting limits were above project specified reporting limits in one seep sample
- Fecal coliform reporting limits were above project specified reporting limits in one groundwater sample

OVERALL DATA QUALITY AND COMPLETENESS

Data precision was evaluated through laboratory duplicates, matrix spike duplicates, and field duplicates. Data accuracy was evaluated through laboratory control samples, surrogate spikes, and matrix spikes. Based on this data quality evaluation, all of the data were determined to be acceptable and no data was rejected. The completeness for this data is 100 percent.

REFERENCES

EPA. 1994a. *Contract Laboratory Program National Functional Guidelines for Organic Data Review.* U.S. Environmental Protection Agency.

EPA. 1994b. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* U.S. Environmental Protection Agency.

Landau Associates. 2002. *Draft Work Plan Supplemental Remedial Investigation Cornwall Avenue Landfill, Bellingham, Washington.* May 13.

Plumb, R.H., JR. 1981. *Procedure for Handling and Chemical Analysis of Sediment and Water Samples*. Technical Report EPA/CE-81-1. U.S. Environmental Protection Agency and U.S. Corps of Engineers, Waterways Experiment Station, Vicksburg, MS.

APPENDIX E

2008 Sediment Investigation Data

APPENDIX E-1
2008 SEDIMENT INVESTIGATION DATA

Cornwall Landfill SPI Image Analysis - Preliminary Results (09/23/08)

Station (CW)	Date	Time	Muni Waste	Wood Debris	Comments
1A	9/16/2008	9:41	No	No	Eelgrass, no obvious debris
1B	9/16/2008	9:42	No	No	Eelgrass, no obvious debris
1C	9/16/2008	9:43	No	No	Eelgrass, no obvious debris
2A	9/16/2008	9:52	No	No	Eelgrass, no obvious debris
2B	9/16/2008	9:53	No	No	Eelgrass, no obvious debris
2C	9/16/2008	9:55	No	No	Eelgrass, no obvious debris
3A	9/16/2008	10:00	No	No	Eelgrass, no obvious debris
3B	9/16/2008	10:01	No	No	Eelgrass, no obvious debris
3C	9/16/2008	10:01	No	No	Eelgrass, no obvious debris
4A	9/16/2008	10:05	No	No	Sparse eelgrass, no obvious debris
4B	9/16/2008	10:06	No	No	Sparse eelgrass, no obvious debris
4C	9/16/2008	10:07	No	No	Sparse eelgrass, no obvious debris
5A	9/16/2008	10:11	No	10%	Small wood particles and fibers in upper 2 cm, indistinct below
5B	9/16/2008	10:11	No	5%	Small wood particles mixed with depth
5C	9/16/2008	10:12	No	10%	25% wood particles in upper 4 cm, 5 % wood particles below
6A	9/16/2008	10:16	No	3%	fine organic/wood particles in upper 5 cm
6B	9/16/2008	10:17	No	5%	fine wood/organic particles in upper 6 cm
6C	9/16/2008	10:18	No	No	methane gas bubble, no obvious debris
7A	9/16/2008	10:21	No	No	fine organics, no obvious debris
7B	9/16/2008	10:22	No	No	fine organics, no obvious debris
7C	9/16/2008	10:22	No	No	fine organics, no obvious debris
8A	9/16/2008	10:27	No	No	partial overpenetration, no obvious debris
8B	9/16/2008	10:27	No	No	overpenetration, no obvious debris
8C	9/16/2008	10:27	No	No	partial overpenetration, no obvious debris
9A	9/16/2008	10:33	No	No	no obvious debris, fine organic particles in upper 3 cm
9B	9/16/2008	10:34	No	No	no obvious debris, fine organic particles in upper 3 cm
9C	9/16/2008	10:35	No	No	no obvious debris
10A	9/16/2008	10:59	No	3%	small wood pieces on surface
10B	9/16/2008	11:00	No	3%	possible small woody debris on surface
10C	9/16/2008	11:00	No	No	organic material on surface, no obvious debris
11A	9/16/2008	11:04	No	No	small wood chips on surface?
11B	9/16/2008	11:04	No	No	no obvious debris
11C	9/16/2008	11:05	No	No	no obvious debris
12A	9/16/2008	11:08	No	No	small wood chips on surface?
12B	9/16/2008	11:08	No	3%	wood pieces upper 2 cm
12C	9/16/2008	11:09	No	No	methane gas bubble, no obvious debris
13A	9/16/2008	11:12	No	No	no obvious debris, possible small wood particles on surface
13B	9/16/2008	11:12	No	No	no obvious debris
13C	9/16/2008	11:13	No	No	no obvious debris
14A	9/16/2008	11:17	No	No	no obvious debris
14B	9/16/2008	11:18	No	No	no obvious debris
14C	9/16/2008	11:18	No	No	no obvious debris
15A	9/16/2008	11:23	No	No	no obvious debris
15B	9/16/2008	11:23	No	No	no obvious debris, polychaetes at depth
15C	9/16/2008	11:24	No	No	no obvious debris, polychaete at depth
16A	9/16/2008	11:29	No	No	no obvious debris
16B	9/16/2008	11:30	No	No	no obvious debris, pull out
16C	9/16/2008	11:31	No	No	no obvious debris
8D	9/16/2008	11:33	No	No	no obvious debris, fine organic particles in upper 3 cm
8E	9/16/2008	11:34	No	No	no obvious debris
8F	9/16/2008	11:35	No	No	no obvious debris
17A	9/16/2008	11:42	No	No	no obvious debris
17B	9/16/2008	11:42	No	2%	fine wood particles in upper 6 cm, brittle star
17C	9/16/2008	11:43	No	No	no obvious debris
18A	9/16/2008	11:46	No	No	no obvious debris
18B	9/16/2008	11:47	No	No	no obvious debris
18C	9/16/2008	11:48	No	No	no obvious debris
19A	9/16/2008	11:51	No	No	no obvious debris
19B	9/16/2008	11:52	No	No	no obvious debris
19C	9/16/2008	11:53	No	No	no obvious debris, void
20A	9/16/2008	11:56	No	No	no obvious debris
20B	9/16/2008	11:56	No	No	no obvious debris
20C	9/16/2008	11:57	No	No	no obvious debris, spionid polychaetes
21A	9/16/2008	12:01	No	No	no obvious debris
21B	9/16/2008	12:02	No	No	no obvious debris
21C	9/16/2008	12:03	No	No	no obvious debris
22A	9/16/2008	13:14	No	No	no obvious debris
22B	9/16/2008	13:15	No	No	no obvious debris
22C	9/16/2008	13:15	No	No	no obvious debris
23A	9/16/2008	13:20	No	No	no obvious debris
23B	9/16/2008	13:21	No	No	no obvious debris
23C	9/16/2008	13:22	No	No	no obvious debris
24A	9/16/2008	13:25	No	5%	wood piece on surface
24B	9/16/2008	13:25	No	No	rocky, shells, no obvious debris
24C	9/16/2008	13:26	No	No	shells, rock, silt, no obvious debris
25A	9/16/2008	13:30	No	No	sculpin, rocky/shell bottom, no obvious debris
25B	9/16/2008	13:31	No	No	low pen, kelp
25C	9/16/2008	13:31	No	No	kelp stock or wire?
26A	9/16/2008	13:37	No	No	rocky, silt, no obvious debris
26B	9/16/2008	13:38	No	No	rocks, shells, silt, no obvious debris
26C	9/16/2008	13:39	No	3%	wood piece in rocks, shells silt
27A	9/16/2008	13:45	No	No	no obvious debris
27B	9/16/2008	13:45	No	20-25%	large wood piece on surface
27C	9/16/2008	13:46	No	No	no obvious debris

APPENDIX E-1
2008 SEDIMENT INVESTIGATION DATA

Cornwall Landfill SPI Image Analysis - Preliminary Results (09/23/08)

Station (CW)	Date	Time	Muni Waste	Wood Debris	Comments
28A	9/16/2008	13:48	No	No	no obvious debris
28B	9/16/2008	13:49	No	No	no obvious debris
28C	9/16/2008	13:50	No	No	no obvious debris
29A	9/16/2008	13:52	No	No	no obvious debris
29B	9/16/2008	13:53	No	No	no obvious debris
29C	9/16/2008	13:54	No	No	no obvious debris
30A	9/16/2008	13:56	No	No	possible wood piece on surface?
30B	9/16/2008	13:57	No	No	no obvious debris
30C	9/16/2008	13:58	No	No	no obvious debris
31A	9/16/2008	14:01	No	No	under pen, no obvious debris
31B	9/16/2008	14:02	No	No	no obvious debris
31C	9/16/2008	14:02	No	No	no obvious debris
32A	9/16/2008	14:06	No	No	no obvious debris
32B	9/16/2008	14:07	No	No	no obvious debris
32C	9/16/2008	14:07	No	No	no obvious debris
33A	9/16/2008	14:34	No	No	no obvious debris, void
33B	9/16/2008	14:35	No	No	no obvious debris
33C	9/16/2008	14:36	No	No	no obvious debris
34A	9/16/2008	14:39	No	No	no obvious debris
34B	9/16/2008	14:40	No	No	no obvious debris
34C	9/16/2008	14:40	No	No	no obvious debris
35A	9/16/2008	14:44	No	No	no obvious debris, sed layering
35B	9/16/2008	14:44	No	No	no obvious debris
35C	9/16/2008	14:45	No	No	no obvious debris
36A	9/16/2008	14:48	No	No	no obvious debris
36B	9/16/2008	14:49	No	No	no obvious debris
36C	9/16/2008	14:50	No	No	no obvious debris
37A	9/16/2008	14:55	No	No	no obvious debris
37B	9/16/2008	14:55	No	No	no obvious debris
37C	9/16/2008	14:56	No	No	no obvious debris
38A	9/16/2008	14:59	No	No	no obvious debris
38B	9/16/2008	15:00	No	No	no obvious debris
38C	9/16/2008	15:01	No	No	no obvious debris, methane bubbles
39A	9/16/2008	15:06	No	No	no obvious debris
39B	9/16/2008	15:07	No	No	no obvious debris
39C	9/16/2008	15:07	No	No	no obvious debris
40A	9/16/2008	15:12	No	No	no obvious debris
40B	9/16/2008	15:12	No	No	no obvious debris
40C	9/16/2008	15:13	No	No	no obvious debris, polychaete
41A	9/16/2008	15:26	No	No	rocky, no obvious debris
41B	9/16/2008	15:26	No	No	rocky, no obvious debris
41C	9/16/2008	15:27	No	No	rocky, no obvious debris
42A	9/16/2008	15:31	No	No	rocky, no obvious debris
42B	9/16/2008	15:32	No	No	rocky, no obvious debris, sea star
42C	9/16/2008	15:32	No	No	rocky, no obvious debris
43A	9/16/2008	15:37	No	No	Eelgrass, no obvious debris
43B	9/16/2008	15:38	No	No	rocky, no obvious debris
43C	9/16/2008	15:38	No	No	rocky, no obvious debris
44A	9/16/2008	15:42	No	No	rocky, no obvious debris
44B	9/16/2008	15:43	No	No	rocky, no obvious debris
44C	9/16/2008	15:43	No	No	rocky, no obvious debris
45A	9/16/2008	15:46	No	No	shells and rock on silt, methane bubbles
45B	9/16/2008	15:47	--	--	pull out
45C	9/16/2008	15:47	No	2%	possible small wood piece in upper sed column
46A	9/16/2008	15:49	No	No	shells, rock, and silt, no obvious debris
46B	9/16/2008	15:50	No	No	shells, rock, and silt, no obvious debris
46C	9/16/2008	15:51	No	No	shells, rock, and silt, no obvious debris
47A	9/16/2008	15:57	No	1%	wood piece on surface
47B	9/16/2008	15:58	No	2%	wood piece on surface
47C	9/16/2008	15:59	No	No	no obvious debris
48A	9/16/2008	16:01	No	No	no obvious debris
48B	9/16/2008	16:02	No	No	no obvious debris
48C	9/16/2008	16:03	No	No	no obvious debris
49A	9/16/2008	16:08	No	No	no obvious debris
49B	9/16/2008	16:09	No	No	no obvious debris, methane bubble
49C	9/16/2008	16:09	No	No	no obvious debris
50A	9/16/2008	16:13	No	5%	wood piece on surface
50B	9/16/2008	16:14	No	No	no obvious debris
50C	9/16/2008	16:14	No	No	no obvious debris
51A	9/16/2008	16:18	No	No	no obvious debris
51B	9/16/2008	16:18	No	No	no obvious debris
51C	9/16/2008	16:19	No	No	no obvious debris
52A	9/16/2008	16:22	No	No	no obvious debris
52B	9/16/2008	16:23	No	No	no obvious debris, polychaetes at depth
52C	9/16/2008	16:23	No	No	no obvious debris
53A	9/16/2008	16:36	No	No	no obvious debris
53B	9/16/2008	16:37	No	No	no obvious debris
53C	9/16/2008	16:38	No	No	no obvious debris
54A	9/16/2008	16:41	No	No	no obvious debris, pull out
54B	9/16/2008	16:41	No	No	no obvious debris
54C	9/16/2008	16:42	No	No	no obvious debris
55A	9/16/2008	16:46	No	10%	wood piece on surface?
55B	9/16/2008	16:47	--	--	no pen
55C	9/16/2008	16:48	--	--	no pen

Cornwall Landfill SPI Image Analysis - Preliminary Results (09/23/08)

Station (CW)	Date	Time	Muni Waste	Wood Debris	Comments
56A	9/17/2008	8:28	--	--	no pen
56B	9/17/2008	8:30	No	No	no obvious debris
56C	9/17/2008	8:31	No	No	no obvious debris
57A	9/17/2008	8:37	No	No	no obvious debris
57B	9/17/2008	8:38	No	No	no obvious debris, void
57C	9/17/2008	8:38	--	--	no pen
58A	9/17/2008	8:43	No	No	no obvious debris
58B	9/17/2008	8:44	No	No	no obvious debris
58C	9/17/2008	8:45	No	No	no obvious debris
59A	9/17/2008	8:48	No	No	no obvious debris
59B	9/17/2008	8:49	No	No	no obvious debris
59C	9/17/2008	8:49	No	No	no obvious debris
60A	9/17/2008	8:54	No	No	no obvious debris
60B	9/17/2008	8:55	No	No	no obvious debris
60C	9/17/2008	8:55	No	No	no obvious debris
61A	9/17/2008	9:01	No	No	no obvious debris
61B	9/17/2008	9:01	No	No	no obvious debris
61C	9/17/2008	9:02	No	No	no obvious debris
62A	9/17/2008	9:05	No	2-3%	possible wood particles on surface
62B	9/17/2008	9:06	No	No	possible wood particles on surface
62C	9/17/2008	9:07	No	2-3%	wood particles on surface
63A	9/17/2008	9:11	No	10-15%	wood pieces in surface sediment
63B	9/17/2008	9:12	No	No	possible wood or shell particles
63C	9/17/2008	9:12	No	No	shell particles
64A	9/17/2008	9:16	--	--	under pen
64B	9/17/2008	9:17	No	No	no obvious debris
64C	9/17/2008	9:18	--	--	disturbed
65A	9/17/2008	9:23	No	No	no obvious debris
65B	9/17/2008	9:24	No	No	no obvious debris
65C	9/17/2008	9:25	No	No	
66A	9/17/2008	9:29	No	No	wood piece or kelp draw down?
66B	9/17/2008	9:30	--	--	no pen
66C	9/17/2008	9:31	No	5%	wood piece on surface?
67A	9/17/2008	9:36	No	No	no obvious debris
67B	9/17/2008	9:36	No	No	no obvious debris
67C	9/17/2008	9:37	No	3%	wood piece on surface?
68A	9/17/2008	9:41	No	No	no obvious debris, compact bottom & no pen
68B	9/17/2008	9:41	--	--	no pen
68C	9/17/2008	9:42	--	--	no pen
69A	9/17/2008	9:48	7-10%	No	piece of glass
69B	9/17/2008	9:49	No	No	no obvious debris
69C	9/17/2008	9:50	No	No	no obvious debris, rocks and shells on surface
70A	9/17/2008	9:54	No	No	rocks and shells in sand/silt, no obvious debris
70B	9/17/2008	9:54	No	No	rocks and shells in sand/silt, no obvious debris
70C	9/17/2008	9:55	No	No	rocks and shells in sand/silt, no obvious debris
71A	9/17/2008	10:01	No	No	rocks and shell hash, low pen, no obvious debris
71B	9/17/2008	10:02	No	No	rocks and shell hash, low pen, no obvious debris
71C	9/17/2008	10:02	No	No	rocks and shell hash, low pen, no obvious debris
72A	9/17/2008	10:37	No	5%	possible fine wood particles upper 5 cm
72B	9/17/2008	10:38	No	5%	possible fine wood particles upper 5 cm
72C	9/17/2008	10:38	--	--	possible wood particles on surface, under pen
73A	9/17/2008	10:42	No	No	no obvious debris
73B	9/17/2008	10:43	--	--	no pen
73C	9/17/2008	10:43	No	No	no obvious debris
74A	9/17/2008	10:47	No	No	no obvious debris
74B	9/17/2008	10:48	No	No	no obvious debris
74C	9/17/2008	10:48	No	3%	possible fine wood particles upper 3 cm
75A	9/17/2008	10:53	No	No	rocks and shells on silt, no obvious debris
75B	9/17/2008	10:54	No	No	rocks and shells on silt, no obvious debris
75C	9/17/2008	10:54	No	No	rocks and shells on silt, no obvious debris
76A	9/17/2008	10:59	No	No	rocks and shells on silt, no obvious debris
76B	9/17/2008	10:59	No	No	rocks and shells on silt, no obvious debris
76C	9/17/2008	11:00	No	No	rocks and shells on silt, no obvious debris
77A	9/17/2008	11:03	No	3%	small wood pieces on surface
77B	9/17/2008	11:04	No	3%	small wood pieces on surface
77C	9/17/2008	11:05	No	20-25%	wood pieces on surface
78A	9/17/2008	11:10	No	2%	small wood pieces on surface
78B	9/17/2008	11:11	No	No	no obvious debris
78C	9/17/2008	11:11	No	No	no obvious debris, brittle star
79A	9/17/2008	11:17	No	No	no obvious debris
79B	9/17/2008	11:18	No	No	no obvious debris
79C	9/17/2008	11:19	No	No	no obvious debris
80A	9/17/2008	11:22	No	No	no obvious debris
80B	9/17/2008	11:23	No	No	no obvious debris
80C	9/17/2008	11:23	No	No	no obvious debris, polychaete
81A	9/17/2008	11:26	No	No	no obvious debris, small void?
81B	9/17/2008	11:27	No	No	no obvious debris
81C	9/17/2008	11:28	No	No	no obvious debris
82A	9/17/2008	11:30	5%	No	neck of glass bottle?
82B	9/17/2008	11:31	No	No	no obvious debris
82C	9/17/2008	11:31	No	No	no obvious debris
83A	9/17/2008	11:34	No	No	Eelgrass, no obvious debris
83B	9/17/2008	11:35	No	No	Eelgrass, no obvious debris
83C	9/17/2008	11:36	No	No	Eelgrass, no obvious debris

APPENDIX E-1
2008 SEDIMENT INVESTIGATION DATA

Cornwall Landfill SPI Image Analysis - Preliminary Results (09/23/08)

Station (CW)	Date	Time	Muni Waste	Wood Debris	Comments
84A	9/17/2008	12:49	No	5-7%	wood pieces on surface
84B	9/17/2008	12:50	5-7%	No	seastar on neck of bottle
84C	9/17/2008	12:51	No	No	no obvious debris, shell on surface
85A	9/17/2008	12:54	No	10%	very low pen, wood pieces on surface
85B	9/17/2008	12:55	No	10%	wood pieces, also in farfield?, low pen
85C	9/17/2008	12:55	--	--	under pen
86A	9/17/2008	13:00	10-15%	3%	bottle glass piece, small wood pieces on surface
86B	9/17/2008	13:01	No	No	no obvious debris, disturbed
86C	9/17/2008	13:02	No	5%	stick?
87A	9/17/2008	13:05	No	No	no obvious debris
87B	9/17/2008	13:05	No	No	no obvious debris
87C	9/17/2008	13:06	No	No	no obvious debris
88A	9/17/2008	13:09	No	No	no obvious debris
88B	9/17/2008	13:10	No	No	no obvious debris
88C	9/17/2008	13:11	No	No	no obvious debris
89A	9/17/2008	13:14	No	No	no obvious debris
89B	9/17/2008	13:15	No	No	under pen
89C	9/17/2008	13:15	No	No	no obvious debris
90A	9/17/2008	13:21	--	--	no pen
90B	9/17/2008	13:21	No	No	low pen
90C	9/17/2008	13:22	No	No	low pen
91A	9/17/2008	13:30	No	No	no obvious debris
91B	9/17/2008	13:31	No	No	no obvious debris
91C	9/17/2008	13:32	No	No	no obvious debris
92A	9/17/2008	13:36	No	No	possible wood in farfield, no obvious debris
92B	9/17/2008	13:37	No	No	no obvious debris
92C	9/17/2008	13:37	No	No	no obvious debris
93A	9/17/2008	13:40	--	--	no pen, disturbed
93B	9/17/2008	13:41	No	No	hard bottom, no pen
93C	9/17/2008	13:41	--	--	no pen, disturbed
94A	9/17/2008	13:44	No	No	no obvious debris, polychaete
94B	9/17/2008	13:45	No	No	no obvious debris, polychaetes at depth
94C	9/17/2008	13:46	No	No	no obvious debris
95A	9/17/2008	14:20	No	No	no obvious debris
95B	9/17/2008	14:20	No	No	no obvious debris
95C	9/17/2008	14:21	No	No	no obvious debris
96A	9/17/2008	14:24	No	No	no obvious debris
96B	9/17/2008	14:24	No	No	no obvious debris
96C	9/17/2008	14:25	No	No	no obvious debris
97A	9/17/2008	14:29	No	No	no obvious debris
97B	9/17/2008	14:30	No	No	no obvious debris
97C	9/17/2008	14:30	No	No	no obvious debris
98A	9/17/2008	14:35	No	No	no obvious debris
98B	9/17/2008	14:36	No	No	no obvious debris
98C	9/17/2008	14:36	No	No	no obvious debris, polychaete
99A	9/17/2008	14:39	No	No	no obvious debris
99B	9/17/2008	14:40	No	No	no obvious debris
99C	9/17/2008	14:41	No	2%	possible wood piece on surface?
100A	9/17/2008	14:46	No	3-5%	small wood pieces on surface, methane bubble
100B	9/17/2008	14:47	No	2-3%	small wood pieces on surface, methane bubble
100C	9/17/2008	14:48	No	1-2%	possible wood pieces on surface?
101A	9/17/2008	14:51	No	No	no obvious debris
101B	9/17/2008	14:52	No	No	no obvious debris, methane bubbles
101C	9/17/2008	14:52	No	No	no obvious debris
102A	9/17/2008	15:00	No	No	no obvious debris
102B	9/17/2008	15:01	No	No	no obvious debris
102C	9/17/2008	15:02	No	No	no obvious debris
103A	9/17/2008	15:05	No	No	no obvious debris
103B	9/17/2008	15:06	No	No	no obvious debris, void, polychaete
103C	9/17/2008	15:06	No	No	possible wood or plastic piece on surface?
104A	9/17/2008	15:11	No	No	Eelgrass, no obvious debris
104B	9/17/2008	15:12	No	3-5%	possible fine wood particles in upper 3 cm?
104C	9/17/2008	15:13	No	1-2%	possible fine wood particles in upper 2 cm?
105A	9/17/2008	15:17	No	3-5%	possible fine wood particles in upper 3 cm?
105B	9/17/2008	15:18	No	5%	wood piece and particles in upper 3 cm
105C	9/17/2008	15:19	No	No	no obvious debris
106A	9/17/2008	15:23	No	5%	fine wood particles in upper 8 cm?
106B	9/17/2008	15:24	No	No	disturbed, no obvious debris
106C	9/17/2008	15:25	No	No	disturbed, no obvious debris
107A	9/17/2008	15:30	No	No	Eelgrass, no obvious debris
107B	9/17/2008	15:31	No	No	Eelgrass, no obvious debris
107C	9/17/2008	15:31	No	No	Eelgrass, no obvious debris
108A	9/17/2008	15:35	No	No	Eelgrass, no obvious debris
108B	9/17/2008	15:36	No	No	Eelgrass, no obvious debris
108C	9/17/2008	15:37	No	10-15%	fine wood particles in upper 8 cm, eelgrass
109A	9/17/2008	15:40	No	No	Eelgrass, no obvious debris
109B	9/17/2008	15:41	No	No	Eelgrass, no obvious debris
109C	9/17/2008	15:41	No	No	Eelgrass, no obvious debris
110A	9/18/2008	7:31	No	No	no pen, algae
110B	9/18/2008	7:31	No	No	no pen, algae
110C	9/18/2008	7:32	No	No	low pen, brick piece? Rocks
111A	9/18/2008	7:36	No	No	no pen, algae
111B	9/18/2008	7:37	No	No	no pen, algae
111C	9/18/2008	7:38	No	No	no pen, rocks

Cornwall Landfill SPI Image Analysis - Preliminary Results (09/23/08)

Station (CW)	Date	Time	Muni Waste	Wood Debris	Comments
112A	9/18/2008	7:41	No	No	shell hash in sand, no obvious debris
112B	9/18/2008	7:42	No	No	shell hash in sand, no obvious debris
112C	9/18/2008	7:42	No	No	shell hash in sand, no obvious debris
113A	9/18/2008	7:45	No	No	no obvious debris
113B	9/18/2008	7:46	No	No	no obvious debris
113C	9/18/2008	7:46	No	No	no obvious debris
114A	9/18/2008	7:52	No	No	shell on sandy silt, no obvious debris
114B	9/18/2008	7:53	No	10%	possible wood debris upper right surface
114C	9/18/2008	7:53	No	No	shell on sandy silt, no obvious debris
115A	9/18/2008	7:56	No	No	no pen, algae
115B	9/18/2008	7:57	No	No	hard sand bottom, small shell particles, algae
115C	9/18/2008	7:58	No	No	hard sand bottom, small shell particles
116A	9/18/2008	8:05	No	5%	stick in farfield?
116B	9/18/2008	8:06	No	No	sandy hard bottom, eelgrass fronds
116C	9/18/2008	8:06	No	No	sandy hard bottom, shell particles
117A	9/18/2008	8:12	No	No	sandy hard bottom, low pen
117B	9/18/2008	8:12	No	No	sandy hard bottom, shell particles
117C	9/18/2008	8:13	No	No	sandy hard bottom, low pen
118A	9/18/2008	8:16	No	No	algae on hard bottom, no pen
118B	9/18/2008	8:17	No	No	sandy hard bottom, no pen
118C	9/18/2008	8:18	No	No	sandy hard bottom, eelgrass fronds in farfield?
119A	9/18/2008	8:31	No	No	rocky & sandy bottom, no pen
119B	9/18/2008	8:31	No	No	rocky & sandy bottom, no pen
119C	9/18/2008	8:32	No	No	rocky & sandy bottom, no pen, seastar
120A	9/18/2008	8:44	No	No	sparse eelgrass on sandy bottom, no obvious debris
120B	9/18/2008	8:45	No	No	sparse eelgrass on sandy bottom, no obvious debris
120C	9/18/2008	8:45	No	No	sparse eelgrass on sandy bottom, no obvious debris
121A	9/18/2008	8:49	No	No	eelgrass on sandy bottom
121B	9/18/2008	8:50	No	No	eelgrass on sandy bottom
121C	9/18/2008	8:51	No	No	eelgrass on sandy bottom, crab
122A	9/18/2008	8:54	No	No	Eelgrass, no obvious debris
122B	9/18/2008	8:54	No	No	Eelgrass, no obvious debris
122C	9/18/2008	8:55	No	No	Eelgrass, no obvious debris
123A	9/18/2008	8:58	No	No	Eelgrass, no obvious debris
123B	9/18/2008	8:58	No	No	Eelgrass, no obvious debris
123C	9/18/2008	8:59	No	No	Eelgrass, no obvious debris
124A	9/18/2008	9:03	No	No	Eelgrass, no obvious debris
124B	9/18/2008	9:04	No	No	Eelgrass, no obvious debris
124C	9/18/2008	9:04	No	3-5%	possible fine wood particles in upper 2 cm?
125A	9/18/2008	9:11	No	No	rocky bottom, no pen
125B	9/18/2008	9:12	No	No	rocky bottom, no pen
125C	9/18/2008	9:12	No	No	rocky bottom, no pen
126A	9/18/2008	9:17	No	No	rocky bottom, no pen
126B	9/18/2008	9:18	No	No	rocky bottom, no pen
126C	9/18/2008	9:19	No	No	rocky bottom, no pen
127A	9/18/2008	9:25	No	No	eelgrass, low pen
127B	9/18/2008	9:25	No	No	eelgrass, low pen, deceased shiner perch?
127C	9/18/2008	9:26	No	No	eelgrass, low pen
128A	9/18/2008	9:30	No	No	sandy/rocky bottom with fine shell
128B	9/18/2008	9:31	--	--	no pen
128C	9/18/2008	9:31	No	No	sandy/rocky bottom with fine shell
129A	9/18/2008	9:37	No	No	compact sandy bottom, brick piece?
129B	9/18/2008	9:38	No	No	sandy bottom, algae/bryozoan clump
129C	9/18/2008	9:38	No	No	rocks on sandy bottom
130A	9/18/2008	9:56	No	No	Eelgrass, no obvious debris
130B	9/18/2008	9:57	No	No	Eelgrass, no obvious debris
130C	9/18/2008	9:58	No	No	Eelgrass, no obvious debris
131A	9/18/2008	10:09	No	3%	possible fine wood particles in surface
131B	9/18/2008	10:09	No	1-2%	possible fine wood particles in surface
131C	9/18/2008	10:10	No	1-2%	possible fine wood particles in surface
132A	9/18/2008	10:13	No	No	no obvious debris
132B	9/18/2008	10:14	No	No	no obvious debris
132C	9/18/2008	10:15	No	No	no obvious debris
133A	9/18/2008	10:18	No	No	no obvious debris
133B	9/18/2008	10:18	No	No	no obvious debris, polychaete
133C	9/18/2008	10:19	No	No	no obvious debris
134A	9/18/2008	10:22	No	No	no obvious debris
134B	9/18/2008	10:23	No	No	no obvious debris
134C	9/18/2008	10:23	No	No	no obvious debris
135A	9/18/2008	10:33	No	No	no obvious debris
135B	9/18/2008	10:34	No	No	no obvious debris
135C	9/18/2008	10:34	No	No	no obvious debris, spionid polychaete?
136A	9/18/2008	10:38	No	No	no obvious debris
136B	9/18/2008	10:39	No	No	no obvious debris
136C	9/18/2008	10:40	No	No	no obvious debris
137A	9/18/2008	10:44	No	No	no obvious debris, methane bubbles
137B	9/18/2008	10:45	No	No	no obvious debris
137C	9/18/2008	10:46	No	No	no obvious debris
138A	9/18/2008	10:49	No	No	no obvious debris
138B	9/18/2008	10:50	No	No	no obvious debris
138C	9/18/2008	10:51	No	No	no obvious debris

🟨	Image for final analysis
--	Parameter indeterminate

APPENDIX E-2
2008 SEDIMENT INVESTIGATION DATA

Cornwall Avenue Landfill Mapping - Sediment Coring Observations[1]

Station	Date	Time	Total Penetration (ft)	Total Recovery (ft)	Refuse?	Refuse Thickness (ft)	Description	Percent by Volume[2]	Wood Debris?	Wood Thickness (ft)	Percent by Volume[3]	Relative Percent[3] (Bark vs. Chips/Sawdust)	Bore Log Notes	Recent Overlying Sediment Layer (ft)[4]
BLVD-SC-01	9/23/2008	1530	6.0 (refusal)	6.0	No	--	refusal likely due to wood debris	--	Yes	5	25-50			1.0
BLVD-SC-02	9/23/2008	1438	9.1 (refusal)	5.4	No	--	refusal due to wood debris, also caused compaction	--	Yes	5.4	25-50			0.4
BLVD-SC-03	9/23/2008	1126	11.3	6.6	No	--	compaction likely due to wood debris	--	Yes	6.6	**>50**			0.0
BLVD-SC-04	9/23/2008	1014	11.5	10.2	No	--	no native sediment observed	--	Yes	9.7	**>50**			0.5
BLVD-SC-05	9/22/2008	1630	14.0	14.0	No	--	"native" sediments encountered at ~9.5 ft.	--	Yes	9.5	>50			0.0
BLVD-SC-06	9/22/2008	1530	15.0	7.8	No	--	"native" sediments encountered at ~6 ft.	--	Yes	4.5	25-50			1.5
BLVD-SC-07	9/24/2008	902	4.0 (refusal)	3.3	No	--	refusal due to wood debris	--	Yes	3.3	25-50			0.0
BLVD-SC-08	9/23/2008	1656	16.0	15.0	No	--	"native" sediments encountered at ~7 ft.	--	Yes	4.5	25-50			2.5
BLVD-SC-09	9/23/2008	1818	9.7 (refusal)	8.1	No	0*	milk container fragment observed from 1.7-2.5 ft	<5	Yes	3.5	25-50	Both	bark, wood chips, sawdust	0.5
CW-002	9/25/2008	1615	5.7 (refusal)	2.2	No	--	refusal caused by wood debris	--	Yes	2.2	**>50**	>Chips/Dust	bark and wood chips/sawdust	~ 0.5 + eelgrass
CW-003	9/26/2008	1551	6.0 (refusal)	2.7	No	--	refusal and pile driving due to wood debris	--	Yes	2.7	**>50**	>Chips/Dust	sawdust	~ 0.5 + eelgrass
CW-005	9/29/2008	1455	7.1	1.8	Yes	0*	single piece of plastic at 1 ft, pile drive due to wood debris	<5	Yes	1.8	25-50	>Chips/Dust	wood chips, fibers	~ 1
CW-007	9/26/2008	1109	7.0	3.3	Yes	0.4	plastic fragments, rubber band, blue rubber, aluminum foil	<5	Yes	2.3	25-50	>Bark	piece of wood and bark	2.9
CW-008	9/25/2008	1150	7.0	6.3	Yes	1	plastic, tongue depressor, tin foil, sock	<5	Yes	4.3	25-50	>Chips/Dust	wood chips/sawdust and bark (3 inch)	2.0
CW-012	9/25/2008	1031	8.5	6.5	No	0*	single piece of aluminum foil in upper 0.5 ft	<5	Yes	6	**>50**	Both	wood chips and bark	0.5
CW-014	9/25/2008	1116	7.5	7.5	Yes	3.5	plastic pieces, bags	<5	Yes	4.5	25-50	Both	bark and wood chips	1.5
CW-017	9/29/2008	1010	8.0	3.5	Yes	0*	one shoe lace at 2.5 ft, pile drive due to wood debris	<5	Yes	2	25-50	Both	bark, wood chips/sawdust	1.5
CW-019	9/29/2008	1030	8.0	4.0	No	--	pile drive due to wood debris	--	Yes	1.5	25-50	Both	bark, wood chips, sawdust	2.5
CW-025	9/29/2008	1519	refusal	refusal	--	--	glass and fine gravel at bottom may have caused refusal	--	--	--	--	--	--	0.0
CW-026	9/26/2008	1206	6.0 (refusal)	1.7	Yes	1.7	glass and plastic fragments, refusal due to gravel and refuse	<5	Yes	1.7	25-50	>Bark	bark	0.0
CW-028	9/26/2008	1303	7.0	3.7	Yes	0*	one piece of plastic at 1.5 ft	<5	Yes	2.2	25-50	>Bark	large (3-4 inch) piece of bark	1.5
CW-029	9/25/2008	1409	7.0	6.0	Yes	0.5	plastic fragments	<5	Yes	5	25-50	>Chips/Dust	moderate to abundant wood chips/sawdust	3.0
CW-031	9/29/2008	1236	6.7	3.5	No	--	--	--	Yes	2	25-50	>Bark	bark, wood sticks	1.0
CW-036	9/29/2008	1307	7.7	5.5	Yes	0*	single piece of plastic (candy wrapper) at 1.8 ft	<5	No	--	--	--	--	1.8

APPENDIX E-2
2008 SEDIMENT INVESTIGATION DATA

Cornwall Avenue Landfill Mapping - Sediment Coring Observations[1]

Station	Date	Time	Total Penetration (ft)	Total Recovery (ft)	Refuse?	Refuse Thickness (ft)	Description	Percent by Volume^2	Wood Debris?	Wood Thickness (ft)	Percent by Volume^3	Relative Percent^3 (Bark vs. Chips/Sawdust)	Bore Log Notes	Recent Overlying Sediment Layer (ft)^4
CW-048	9/26/2008	1319	6.0 (refusal)	3.9	Yes	0.4	plastic bag/fragments, christmas tinsel, detergent bottle cap, refusal due to refuse?	10	Yes	3.5	25-50	>Bark	bark	3.5
CW-049	9/25/2008	1552	7.5	4.8	Yes	2.5	plastic bags, plastic jar bottom	5-10	Yes	2.8	25-50	Both	some bark, wood chips	2.0
CW-051	9/29/2008	1251	7.8	6.8	No	--	--	--	Yes	1.4	25-50	>Chips/Dust	fibers, wood chips, sawdust, piece of bark	1.5
CW-053	9/25/2008	1708	6.3	2.8	No	0*	single plastic sheet at 0.8 ft, pile drive due to wood debris	<5	Yes	2	**>50**	>Chips/Dust	wood chips, bark, one large wood chip	0.8
CW-057	9/29/2008	1324	6.5	3.7	No	--	--	--	Yes	2.7	25-50	>Bark	bark	1.0
CW-061	9/25/2008	1800	7.7	5.7	Yes	2	plastic sheet, blue plastic	<5	Yes	3.7	>50	>Chips/Dust	wood chips	2.0
CW-063	9/25/2008	1729	6.5	5.0	No	--	--	--	Yes	3	>50	>Chips/Dust	wood sawdust	1.5
CW-064	9/26/2008	1414	7.6	5.0	No	--	--	--	Yes	5	25-50	>Chips/Dust	thin layer (~2 inches) of fibrous wood	3.0
CW-066	9/26/2008	1354	7.1	2.0	Yes	1	rubber gasket, plastic fragments, wood at bottom caused pile drive	<5	Yes	1	25-50	>Bark	large piece of wood (3-inch)	1.0
CW-067	9/25/2008	1634	7.9	4.8	Yes	1	plastic sheet and fragments	<5	Yes	2	>50	>Chips/Dust	bark and wood chips/sawdust	2.0
CW-068	9/26/2008	1339	8.2	2.6	Yes	0*	piece of linoleum flooring may have cause pile driving	<5	Yes	2.6	25-50	>Bark	bark	2.6
CW-075	9/26/2008	1521	4.8 (refusal)	2.3	Yes	0*	single plastic sheet at 0.7 ft	<5	Yes	2.3	25-50	Both	bark, wood chips, large piece of wood	2.3
CW-077	9/26/2008	1430	7.2	3.0	Yes	1.5	brick and glass frags, plywood piece, pile drive due to debris	5-10	Yes	3	25-50	Both	wood debris	0.0
CW-080	9/26/2008	851	8.5	7.2	No	--	--	--	Yes	4	25-50	>Chips/Dust	bark and wood chips/sawdust	3.0
CW-082	9/26/2008	1037	5.9 (refusal)	2.9	Yes	1.4	plastic bags, aluminum foil, refusal caused by wood debris	<5	Yes	1.4	25-50	>Chips/Dust	wood chips	1.5
CW-084	9/26/2008	1128	7.0	4.2	Yes	1.2	bread clip, newspaper, glass fragments	<5	Yes	3.7	25-50	>Chips/Dust	wood chips/sawdust, small bark	0.5
CW-087	9/25/2008	1343	4.5 (refusal)	2.3	Yes	0*	refusal caused by refuse, glass and porcelain frags, plastic	<5	Yes	2.3	<25	Both	moderate to abundant wood debris	2.3
CW-089	9/29/2008	1146	6.1	2.5	No	--	pile drive due to wood debris	--	Yes	2	25-50	>Chips/Dust	wood chips, fibers, sawdust	0.5
CW-091	9/25/2008	1313	7.5	5.9	Yes	2	cigarette pack, paper, plastic	<5	Yes	2.5	25-50	Both	wood chips and bark	0.5
CW-093	9/29/2008	1125	7.5	5.4	Yes	0.5	small piece of leather, glass fragment	<5	Yes	2	25-50	Both	wood debris	2.5
CW-108	9/29/2008	1434	6.8	2.0	No	--	pile drive due to wood debris	--	Yes	2	**>50**	>Chips/Dust	sawdust/wood chips, large 3-4 inch wood piece	~ 0.5 + eelgrass
CW-113	9/26/2008	1501	6.0	3.6	Yes	0*	one small piece of plastic at 3 ft	<5	Yes	3.6	25-50	>Bark	bark (3-inch)	3.0
CW-117	9/29/2008	1538	4.0	4.0	No	--	--	--	Yes	2.5	**>50**	>Chips/Dust	wood chips and sawdust	< 0.5
CW-120	9/26/2008	1539	2.0 (refusal)	1.3	No	--	refusal due to wood debris	--	Yes	1.3	**>50**	>Chips/Dust	wood chips and sawdust	~ 0.5 + eelgrass
CW-124	9/29/2008	1503	6.2	3.8	Yes	0*	piece of fabric/textile at 3.8 ft, pile drive due to wood debris	<5	Yes	3.8	25-50	Both	--	2.0
CW-132	9/29/2008	1404	6.5	2.5	Yes	0*	single piece of plastic sheet, pile drive due to wood debris	<5	Yes	2.5	25-50	>Chips/Dust	wood chips, sawdust, fibers	1.5
CW-134	9/29/2008	1339	8.5	6.5	No	--	--	--	Yes	0.7	25-50	>Chips/Dust	fibers, wood chips	2.7

APPENDIX E-2
2008 SEDIMENT INVESTIGATION DATA

Cornwall Avenue Landfill Mapping - Sediment Coring Observations[1]

Station	Date	Time	Total Penetration (ft)	Total Recovery (ft)	Refuse?	Refuse Thickness (ft)	Description	Percent by Volume[2]	Wood Debris?	Wood Thickness (ft)	Percent by Volume[3]	Relative Percent[3] (Bark vs. Chips/Sawdust)	Bore Log Notes	Recent Overlying Sediment Layer (ft)[4]
CW-136	9/29/2008	1046	7.5	5.7	Yes	0*	small piece of plastic at 4 ft	<5	Yes	4	25-50	>Bark	primarily bark	1.7
CW-139	9/29/2008	1107	7.5	5.6	Yes	2	plastic frags, aluminum foil	<5	Yes	3.6	25-50	>Chips/Dust	fibers, wood chips, sawdust, large piece of bark (3-inches)	2.0
RGH-SC-01	8/26/2008	1654	6.0	4.5	Yes	0.5	glass fragments on surface, brick debris at 2.5 ft	<5	Yes	<1	<25	>Chips/Dust	chips, sawdust, 2-inch wood chip	<0.5
RGH-SC-02	8/26/2008	1802	6.0	5.2	Yes	3	brick, glass, wire fragments on surface, brick and glass fragments at 2.25 ft to 5.2 ft	10	Yes	2.25	25-50	>Chips/Dust	scattered wood fiber on surface, 3-inch wood chips from 3 to 5.25 ft	0.5
RGH-SC-03	8/27/2008	1212	6.2	5.5	No	--	brick fragments on surface	--	Yes	3	>50	>Chips/Dust	abundant wood sticks (0.5 to 4 inch long) at surface, wood chips from 2.8 ft to 5.5 ft	1.8
RGH-SC-04	8/27/2008	1149	6.0	5.7	No	--	--	--	Yes	5	>50	>Chips/Dust	wood pieces (0.5 to 2 inch) from 0.7 to 2.2 ft, wood chip layers at 2.5 ft and 5.1 ft, abundant wood pieces to 5.7 ft	0.7
RGH-SC-05	8/27/2008	1127	6.0	4.5	No	--	--	--	Yes	4	>50	>Chips/Dust	wood fragments 0.5 to 1.5 ft, abundant wood chips from 3 to 4.5 ft	0.5
RGH-SC-06	8/27/2008	1017	6.0	5.3	No	--	--	--	Yes	3.5	>50	>Chips/Dust	root/wood fragments from surface to 2.75 ft, wood chip layers (1 to 3 cm thick) at 2.75 and 3.25 ft, wood chip layers increase to 5.25 ft	0.9
RGH-SC-07	9/24/2008	1403	6.8	4.9	Yes	0*	5 inch piece black plastic at 6.8'	<5	Yes	6.5	25-50	>Chips/Dust	wood chips, sawdust	0.5
RGH-SC-08	9/24/2008	1639	5.5	4.8	Yes	0*	plastic syringe at 5.5 ft	<5	Yes	3.5	>50	>Chips/Dust	wood chips, sawdust, fibers	2.0
RGH-SC-09	9/24/2008	1601	5.5	4.3	No	--	--	--	Yes	3.5	25-50	>Chips/Dust	wood pieces (0.5 to 4 inch), increasing amounts with depth	2.0

Notes:

0* - single piece or fragment of refuse observed in core

[1] Observations are based on recovered sediment depth (not penetration depth)

[2] Percent by volume - visual estimate of refuse volume in sediment thickness (<5% is limit of observation)

[3] Percent volume is an estimate based on field observations. Highly organic sediments (PT) contain >50% wood debris. Bold (**>50%**) indicates primarily wood debris, with little sediment. Organic silts and clays (OL) contain 25-50% wood debris.

[4] Recent sediments at some stations contain organic material including wood debris but generally less than observed with increasing sediment depth.

🟧 Municipal refuse present with < 1.0 foot of recent overlying sediment
🟨 Greater than 1.0 foot accumulated wood containing > 50% sawdust/wood chips with < 1.0 foot of recent overlying sediment

APPENDIX F

Cost Estimates

TABLE F-1
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**
Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of low permeability soil cap over Upland Site Unit					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Temporary Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Import fill for site grading/preparation	c.y.	27,500	$18	$495,000	4
Place, grade, and compact imported fill	c.y.	27,500	$9	$247,500	1,4
LFG control layer installing pipe, welding, testing)	l.f.	7,350	$16	$117,600	1,5
LFG control layer - granular fill	c.y.	8,400	$25	$210,000	6
Place, grade, and compact low permeability layer	c.y.	47,500	$9.00	$427,500	7
Separation / Protection Layer	s.y.	50,610	$1.30	$65,793	8
Import fill for drainage and topsoil layers	c.y.	33,700	$18	$606,600	9
Estin Placement and grading of drainage and topsoil layers	c.y.	33,700	$9	$303,300	1,9
OSWER 9355.0-75, July 2000					
Hydroseeding capped area	ac	10	$4,000	$41,829	1
Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses;					
$100 per sample for data validation and management; $300 for LFG VOC analysis, $100 for LFG analyzer rental;					
and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2),					
Stormwater management system (incl. BNSF drainage)	LS	1	$100,000	$100,000	1
Passive vents for LFG system	LS	1	$25,000	$25,000	1
Installation of 8 groundwater monitoring wells	LS	1	$16,000	$16,000	10
Deed restrictions (institutional controls)	LS	1	$5,000	$5,000	1
Subtotal for Direct Capital Costs				***$2,700,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$50,000	1
Remedial Design	%	12		$324,000	11,14
Project Management	%	6		$162,000	12,14
Construction Management	%	8		$216,000	13,14
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	3		$81,000	1
Ecology Oversight	%	2		$54,000	1
Estimate of Taxes	%	9		$243,000	
Subtotal for Capital Indirect Costs				***$1,170,000***	
Subtotal for Capital Direct and Indirect Costs				***$3,870,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$967,500***	
Total for Direct and Indirect Capital Costs				**$4,837,500**	

Operation and Maintenance - Upland Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Groundwater and LFG Compliance Monitoring and Reporting						
Years 1 to 2 - Water Quality and LFG Monitoring (Quarterly)	Ea.	4	$12,700	$50,800	$97,204	15,16
Years 3 to 5 - Water Quality and LFG Monitoring (Semi-annually)	Ea.	2	$12,950	$25,900	$69,765	15,16
Subtotal for Operation and Maintenance Costs				***$166,969***		
Contingency on Operation and Maintenance Costs		25%		***$42,000***		
Total for Operation and Maintenance Costs				***$208,969***		

PRESENT WORTH OF ALTERNATIVE 1 - Upland Site Unit	**$5,050,000**

TABLE F-1
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1:	**Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**
Scope of Work:	Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Dust control, street sweeping, erosion control measures
4 Based on creating 1.5% slope over 85% of Upland Site Area. [Assume 15% coverage by buildings/pavement (535,900 sf x 0.85 = 455,515 sf)] Assumed excess stabilized sediment is available after creating 2 ft cap, which provides an additional 13,750 CY to achieve desired slope. Assumed imported structural fill from clean borrow required for grade not achieved with the stabilized sediment.
5 Assumed perforated 2" HDPE SDR-11 on 75-ft centers under cap
6 Assumed granular fill material with a thickness of 6-inches under cap area (455,520 sf)
7 Assumed approximately 47,500 c.y. of stabilized sediment will be graded and compacted across 85% of the Upland Site Unit (455,520 sf)
8 Assumed non-woven geotextile, installed cost; throughout cap area (455,520 sf / 9 = 50610 CY)
9 Assumes 1 ft drainage layer, 1 ft topsoil over 455,520 sf area
10 Assumed installation occurs during shoreline stabilization; assumed $2,000 in labor and materials per well
11 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
12 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
13 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
14 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
15 Groundwater monitoring - 8 samples + 2 QA/QC per event; monitoring on quarterly basis for 2 years, semi-annually for 3 years, annually for 5 years. Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses; $100 per sample for data validation and management; $300 for LFG VOC analysis, $100 for LFG analyzer rental; and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2), and $7,500 per annum (years 3 through 5).
16 Present Worth Values calculated assuming a 3 percent discount rate.

TABLE F-2
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**

Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of shoreline stabilization					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Select removal and disposal of refuse along shoreline	c.y.	1,000	$96	$96,125	4
Placement of 3 ft of gravel/riprap for shoreline stabilization	c.y.	30,800	$38	$1,170,400	5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	5,100	$25	$127,500	5
Subtotal for Direct Capital Costs				***$1,430,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$70,000	1
Remedial Design	%	15		$214,500	1,6,9
Project Management	%	6		$85,800	7,9
Construction Management	%	8		$114,400	8,9
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	10		$143,000	1
Ecology Oversight	%	2		$28,600	1
Estimate of Taxes	%	9		$128,700	
Subtotal for Capital Indirect Costs				***$825,000***	
Subtotal for Capital Direct and Indirect Costs				***$2,255,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$563,750***	
Total for Direct and Indirect Capital Costs				**$2,818,750**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Natural Recovery Compliance Monitoring and Reporting						
Years 1 to 10 - Sediment Sampling (Yr 1, 5,10)	Ea.	1	$22,400	$22,400	$82,689	10,13
Bathymetric Survey of Subtidal MNR (same schedule as monitoring)						
Survey and letter report	Ea.	1	$8,000	$8,000	$29,532	11,13
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$29,401	12,13
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Design/Coordination/Permitting	LS	1	$5,000	$5,000		
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10,15,20 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Sum	1		$15,100	$42,314	13
Subtotal for Operation and Maintenance Costs				***$183,936***		
Contingency on Operation and Maintenance Costs		25%		***$46,000***		
Total for Operation and Maintenance Costs				***$229,936***		
PRESENT WORTH OF ALTERNATIVE 1 - Marine Site Unit				**$3,050,000**		

TABLE F-2
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**

Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Assumed 1,000 c.y. of material to be excavated, hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
5 Assumes 3 ft of riprap and 0.5 ft of gravel over 276,946 sf of area for shoreline stabilization system
6 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
7 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
8 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
9 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
10 Monitoring sediment accumulation / recovery from 10 shallow sediment cores; plus 12 surface sediment samples collected for PCB analysis.
11 Assume bathymetry survey on same frequency as sediment monitoring.
12 Inspection assumes 6-hour travel/field effort and 4-hour report effort at $140/hr.
13 Present Worth Values calculated assuming a 3 percent discount rate.

TABLE F-3
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2: **Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**

Scope of Work: Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of low permeability soil cap over Upland Site Unit					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Temporary Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Import fill for site grading/preparation	c.y.	27,500	$18	$495,000	4
Place, grade, and compact imported fill	c.y.	27,500	$9	$247,500	1,4
LFG control layer installing pipe, welding, testing)	l.f.	7,350	$16	$117,600	1,5
LFG control layer - granular fill	c.y.	8,400	$25	$210,000	6
Place, grade, and compact low permeability layer	c.y.	47,500	$9.00	$427,500	7
Separation / Protection Layer (Scrim Reinforced Liner)	s.y.	50,610	$3.33	$168,531	8
Import fill for drainage and topsoil layers	c.y.	33,700	$18	$606,600	9
Placement and grading of drainage and topsoil layers	c.y.	33,700	$9	$303,300	1,9
Hydroseeding capped area	ac	10	$4,000	$41,829	1
Other Components of Cleanup Action Alternative					
Import and placement of sand for shoreline sand filter	c.y.	10,300	$26	$267,800	17
Stormwater management system (incl. BNSF drainage)	LS	1	$100,000	$100,000	1
Passive vents for LFG system	LS	1	$25,000	$25,000	1
Installation of 8 groundwater monitoring wells	LS	1	$16,000	$16,000	10
Deed restrictions (institutional controls)	LS	1	$5,000	$5,000	1
Subtotal for Direct Capital Costs				***$3,070,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$75,000	1
Remedial Design	%	12		$368,400	11,14
Project Management	%	6		$184,200	12,14
Construction Management	%	8		$245,600	13,14
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	3		$92,100	1
Ecology Oversight	%	2		$61,400	1
Estimate of Taxes	%	9		$276,300	
Subtotal for Capital Indirect Costs				***$1,343,000***	
Subtotal for Capital Direct and Indirect Costs				***$4,413,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$1,103,250***	
Total for Direct and Indirect Capital Costs				**$5,516,250**	

Operation and Maintenance - Upland Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Groundwater and LFG Compliance Monitoring and Reporting						
Years 1 to 2 - Water Quality and LFG Monitoring (Quarterly)	Ea.	4	$12,700	$50,800	$97,204	15,16
Years 3 to 5 - Water Quality and LFG Monitoring (Semi-annually)	Ea.	2	$12,950	$25,900	$69,765	15,16
Subtotal for Operation and Maintenance Costs				***$166,969***		
Contingency on Operation and Maintenance Costs		25%		***$42,000***		
Total for Operation and Maintenance Costs				***$208,969***		

PRESENT WORTH OF ALTERNATIVE 2 - Upland Site Unit **$5,730,000**

TABLE F-3
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2:	**Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**
Scope of Work:	Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Dust control, street sweeping, erosion control measures
4 Based on creating 1.5% slope over 85% of Upland Site Area. [Assume 15% coverage by buildings/pavement (535,900 sf x 0.85 = 455,515 sf)] Assumed excess stabilized sediment is available after creating 2 ft cap, which provides an additional 13,750 CY to achieve desired slope. Assumed imported structural fill from clean borrow required for grade not achieved with the stabilized sediment.
5 Assumed perforated 2" HDPE SDR-11 on 75-ft centers under cap
6 Assumed granular fill material with a thickness of 6-inches under cap area (455,520 sf)
7 Assumed approximately 47,500 c.y. of stabilized sediment will be graded and compacted across 85% of the Upland Site Unit (455,520 sf)
8 Assumed 20-mil scrim reinforced liner, installed cost; throughout cap area (455,520 sf / 9 = 50610 CY)
9 Assumed 1 ft drainage layer, 1 ft topsoil over 455,520 sf area
10 Assumed installation occurs during shoreline stabilization; assumed $2,000 in labor and materials per well
11 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
12 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
13 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
14 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
15 Groundwater monitoring - 8 samples + 2 QA/QC per event; monitoring on quarterly basis for 2 years, semi-annually for 3 years, annually for 5 years. Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses; $100 per sample for data validation and management; $300 for LFG VOC analysis, $100 for LFG analyzer rental; and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2), and $7,500 per annum (years 3 through 5).
16 Present Worth Values calculated assuming a 3 percent discount rate.
17 Assumed 1 ft of sand placed over 276,950 sf of area beneath the shoreline stabilization system

TABLE F-4
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 - MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2: **Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**

Scope of Work: Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of shoreline stabilization					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Select removal and disposal of refuse along shoreline	c.y.	1,000	$96	$96,125	4
Placement of 3 ft of gravel/riprap for shoreline stabilization	c.y.	30,800	$38	$1,170,400	5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	5,100	$25	$127,500	5
Construction of thin layer subtidal sediment cap					
Placement of thin layer sand cap	c.y.	5,100	$35	$178,500	6
Subtotal for Direct Capital Costs				***$1,610,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$70,000	1
Remedial Design	%	15		$241,500	6,9
Project Management	%	6		$96,600	7,9
Construction Management	%	8		$128,800	8,9
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	10		$161,000	1
Ecology Oversight	%	2		$32,200	1
Estimate of Taxes	%	9		$144,900	
Subtotal for Capital Indirect Costs				***$915,000***	
Subtotal for Capital Direct and Indirect Costs				***$2,525,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$631,250***	
Total for Direct and Indirect Capital Costs				**$3,156,250**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Natural Recovery Compliance Monitoring and Reporting						
Years 1 to 10 - Sediment Sampling (Yr 1, 5,10)	Ea.	1	$22,400	$22,400	$82,689	10,13
Bathymetric Survey of Subtidal MNR (same schedule as monitoring)						
Survey and letter report	Ea.	1	$8,000	$8,000	$29,532	11,13
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$29,401	12,13
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Design/Coordination/Permitting	LS	1	$5,000	$5,000		
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Ea.	1		$15,100	$24,261	13
Subtotal for Operation and Maintenance Costs				***$165,883***		
Contingency on Operation and Maintenance Costs		25%		***$41,000***		
Total for Operation and Maintenance Costs				***$206,883***		

PRESENT WORTH OF ALTERNATIVE 2 - Marine Site Unit **$3,360,000**

TABLE F-4
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 - MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2:	**Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**
Scope of Work:	Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Assumed 1,000 c.y. of material to be excavated, hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
5 Assumes 3 ft of riprap and 0.5 ft of gravel over 276,946 sf of area for shoreline stabilization system
6 Assumed sediment capping area of 229,000 sf capped with 6 inches of sand (plus 20% additional for placement difficulty)
7 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
8 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
9 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
10 Monitoring sediment accumulation / recovery from 10 shallow sediment cores; plus 12 surface sediment samples collected for PCB analysis.
11 Assume bathymetry survey on same frequency as sediment monitoring.
12 Inspection assumes 6-hour travel/field effort and 4-hour report effort at $140/hr.
13 Present Worth Values calculated assuming a 3 percent discount rate.

TABLE F-5
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater diversion barrier system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of low permeability soil cap over Upland Site Unit					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Temporary Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Import fill for site grading/preparation	c.y.	27,500	$18	$495,000	4
Place, grade, and compact imported fill	c.y.	27,500	$9	$247,500	1,4
LFG control layer installing pipe, welding, testing)	l.f.	7,350	$16	$117,600	1,5
LFG control layer - granular fill	c.y.	8,400	$25	$210,000	6
Place, grade, and compact low permeability layer	c.y.	47,500	$9.00	$427,500	7
Installation of FML Layer	s.y.	50,610	$8.20	$415,002	8
Import fill for drainage and topsoil layers	c.y.	33,700	$18	$606,600	9
Placement and grading of drainage and topsoil layers	c.y.	33,700	$9	$303,300	1,9
Hydroseeding capped area	ac	10	$4,000	$41,829	1
Other Components of Cleanup Action Alternative					
Import and placement of sand for shoreline sand filter	c.y.	10,300	$26	$267,800	24
Stormwater management system (incl. BNSF drainage)	LS	1	$100,000	$100,000	1
Passive vents for LFG system	LS	1	$25,000	$25,000	1
Installation of 8 groundwater monitoring wells	LS	1	$16,000	$16,000	10
Deed restrictions (institutional controls)	LS	1	$5,000	$5,000	1
Construction of Groundwater Diversion Structure					
Installation of sheetpile cutoff wall	s.f.	10,200	$40.00	$408,000	11
Installation of upgradient groundwater interception trench	l.f.	1,350	$70	$94,500	11
Installation of oil/water separator	l.s.	1	$10,000	$10,000	12
Installation of sampling/access vaults	l.s.	3	$2,500	$7,500	13
Installation of outfall/tide gate	l.s.	1	$10,000	$10,000	1
Subtotal for Direct Capital Costs				***$3,840,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$50,000	1
Pre-Design Investigation/Evaluation	LS	1		$50,000	1
Remedial Design	%	10		$384,000	14,17
Project Management	%	5		$192,000	15,17
Construction Management	%	6		$230,400	16,17
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	3		$115,200	1
Ecology Oversight	%	2		$76,800	1
Estimate of Taxes	%	9		$345,600	
Subtotal for Capital Indirect Costs				***$1,484,000***	
Subtotal for Capital Direct and Indirect Costs				***$5,324,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$1,331,000***	
Total for Direct and Indirect Capital Costs				$6,655,000	

Operation and Maintenance - Upland Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Annual Inspection and cleaning of oil/water separator						
Inspection/cleaning	ea.	1	$1,000	$1,000	$14,877	18,20,23
Groundwater and LFG Compliance Monitoring and Reporting						
Years 1 to 2 - Water Quality and LFG Monitoring (Quarterly)	Ea.	4	$12,700	$50,800	$97,204	19,21,22,23
Years 3 to 5 - Water Quality and LFG Monitoring (Semi-annually)	Ea.	2	$12,950	$25,900	$69,765	19,21,22,23
Subtotal for Operation and Maintenance Costs				***$166,969***		
Contingency on Operation and Maintenance Costs		25%		***$42,000***		
Total for Operation and Maintenance Costs				***$208,969***		
PRESENT WORTH OF ALTERNATIVE 3 - Upland Site Unit				**$6,860,000**		

TABLE F-5
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater diversion barrier system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Dust control, street sweeping, erosion control measures
4 Based on creating 1.5% slope over 85% of Upland Site Area. [Assume 15% coverage by buildings/pavement (535,900 sf x 0.85 = 455,515 sf)] Assumed excess stabilized sediment is available after creating 2 ft cap, which provides an additional 13,750 CY to achieve desired slope. Assumed imported structural fill from clean borrow required for grade not achieved with the stabilized sediment.
5 Assumed perforated 2" HDPE SDR-11 on 75-ft centers under cap
6 Assumed granular fill material with a thickness of 6-inches under cap area (455,520 sf)
7 Assumed approximately 47,500 c.y. of stabilized sediment will be graded and compacted across 85% of the Upland Site Unit (455,520 sf)
8 Assumed 60-mil HDPE liner, installed cost; throughout cap area (455,520 sf / 9 = 50610 CY)
9 Costs hydroseeding Upland Site Unit for short-term stabilization pending Site development
11 Assumed installation occurs during shoreline stabilization; assumed $2,000 in labor and materials per well
12 Assumed trench and steel sheetpile wall extend to bedrock, estimated to be 12 ft BGS, for an 850-ft alignment.
13 Assumes the installation of a 25-gpm coalescing plate oil/water separator.
14 Assumes the installation or access vaults at both ends of the interception trench and at the center to provide access for sampling and
15 maintenance of the interception trench.
16 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
17 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
18 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
19 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
20 Assumes annual inspection of oil/water separator for 20 years
21 Groundwater monitoring - 8 samples + 2 QA/QC per event; monitoring on quarterly basis for 2 years, semi-annually for 3 years, annually for 5 years.
22 Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses; $100 per sample for data validation and management; 300 for LFG VOC analysis, $100 for LFG analyzer rental; and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2), and $7,500 per annum (years 3 through 5).

23 Present Worth Values calculated assuming a 3 percent discount rate.
24 Assumed 1 ft of sand placed over 276,950 sf of area beneath the shoreline stabilization system

TABLE F-6
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Interception, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater interception/diversion system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of shoreline stabilization					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Select removal and disposal of refuse along shoreline	c.y.	1,000	$96	$96,125	4
Placement of 3 ft of gravel/riprap for shoreline stabilization	c.y.	30,800	$38	$1,170,400	5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	5,100	$25	$127,500	5
Construction of engineered subtidal sediment cap					
Placement of engineered sand cap	c.y.	12,700	$35	$444,500	1
Subtotal for Direct Capital Costs				***$1,870,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$70,000	1
Remedial Design	%	15		$280,500	6,9
Project Management	%	6		$112,200	7,9
Construction Management	%	8		$149,600	8,9
Construction Completion Report	LS	1		$18,700	1
Permitting and Regulatory Compliance	%	10		$187,000	1
Ecology Oversight	%	2		$37,400	1
Estimate of Taxes	%	9		$168,300	
Subtotal for Capital Indirect Costs				***$1,023,700***	
Subtotal for Capital Direct and Indirect Costs				***$2,893,700***	
Contingency for Capital Direct and Indirect Costs	%	25		***$723,425***	
Total for Direct and Indirect Capital Costs				**$3,617,125**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Natural Recovery Compliance Monitoring and Reporting						
Years 1 to 10 - Sediment Sampling (Yr 1, 5,10)	Ea.	1	$22,400	$22,400	$82,689	9,12
Bathymetric Survey of Subtidal MNR (same schedule as monitoring)						
Survey and letter report	Ea.	1	$8,000	$8,000	$29,532	10,12
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$29,401	11,12
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Ea.	1		$10,860	$17,449	12
Subtotal for Operation and Maintenance Costs				***$159,071***		
Contingency on Operation and Maintenance Costs		25%		***$40,000***		
Total for Operation and Maintenance Costs				***$199,071***		
PRESENT WORTH OF ALTERNATIVE 3 - Marine Site Unit				**$3,820,000**		

TABLE F-6
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3:	**Two-Layer Upland Cap, Upgradient Groundwater Interception, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**
Scope of Work:	Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater interception/diversion system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Assumed 1,000 c.y. of material to be excavated, hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
5 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
6 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
7 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
8 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
9 Monitoring sediment accumulation / recovery from 10 shallow sediment cores; plus 12 surface sediment samples collected for PCB analysis.
10 Assume bathymetry survey on same frequency as sediment monitoring.
11 Inspection assumes 6-hour travel/field effort and 4-hour report effort at $140/hr.
12 Present Worth Values calculated assuming a 3 percent discount rate.
13 Assumed 1 ft of sand placed over 276,950 sf of area beneath the shoreline stabilization system

TABLE F-7
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 4 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 4:	**Waste Removal**
Scope of Work:	Excavation of existing landfill refuse and wood waste cover materials from Upland and Marine Site Units with disposal at a Subtitle D solid waste landfill facility. Regrading of upland, reconfigure and stabilize the new shoreline.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Excavation of Upland Refuse					
Mobilization/Demobilization	LS	1	$40,000	$40,000	1,2
Erosion and Sedimentation Controls	LS	1	$100,000	$100,000	1,3
Mass excavation of upland refuse - by tracked excavators	c.y.	430,050	$12	$5,160,600	1,4
Disposal of Upland Refuse and Wood Debris					
On-shore handling and loading of waste material	c.y.	430,050	$2	$860,100	1
Stabilization, with fly ash of 10 % of excavated materials	c.y.	43,005	$15	$645,075	1
Transport (by rail) and Disposal at Rabanco	ton	709,583	$40	$28,383,300	1,5
Subtotal for Direct Capital Costs				***$35,190,000***	
Capital Indirect Costs -					
Remedial Design	%	6		$2,111,400	6,9
Project Management	%	4		$1,407,600	7,9
Construction Management	%	5		$1,759,500	8,9
Construction Completion Report	LS	1		$80,000	1
Permitting and Regulatory Compliance	%	2		$703,800	1
Ecology Oversight	%	1		$351,900	1
Estimate of Taxes	%	9		$3,167,100	
Subtotal for Capital Indirect Costs				***$9,581,300***	
Subtotal for Capital Direct and Indirect Costs				***$44,771,300***	
Contingency for Capital Direct and Indirect Costs	%	20		***$8,954,260***	
PRESENT WORTH OF ALTERNATIVE 4 - Upland Site Unit				**$53,730,000**	

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Excavation volume based on estimated depth of refuse and wood waste in Upland Site Unit.
Total Site area = 535,900 sf; Assumed approximately 1/3 of the Site excavated to 30 ft bgs, 1/3 to 20 ft bgs, and 1/3 to 15 bgs
For consistency in comparison of costs estimates, the export of the fine-grained sediment stored at the site is NOT considered in this total.
5 Assumed excavated materials hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
6 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
7 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
8 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
9 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000

TABLE F-8
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 4 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 4:	**Waste Removal**
Scope of Work:	Excavation of existing landfill refuse and wood waste cover materials from Upland and Marina Site Units with disposal at a Subtitle D solid waste landfill facility. Regrading of upland, reconfigure and stabilize the new shoreline.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Excavation of Marine Refuse					
Mobilization/Demobilization	LS	1	$40,000	$40,000	1,2
Erosion and Sedimentation Controls	LS	1	$100,000	$100,000	1,3
Mass excavation of and dredging of refuse and wood debris	c.y.	148,000	$16	$2,368,000	1,4
Disposal of Marine Refuse and Wood Debris					
On-shore handling and loading of waste material	c.y.	148,000	$2	$296,000	1
Stabilization, with fly ash of 10 % of refuse	c.y.	14,800	$15	$222,000	1
Transport (by rail) and Disposal at Rabanco	ton	244,200	$40	$9,768,000	1
Reconstruction of intertidal and subtidal habitat					
Placement of 1 ft of gravel on intertidal face	c.y.	7,100	$25	$177,500	1,5
Placement of 2 ft of riprap on intertidal face	c.y.	14,200	$38	$539,600	1,5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	3,500	$25	$87,500	1,5
Placement of sand to reconstruct subtidal shoreline slopes	c.y.	42,500	$35	$1,487,500	1,6
Subtotal for Direct Capital Costs				***$15,090,000***	
Capital Indirect Costs -					
Construction Compliance monitoring	%	1		$150,900	1
Remedial Design	%	6		$905,400	7,11
Project Management	%	4		$603,600	8,11
Construction Management	%	6		$905,400	9,11
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	2		$301,800	1
Ecology Oversight	%	1		$150,900	1
Estimate of Taxes	%	9		$1,358,100	
Subtotal for Capital Indirect Costs				***$4,416,100***	
Subtotal for Capital Direct and Indirect Costs				***$19,506,100***	
Contingency for Capital Direct and Indirect Costs	%	25		***$4,876,525***	
Total for Direct and Indirect Capital Costs				**$24,382,625**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$22,316	11,12
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10,15,20 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Ea.	1		$10,100	$28,303	12
Subtotal for Operation and Maintenance Costs				***$50,619***		
Contingency on Operation and Maintenance Costs		25%		***$13,000***		
Total for Operation and Maintenance Costs				***$63,619***		
PRESENT WORTH OF ALTERNATIVE 4 - Marine Site Unit				**$24,450,000**		

TABLE F-8
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 4 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 4:	**Waste Removal**
Scope of Work:	Excavation of existing landfill refuse and wood waste cover materials from Upland and Marina Site Units with disposal at a Subtitle D solid waste landfill facility. Regrading of upland, reconfigure and stabilize the new shoreline.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Excavation volume based on the following estimate of refuse and wood waste in Marine Site Unit.
Shoreline through the intertidal zone: Area =184,600 sf; excavation depth decreases from 30 to 5 ft heading away from shore.
Shallow subtidal zone: Area = 173,700; dredging depth decreases from 5 to 2 ft heading away from shore.
Deep subtidal zone: Area = 148,100; dredging depth decreases from 2 to 0 ft heading away from shore.
Assumes subtidal excavation is conducted from a barge-based clamshell; intertidal excavation conducted by land based equipment.

5 Assumed the recreated intertidal zone will be approximately 19,000 sf
6 Material quantities estimated based on creating 10H:1V slope in intertidal zone and 5H:1V below to base of excavation
7 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
8 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
9 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
10 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
11 Assumes 20 annual inspections; 6-hour travel/field effort and 4-hour report effort at $140/hr.
12 Present Worth Values calculated assuming a 3 percent discount rate.