SECOR
International Incorporated

Volume 2 of 3
Appendices A - C

DRAFT
REMEDIAL INVESTIGATION
YAKIMA RAILROAD AREA
YAKIMA, WASHINGTON

SECOR PN: 00378-001-02

Submitted by
SECOR International Incorporated
12034 - 134th Court NE, Suite 102
Redmond, Washington 98052-2442

Prepared for
Cameron Yakima Working Group
c/o Mr. Mark Valentine
de maximis, inc.
10243 Sunrise Place
Bainbridge Island, WA 98110

December 31, 1998

Prepared by:

DRAFT
Clifford T. Schmitt, R.G.
Senior Hydrogeologist

Reviewed by:

DRAFT
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Principal Engineering Geologist

Draft Issued for Ecology Review

APPENDIX A
WORK PLAN, REMEDIAL INVESTIGATION, YRRA

Remedial Investigation
Yakima Railroad Area
Yakima, Washington
SECOR PN: 00378-001-02
December 31, 1998

SECOR
International Incorporated

August 25, 1997

Mr. Rick Roeder
Site Manager
Toxic Cleanup Program
Central Regional Office
Washington State Department of Ecology
15 West Yakima, Suite 200
Yakima, Washington 98902

RE: FINAL WORK PLAN
YRRA REMEDIAL INVESTIGATION
SECOR PN: 00378-001-01

Dear Rick:

SECOR International Incorporated (SECOR) has prepared this letter on behalf of the Cameron-Yakima Working Group (the Group) to clarify the revisions made to the attached Final Work Plan. The revisions were made based on Ecology's comments on the Draft Work Plan for the Remedial Investigation submitted by SECOR on behalf of the Group dated July 16, 1997. This letter specifically addresses the issues set forth in the comments included in Ecology's letters dated July 17 and July 24, 1997. Revisions to the Draft Work Plan have been completed in the attached Final Work Plan.

JULY 17 LETTER

Ecology Comment:

First is the issue of property access for the water sampling over the next year. In my meeting with SECOR and Ellie Haddad last week, it became evident that the process of your group trying to get property access could be very burdensome, especially if some of the subfacilities decide to be uncooperative. To help with this, I have agreed to send out a letter to each of the subfacilities indicating that SECOR will be sampling on behalf of Ecology as part of the RI work. I have enclosed a rough draft of this letter for your comments. As soon as I get your comments I will send it out. I will use our MTCA authority to help streamline getting the necessary property access.

SECOR Response:

SECOR has received copies of the letters issued to the 13 subfacilities located in the YRRA requesting access. SECOR will contact the individuals identified by Ecology at each facility upon Ecology's Final Work Plan approval and prior to collecting the quarterly

[illegible]

samples. Ecology will provide prior written confirmation to SECOR that access is available at all 13 subfacilities.

Ecology Comment:

Second, since the Work Plan was written we have added a couple of subfacilities and removed a couple. The impact is as follows: a) Drop Crest Linen from the sampling program and add a site called Adeline, which is located about two blocks south of Crest Linen; b) None of us here remember why Rainier Plastics was listed for water level only with no PCE samples nor why that specific site was listed since it is not a YRRA subfacility. The site should be the Southgate Laundry facility located at the corner of 3rd Avenue and Nob Hill Boulevard. Both water level and PCE sampling is needed. This does result in the addition of one well or four samples over the course of year.

SECOR Response:

These revisions have been agreed to by the Group and are included in the Final Work Plan. Based on these modifications, there will be 13 subfacilities with a total of 15 monitoring wells to be sampled for the quarterly monitoring program.

Ecology Comment:

Third, it was not real clear in the Work Plan about how the sampling data generated by the subfacilities will be used. As it stands, SECOR will be sampling one well at each subfacility, quarterly for one year. During this same time period each subfacility will be sampling all wells on the same schedule. Ecology will forward this data to SECOR for use in the final report. To enable SECOR to present a true picture of what is happening with the PCE in the area it is necessary for them to use all of this information. You will want to talk with Peter Jewett about this. When I discussed this with Peter last week, it did not sound like this would be any major change to things for them.

SECOR Response:

SECOR understands that Ecology will provide SECOR with a complete packet of quarterly monitoring reports for the 13 subfacilities in the YRRA for each of the four quarters. The packet will include a hard copy of the quarterly report for each subfacility and an electronic database with the results of the quarterly sampling included. SECOR will incorporate these data into the analyses and conclusions developed for the RI. The data collected for the quarterly reports will be incorporated with the data collected by SECOR.

Ecology Comment:

Finally, I would like to talk about communication between you, SECOR, MNA, your work Group and myself. In the decree you and I have the ability to designate others to communicate directly with. I would suggest that we have MNA and Mark Peterschmidt, Ecology Public Involvement Specialist, work together on the public participation plan and its implementation. For the technical issues, Don Abbott, our hydrogeologist, and I will be addressing things either through you or directly with SECOR. Please let me know how you would like to handle things on your end.

SECOR Response:

SECOR understands that Ecology can contact SECOR directly, however, Mark Valentine of *de maximis, inc.* should be included in any communication whenever possible. MNA is available to assist Ecology with public involvement issues, as necessary.

JULY 24 LETTER

Ecology Comment:

Page 1: Compilation of data available in files has not been provided to Ecology electronically nor in hard copy. Woodward Clyde presented some maps of well locations at our past meeting but nothing more. It was our understanding that either Woodward Clyde's work or, as part of RI, the historic PCE sampling information would be compiled into one central database system and provided electronically to Ecology. In essence, complete the process that Ecology began prior to work group negotiations. It is Ecology's feeling that for the RI to be accurate, all historic sampling data needs to be compiled and used in the RI.

SECOR Response:

A draft copy of the Woodward Clyde report and the electronic database has been provided to SECOR for review. The electronic database will be submitted directly to Ecology.

Ecology Comment:

Page 5: In either the RI report or in this document there needs to be a true summary of existing information. Based on the information presented in the Work Plan it is obvious that a detailed file review has not been done since some new subfacilities and more recent work has been completed which is not included in the Final Work Plan.

SECOR Response:

The RI report will provide a summary of the existing historical data to the extent necessary to provide sufficient background information to develop conclusions for the RI. The data presented in the quarterly reports to be provided by Ecology for the 13 existing subfacilities in the YRRA will be incorporated into the RI report.

Ecology Comment:

Page 7: The issue of written authorization: Attorneys need to work out the issues including hold harmless clauses. SECOR is working for the Working Group not Ecology. Maybe language like this is more appropriate: SECOR will obtain written permission from the property owners to place the proposed wells on private property on behalf of Ecology. We need to work this out for the private property, the existing subfacilities, and city properties.

SECOR Response:

Subsequent to receipt of Ecology's comment noted above, Ecology agreed to issue the access request letters as the owner of the new wells, with technical support provided by SECOR. SECOR is providing coordination and technical support for Ecology to obtain access permission. Ecology has submitted written requests for access to the public and private monitoring well locations located in the YRRA.

Ecology Comment:

Waste Storage: Storage is SECOR's responsibility; Ecology just signs final disposal. This can get worked out in the addendum.

SECOR Response:

The Addendum attached with the Final Work Plan provides potential options for disposal of wastewater and soil. Ecology will select and approve the disposal options and sign all waste disposal manifests. SECOR will contract with the disposal facility selected by Ecology.

Ecology Comment:

Page 9: Ecology will work with SECOR to gain access for survey. Also the electronic map data needs to include latitude and longitude in degree/minute/second for our system.

SECOR Response:

Ecology has submitted a letter authorizing access for SECOR to the 13 subfacilities in the YRRA to complete the surveying and conduct quarterly monitoring activities. SECOR will contact the facilities; Ecology will confirm in writing to SECOR that access to the YRRA subfacilities has been granted prior to initiation of SECOR.

As noted in the Final Work Plan, the surveying will include "northing and easting coordinates" which means latitude and longitude in degree/minute/second which will be included on the electronic map.

Ecology Comment:

Page 11: PCE and breakdown products. Is it possible to get lab reports for all 8010 components? We do not need SECOR to do anything with the information but it would be useful to Ecology.

SECOR Response:

The laboratory analytical results for the PCE breakdown products included in EPA Method 8010 will be provided to Ecology separately from the required PCE analytical results, which will be included in the RI documentation.

Ecology Comment:

Page 12: SECOR data standard is okay if it includes all of Ecology's needs. The CD-ROM I recently provided to Peter Jewett at SECOR is the format Ecology needs. It would be best if data, maps, and sample results were exported by SECOR straight to Ecology format. Please provide all maps and sample data already exported into MapInfo or directly importable format.

SECOR Response:

SECOR will provide all electronic data generated from this investigation in a format consistent with the Ecology format.

Ecology Comment:

Page 13: The determination about Area 2 will be based on the language in the consent decree. We suggest you just use language on page 13 of Consent Decree Work Plan. Final product needs to include a map(s) and listing of specific addresses and whether they are on water or not. It is Ecology's goal to be able to have a specific enough package of information that future work can be based on this information.

SECOR Response:

See the revised text for the modified language.

Ecology Comment:

Page 14: The RI report needs to include the historic subfacility information that was given to Woodward Clyde and SECOR in order to get accurate picture of what is happening with the PCE.

SECOR Response:

The historical data will be summarized in the RI Report to the extent necessary to provide sufficient background information to develop conclusions for the YRRA.

The attached Final Work Plan has been revised to accommodate the modifications discussed above. Feel free to contact Mark Valentine of *de maximis, inc.* at (206) 682-1966, Mr. Cliff Schmitt or Mr. Peter Jewett of SECOR at (425) 641-9900 if you have any questions.

Sincerely,

Clifford T. Schmitt
Clifford T. Schmitt, R.G.
Senior Project Manager

Peter Jewett
Principal Engineering Geologist

CTS/PJ/ss

cc: Mark Valentine, *de maximis, inc.*

Attachment

WORK PLAN
FOCUSED REMEDIAL INVESTIGATION
YAKIMA RAILROAD AREA
YAKIMA, WASHINGTON

SECOR PN: 00378-001-01

Prepared by
SECOR International Incorporated

for
Cameron-Yakima Working Group
c/o Mr. Mark Valentine
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705 Second Avenue, Suite 802
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August 25, 1997

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APPENDICES

1.0 INTRODUCTION

SECOR International Incorporated (SECOR) has prepared this Focused Remedial Investigation (RI) Work Plan (Work Plan) on behalf of the Cameron Yakima Working Group (the Group), to describe the planned assessment activities and fieldwork protocols for the Focused Remedial Investigation to be conducted at the Yakima Railroad Area site (YRRA) in Yakima, Washington (Figures 1 and 2). The technical scope of work is in accordance with the Consent Decree entered into between the Washington State Department of Ecology (Ecology) and the Group. As defined in the Consent Decree, the Scope of Work is to be conducted as follows:

1) A Remedial Investigation (RI) of the facility known as the Yakima Railroad Area (YRRA, Figures 1 and 2);

2) Connection of approximately 63 houses in the 1500, 1600, 1700, and 1800 Blocks of Ninth Avenue in Yakima, to the city water supplies;

3) A public participation plan;

4) A receptor analysis of the YRRA;

5) Provisions of bottled water to 63 residents identified in Item (2) above, until such time as the municipal water supply conversion is available;

6) The compilation and review of soil and groundwater data collected at the YRRA; and

7) Data review for purposes of identifying additional potentially liable persons (PLPs) at the YRRA.

1.1 PURPOSE

The purpose of this Work Plan is to provide a technical guidance document for collection of data, specified in Exhibit B of the Consent Decree to prepare a Focused Remedial Investigation (RI) Report in accordance with Ecology Model Toxic Control Act (MTCA) Washington Administration Code (WAC) Chapter 173-340-350. This Work Plan specifically addresses Items (1) and (4) required by the Consent Decree. The remaining items, (2), (3), (5), (6), and (7), required by the Consent Decree are to be or have been conducted by the Group and are not incorporated into this submittal.

The Group is currently in the process of finalizing a contract agreement with the city of Yakima to allow the connection of the 63 houses on South Ninth Avenue to the city of Yakima's municipal water system (Item 2). The Group is financing a bottled water distribution program until the residents are connected to the city's water system (Item 5). Regarding Item 3, on November 29, 1995 the Group submitted to Ecology a public participation plan which was prepared by MNA Associates. The Group contracted with Woodward Clyde Consultants to compile data available in Ecology files up to 1995 (Item 6). The database will be provided to Ecology in an electronic format. Regarding Item 7, Kleinfelder, Inc. conducted a review to identify additional PLPs based on carbon shipment records available at the Cameron-Yakima facilities. Lists of generators who shipped carbon to Cameron-Yakima were provided to Ecology on June 9, 1995 and July 7, 1995.

The purpose of the Focused RI study is to: 1) evaluate the seasonal groundwater flow regime and provide additional aquifer characterization in the vicinity of the YRRA; 2) analyze samples from the upper and lower aquifers for PCE in the groundwater, and 3) evaluate the extent of potential receptors exposed to PCE by use of groundwater as a potable resource in the vicinity of the YRRA.

1.2 WORK PLAN ORGANIZATION

The Work Plan is organized in accordance with WAC 173-340 requirements. Section 2.0 provides a brief site description from available information. Section 3.0 discusses the proposed scope of work for the RI. Section 4.0 summarizes the data management scope of work. Section 5.0 provides the receptor survey scope of work, and Section 6.0 details the reporting requirements. Project organization is discussed in Section 7.0, and the project schedule is provided in Section 8.0.

This Work Plan contains three necessary components to complete the Focused RI. Specific field protocols for sampling and analysis are summarized in the Sampling and Analysis Plan (SAP), attached as Attachment B. The specific Quality Assurance/Quality Control measures are detailed in the Quality Assurance Project Plan (QAPP) attached as Attachment C. A Health and Safety Plan (HASP) required by state and federal law is attached as Attachment D.

2.0 SITE DESCRIPTION

This section describes features at the site and vicinity, reviews operational history of the site, and summarizes the present understanding of the local hydrogeology. Information summarized in this Section is based on information provided to SECOR by the Group. On-site investigations have not been conducted by SECOR for this summary. The following is a summary of relevant site area information as provided to SECOR.

2.1 SURFICIAL FEATURES

The YRRA, as defined by Ecology, consists of approximately six square miles of predominantly industrial and commercial property that parallels the railroad corridor on the east side of Yakima, and the northern portion of Union Gap in Washington (Figures 1 and 2). The four-mile-long railroad corridor trends diagonally from Lincoln Avenue in the northwest to Ahtanum Road in the southeast (Figure 2). The YRRA consists of a broad, gently sloping plain located west of the Yakima River. The ground surface slopes from northwest to southeast with maximum elevation of 1,080 feet above mean sea level (msl) at Lincoln Avenue to elevations of less than 960 feet above msl near Ahtanum Road in Union Gap.

2.2 GEOLOGY AND HYDROGEOLOGY

2.2.1 Regional Geology

The Yakima Valley is a broad syncline bounded by east-west trending anticlinal ridges of basalt in the Yakima fold belt, including the Yakima Ridge to the north and the Ahtanum/Rattlesnake Ridges to the south. The Yakima River bisects these folded uplands at Selah Gap and Union Gap, respectively. Columbia River Basalts, which form effective bedrock in the area, outcrop on the ridges and dip beneath the valley-filling sediments of the Ellensburg Formation and Yakima Gravels.

The uppermost number of the basaltic-bedrock is the Pomona basalt which is the youngest member of the Columbia River basalt group. Overlying the basalt-bedrock is the Upper Ellensburg Formation which consists predominantly of volcaniclastic detritus of variable texture (gravel, sand, and fine-grained members), including mudflow and ash deposits from the ancestral Cascade Mountains. Overlying the Upper Ellensburg Formation are Yakima Gravel deposits, which consist of coarse-grained (sand and gravel) fluvial, alluvial, and preglacial flood deposits associated with the present and ancestral Yakima River and its tributaries. Manmade fill deposits have been placed in the valley during the construction of the railways and other historical construction activities. In many places this required filling of wetland areas during early settlement.

2.2.2 Regional Hydrogeology

The Yakima Valley hydrogeology consists of a three-aquifer system. Water-bearing zones include: 1) the uppermost aquifer consisting of unconfined, relatively uninterrupted sand and gravel in the Yakima Gravel; 2) an intermediate, lower aquifer consisting of confined coarse-grained interbeds in the Ellensburg Formation; and 3) the lower-most aquifer confined fractured intervals in the Pomona Basalt. These aquifers are capable of yielding hundreds of gallons per minute.

The Yakima Gravels are extremely permeable in the vicinity of the Yakima River, but fines content and cementation increases to the west resulting in permeability decrease in the Yakima Railroad Corridor. An older, alluvial terrace is mapped in the western part of the valley and evidently accounts for the reduced permeability of the unconfined aquifer in that area (Hart-Crowser, 1994). The depth to first encounter groundwater is typically less than 20 feet below ground surface (bgs), depending on topography, seasonal weather variations, and irrigation practices. The depth of groundwater fluctuates seasonally by as much as five feet or more; typically deeper in the spring and shallower in the fall due to recharge effect from irrigation during the summer months.

Direction of the regional groundwater flow is predominantly from the surrounding upland regions into the valley, and eventually toward the Yakima River. In the vicinity of the Yakima River, where Yakima Gravels have fewer fine grained material and are more permeable, groundwater flow becomes subparallel to the river course and assumes a more southerly directional orientation. The vertical groundwater gradient is typically upward, and artesian flow is commonly observed in wells completed a few hundred feet or more bgs. Artesian conditions are thought to be augmented by the synclinal structure of the basin.

2.3 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The YRRA is a commercial and industrial corridor located along the Burlington Northern Railroad in Yakima and Union Gap, Washington (Figures 1 and 2). During routine inspections of industrial sites located within the YRRA during the 1980s, EPA discovered concentrations of PCE in soil and groundwater samples collected from the area. According to Ecology files, groundwater was first detected with PCE during sampling at the Rainier Plastics facility, near Nob Hill Road in the central part of the YRRA (Figure 2).

In 1988, Black & Veatch Waste Management, Inc. conducted a preliminary investigation of the Cameron-Yakima site, also located in the central part of the YRRA, and identified elevated concentrations of PCE in soils. Soil containing concentrations of PCE also had been detected by EPA at the Woods Industries site in the southern part of the area, and a number of other facilities in the area that had managed PCE (including dry cleaners and auto repair shops). As a result, EPA contracted with Ecology and Environment (E&E) to conduct a soil-gas survey to provide a screening level assessment of PCE in soil/groundwater throughout the area.

The E&E report identified the following four sites known to have managed or used PCE and potential sources of contamination: Nu-Way Cleaners, U-Haul, Cameron-Yakima, and Woods Industries (Figure 2). Two additional soil-gas anomalies were identified between the Cameron-Yakima and Woods Industries sites, but no obvious sources were identified. The E&E report identified soil-gas PCE concentrations ranging from 0.02 to 2 mg/m^3 near the Cameron-Yakima site, up to 18 mg/m^3 upgradient of the site near the U-Haul site and up to 4 mg/m^3 downgradient of the Cameron-Yakima site, near the Woods Industries site.

In February 1991, Science Applications International Corporation (SAIC), under contract to Ecology, submitted recommendations to Ecology regarding the additional work required to identify PCE sources and to better determine the extent of PCE contamination in the YRRA. In the fall of 1991, Ecology notified nine entities (including Cameron-Yakima Incorporated, Nu-Way Cleaners, Hahn Motor Company, Frank Wear Cleaners, Yakima County, Paxton Sales Corporation, U-Haul of Inland Northwest, and Briar

Development) that they might be listed as PLPs for the YRRA under Chapter 70.105D RCW. Final PLP determinations were made by Ecology in 1991 for U-Haul, Paxton Sales, Frank Wear Cleaners, Nu-Way Cleaners, Cameron-Yakima, CMX Corporation, Yakima County, Briar Development, Hahn Motors, Burlington Northern Railroad, Westco Martinizing, Agri-Tech, and Fifth Wheel Shop.

On July 19, 1995, Ecology issued Enforcement Order No. DE 95TC-C212 to 17 PLPs ordering them to either monitor for PCE in groundwater in the Ninth Avenue area or to connect these homes to an appropriate municipal water system. In addition, Ecology ordered these PLPs to prepare for and to conduct an area-wide Remedial Investigation/Feasibility Study (RI/FS) for the entire YRRA. Between mid-1992 and mid-1995 Ecology issued Enforcement and Agreed Orders to seven PLP facilities to perform source work.

The Group entered into a Consent Decree which superseded any previous Enforcement Order. The Consent Decree requires the Group to complete a Focused RI in accordance with Exhibit B.

A total of 105 monitoring wells have been installed in the YRRA. The PCE data from these 105 monitoring wells and additional data from approximately 58 residential wells sampled by Ecology indicate that concentrations of PCE in groundwater begin at the northwest part of the YRRA, upgradient from the Cameron-Yakima facility. Three dry-cleaning establishments located in this area appear to be the initial sources of this groundwater impact. The PCE groundwater plumes from these facilities effect background upgradient wells installed for other facilities located to the southeast (downgradient). However, PCE concentrations in groundwater also increase downgradient. Most of the 105 monitoring wells are shallow, water-table wells completed in the upper 20 to 30 feet of the aquifer. Fewer than 10 of these wells are believed to be installed deeper into the aquifer. However, where deeper well PCE data are available, they generally show decreases in PCE concentrations with increasing depth.

A more detailed discussion of the historical data will be provided in the RI Report.

3.0 REMEDIAL INVESTIGATION

Prior investigations at the YRRA site (Section 2.3) has consisted of the assessment for PCE in soil and groundwater underlying the site. Results of these investigations indicate that PCE was released to the YRRA and has effected soil and groundwater above MTCA Method A cleanup standards.

The investigation activities will be performed to assess the characteristics of groundwater at the locations specified in Figure B-1, Exhibit B, Consent Decree. The laboratory analytical results and the field observations will be used to evaluate for the presence of PCE in the shallow and deeper aquifer. The assessment was designed to evaluate depth to groundwater in the first two water bearing zones and the extent and degree of PCE in the groundwater. In addition to the groundwater evaluation, a receptor survey will be done to determine the potential risk of exposure in the YRRA and downgradient area to PCE contaminated groundwater. The survey results will be incorporated into the RI Report.

This Section describes the tasks that will be performed for the Focused RI. These tasks involve obtaining access for public street work, complying with permitting requirements, conducting the site assessment, and reporting. The objectives and rationale for each task, and field work protocols, are also described in the following subsections.

3.1 PRE-FIELD INVESTIGATION

Prior to the initiation of the drilling activities, SECOR representatives will meet with a city of Yakima Public Works Department engineer, the city of Union Gap, and a representative of Ecology to inspect, approve, and mark the proposed groundwater monitoring well locations specified in Figure B-1 of Exhibit B of the Consent Decree. Ecology will submit access agreements to the city of Yakima, and to the city of Union Gap for installation of the wells at the various locations.

3.1.1 Health and Safety Plan

A project-specific Health and Safety Plan (HASP) for field investigation activities is included in Appendix C of the Work Plan. The HASP is prepared in accordance with state (WAC Chapter 296-62) and federal regulation (40 CFR 1910.120) guidelines for performing work at hazardous or potentially hazardous waste sites.

3.1.2 Access Agreements and Permitting

Before drilling and well installation, well start card permits will be filed with Ecology in accordance with WAC Chapter 173-160. Ecology will be included on these cards as the owner of the wells.

Ecology has submitted letters to owners of the existing groundwater wells to be sampled as part of this RI to confirm that SECOR will have access to the monitoring wells (Appendix A). Ecology will provide SECOR with written authorization; keys for each well; and a site map confirming the specific well on each site to be sampled.

Monitoring wells located on city streets, right-of-ways, and/or easements, may require a street use permit or other access agreement required by the city of Union Gap and/or Yakima. The permit/access agreements will be in place prior to beginning the drilling. A copy of Ecology's access request is included in Appendix A.

There are four well sites located on the southern portion of the YRRA, in the city of Union Gap, which will be located on private property (RI 7s and d; RI 8s and d, RI 9s and d, RI 11s and d, Figure 2). Ecology has submitted a written request for access to the private sites (Appendix A).

3.1.3 Utility Locate/Utility Clearance

SECOR will notify the Underground Utility Council (UUC) of Upper Yakima Valley/Kittitas County of the intent to drill at each boring location. UUC contacts the appropriate agencies or companies with underground utilities in the identified drilling area. The agencies then mark the locations of their utilities at each drilling site. To confirm clearance of underground utilities, SECOR will contract a private utility locating company, Applied Professional Services, Inc. (APS) of Issaquah, Washington, to clear the specific drilling locations. APS will review the city utility map and conduct an electronic locate at each boring location prior to drilling.

3.1.4 Waste Disposal

Addendum #1, Attachment A, provides waste disposal options for disposal of soil, groundwater, and decon-water identified by SECOR. Ecology will select and approve of the waste disposal facility and will sign all disposal manifests. The intent is to transport the waste directly to the disposal location and avoid any need for temporary storage.

3.2 WELL INSTALLATION

Specific details for well construction, waste sampling, and analytical testing are provided in the SAP attached as Attachment B of this Work Plan. The groundwater monitoring wells will be owned by Ecology. The proposed well locations, labeling protocols, and other details are summarized on Table 1 and shown on Figure 2.

SECOR will install 26 to 28 groundwater wells at the locations shown on Figure 1-B of the Consent Decree. If groundwater elevation in the deep extraction well to be installed on the east side of the YRRA, (RI 13d, Figure 2) is at the same elevation as the shallow well (RI 13s, Figure 2), then the two deep monitoring wells proposed to the south (RI 12d and RI 11d, Figure 2) will not be installed. With two possible exceptions, the wells will be installed in pairs, at least 10 feet below seasonally low groundwater with the deeper well drilled to an anticipated 130 feet bgs and 20 feet below the seasonal water table, with the shallow well expected to be 30 feet bgs. A review of existing groundwater data in the vicinity of each well location will be completed prior to drilling. The paired wells will be installed as close together as possible and located no greater than 20 feet apart. SECOR will use an air rotary drill rig to avoid difficulties with the hard drilling conditions expected in the YRRA. Barricades and traffic control signs will be used to secure the work area in accordance with the site-specific traffic control plan. Soil cuttings will be handled as waste and contained in WDOT rated 1-cubic yard boxes or lined drop boxes and stored at the temporary storage facility pending characterization and disposal.

3.2.1 Soil Boring Installation

A SECOR geologist registered with Ecology in accordance with WAC Chapter 173-360 to perform site assessments will be at the drilling sites to supervise the advancement of the soil borings. The borings will be drilled and the wells installed by Cascade Drilling, Inc. (Cascade), of Woodinville, Washington, a Washington State licensed driller, using a truck-mounted Ingersoll Rand T3W top drive air rotary drilling rig equipped with 10-inch or 8-inch outside diameter drill casing. (CASCAD1088KK).

Soil drill cuttings will be visually classified by the field geologist in accordance with the Unified Soils Classification System (USCS). The results of field observations will be recorded on field reports on boring logs. Information recorded on each boring log will include pertinent geologic aspects of the soil units (lithologic descriptions including color, grain size, hardness, moisture, and other features), hydrogeologic conditions encountered during drilling, and well completion details. Upon completion, the borings will be constructed as groundwater monitoring or as aquifer test wells in accordance with WAC Chapter 173-160.

With two possible exceptions, the borings will be advanced in pairs; one boring of the pair will be advanced to a depth of 100-feet below the seasonal low water table, and one to a depth of 20-feet below the seasonal low water table. The boring pairs will be located as close together as possible and not greater than 20-feet apart. A maximum of 28 soil borings, 14 deep and 14 shallow, or a minimum of 26 soil borings, 12 deep and 14 shallow will be advanced at the site. One boring pair will be advanced at the location near Nob Hill Boulevard and South 18th Street. If the groundwater level in the deep boring/well of this pair located near Nob Hill Boulevard is equal to or higher than the groundwater level in the shallow boring/well, then the deep borings in the other two easternmost locations, Lilac Lane near South 18th Street and Valley Mill Road near Rudkin Road, will not be drilled (Figure 2).

3.2.2 Groundwater Monitoring Well Installation

Monitoring well installation will be conducted in accordance with the *Minimum Standards For Construction and Maintenance of Wells* (WAC Chapter 173-160). The wells will be constructed through the hollow portion of the drill casing using 2-inch diameter schedule 40 PVC, flush-threaded 0.020-inch slot screened casing and blank casing. The base of the casing will be sealed with a PVC flush-threaded bottom cap and the top covered with a locking expansion plug-type locking cap. The plug-type locking caps will be secured with a padlock. A detailed schematic of a typical well installation is attached with the SAP, Attachment B.

3.2.3 Groundwater Pump Test Well Installation

The groundwater pump test wells will be installed in accordance with WAC Chapter 173-160. The wells will be constructed through the hollow portion of the drill casing using 6-inch diameter schedule 80 PVC, flush-threaded 0.030-inch slot screened casing and blank casing. The base of the casing will be sealed with a PVC flush-threaded bottom cap and the top covered with a locking expansion plug-type locking cap. A traffic rated flush mount monument will cover the well heads.

3.2.4 Well Development

SECOR and the drilling subcontractor, Cascade, will develop the newly installed wells upon completion in accordance with the protocols defined in the SAP, Attachment B. Well development will be completed by surging, pumping, or bailing, as appropriate. Wells will be developed to be silt and clay free, if possible. Formation water will be used for developing the wells. Development water will be contained in WDOT approved drums or direct discharge to a storm drain or irrigation ditch. The drums will be stored pending characterization and disposal.

3.2.5 Survey of Monitoring Wells

A survey point on each well will be clearly marked by cutting a small notch in the top of the well casing. The newly installed 28-wells and 15 previously installed wells will be surveyed by PLSA, a licensed surveyor located in Yakima, Washington. Ecology has submitted written requests for access to the subfacilities (Appendix A). SECOR will assist with coordination and technical support. The survey will obtain northing and easting coordinates for each monitoring well in the Washington State Plane, South Zone NAD 29 Datum. The surveying data will be provided on an electronic map with latitude and longitude (in degree/minute/second) consistent with Ecology format. Elevations of each well will be measured, to the nearest 0.01-foot, at the top of casing in NAD 29 Datum, 1947 adjustment. The state plane coordinates and elevations will be based on the city of Yakima's GPS control points with elevations and coordinates being provided by the city of Yakima.

3.3 WASTE HANDLING

Soil generated from the drilling will be discharged directly to storage boxes or dump trucks for transport to a disposal facility. Extracted groundwater will be stored at each monitoring well in 55-gallon drums pending disposal. Analysis and characterization of soil cuttings, extracted groundwater, and decontamination water will be done in accordance with the SAP in Attachment B.

Disposal of the soil and extracted groundwater will be selected by Ecology and will depend on the concentrations of PCE, as defined in the SAP. SECOR has identified options for disposal of the soil and extracted groundwater generated from the field investigation. The options are summarized in Addendum 1, Attachment A.

3.4 AQUIFER EVALUATION

The objective of the proposed aquifer characterization program is to determine whether known impacts to the shallow aquifer units can reasonably be expected to effect a deeper aquifer in the future and to develop aquifer characteristics.

3.4.1 Aquifer Pumping Tests

Aquifer testing will consist of two tests: a step draw-down test followed by a constant discharge rate test. The step draw-down test will be performed to determine the optimum sustainable rate for pumping during the constant discharge rate test. Once a discharge rate has been selected, the constant discharge rate test will be performed to evaluate hydraulic properties of the aquifer.

Each constant rate discharge aquifer test will be of a 24-hour duration and be run in up to two shallow and two deep wells. Recovery data will be collected following pump shutdown. The tests will be run by placing a 4- or 5-inch diameter submersible impeller pump (with three to five horsepower) in the pumping well. The pumping rate will be based on the results of the stepped draw-down tests. To record the draw-down and recovery data pressure transducers will be placed in both the pumping well and the observation well. The transducers will be connected to a data logger for data collection and storage. The data will be collected at logarithmical timed intervals for the first half-hour and then every half-hour for the duration of test (and for recovery data collection).

3.5 QUARTERLY GROUNDWATER MONITORING

SECOR will conduct quarterly groundwater monitoring and sampling of the 26 to 28 new wells and 15 existing wells (total of 41 to 43) for four quarters. Ecology has submitted written requests for access to these sites (Appendix A). Ecology will provide SECOR written authorization prior to sampling at each subfacility. Each monitoring well will be gauged for static water levels and total depth of the well by measuring, using a water level indicator, the distance from the survey notch on the top of the well casing to the top of the water column and to the base of the casing. Using the static water level and the total well depth measurements, a casing volume of water will be calculated. Based on this calculation, three well casing volumes of groundwater will be purged from the well before groundwater samples are collected.

Groundwater samples will be collected, labeled, stored, and handled using EPA/Ecology protocols. The samples will be sent to North Creek Analytical of Bothell, Washington, for analysis. Groundwater samples will be analyzed for PCE by EPA Method 8010, specific details are provided in the SAP, Attachment B. QA/QC samples, including trip blanks and field duplicates, will be included with the analyses. Specific details are provided in the QAPP, Attachment C.

4.0 DATA MANAGEMENT

SECOR will maintain analytical chemistry, ground water level, and well construction detail records in an Access™-based data management system. Analytical data will be received by electronic transfer from the laboratory and uploaded into the database. Water level records will be submitted in spreadsheet format by the field crews. All data will be stored in a previously-developed ("SECOR standard") database format which will be consistent with the Ecology format. Paper copies of the analytical data will also be maintained in the project files.

Data from the SECOR standard system can be exported for use in all major mapping, contouring, and spreadsheet programs including MapINFO™, AutoCAD™, and SURFER™. Necessary tables will be generated from the database and may be imported into word-processing programs for reports, if desired. All data will undergo a QA/QC review at time of receipt (see Attachment C, Quality Assurance Project Plan). Portions of this review are automated and are performed by the SECOR database management system.

5.0 RECEPTOR ANALYSIS

A receptor analysis will be done on behalf of Ecology as part of this RI. A questionnaire will be developed to survey businesses and residents of the YRRA, Areas 1 and 2 are shown on Figure 1-B, Exhibit B, Consent Decree. The questionnaire and an explanatory cover letter will be developed in both English and Spanish. The questionnaire and letter will be reviewed by Ecology prior to completion. Before it is finalized, the questionnaire will be pre-tested on a small group of selected businesses and residents, and it will be modified as necessary.

Complete mailing and telephone lists will be developed for businesses in the YRRA, and for businesses and residents in Area 1. Based on the results of the quarterly groundwater sampling analytical results, lists will also be developed for businesses and residents in Area 2. Area 2, located east of the YRRA (east of 4th Street and north of Pacific Avenue), will be surveyed only if, after one irrigation and one non-irrigation event, the groundwater monitoring program indicates that the groundwater in Area 2 flows east during at least one monitoring period and that PCE concentrations at the easternmost well in Area 2 are above 1 micrograms per liter (μg/l). The survey for Area 2 will follow the same steps as above. The survey for Areas 1 and 2 will reach approximately 150 to 250 residences and businesses, respectively.

The questionnaire will be mailed with a postage-paid business reply envelope. Within two weeks of the first mailing, a follow-up mailing will be sent to all addressees who have not replied. Starting two weeks after the second mailing, all of those who have still not responded will be contacted by telephone, utilizing both English and Spanish speaking interviewers. Those businesses and residents who cannot be successfully reached by telephone will be contacted through a door to door survey. The door to door survey will be completed within two months of the initiation of the overall receptor analysis process.

Businesses that are renting or leasing a building may not have sufficient information about the origins of the water they are using. Such instances will be identified through the survey itself, and in these cases the survey team will attempt to obtain relevant information about groundwater by contacting the landlord and/or property owner.

Statistical analysis of the survey results will include tabulation by geographic subarea within the YRRA, Areas 1, and 2, if applicable. Businesses will also be subdivided as to type of business using common business classifications (retail, service, food processing, etc.). The statistical analysis will be completed within 11 weeks of the start of the survey process. The results of the survey and statistical analysis will be included in the RI Report and the electronic database.

6.0 REPORTING

6.1 PROGRESS REPORTING

Monthly Summary reports will summarize the project status, work completed, schedule, and any analytical results completed for that month. The monthly status reports will be submitted to Ecology. The reporting frequency may be reduced to quarterly with approval from Ecology.

6.2 RI REPORT

The Scope of Work summarized in this Work Plan and specified in the Consent Decree will result in the preparation of a draft RI Report in accordance with WAC Chapter 173-340-350 and the Consent Decree. The RI Report will integrate all information developed during this investigation. SECOR will submit a copy of the draft RI Report to Ecology for their review and comment. Following receipt of Ecology's comments, SECOR will revise the draft RI Report for submittal of a final RI Report to Ecology.

6.2.1 RI Report Outline

The RI Report will follow the Ecology outline, Exhibit B, Consent Decree and the requirements of WAC Chapter 173-340-350. A generalized format for the RI Report follows.

INTRODUCTION

AREA BACKGROUND

The area background will summarize the historical data for regional location, pertinent boundary features, general physiography, and hydrogeology and may include maps as specified by WAC Chapter 173-340-840(4) and CFR 300.430(d)(2) depicting the following:

a. General geographic locations

b. Topography and surface drainage depicting waterways, wetlands, flood plains, water features, and surface water bodies located in the area

c. Hydrogeologic features interpreted from series of historical and recent aerial photographs from public sources (up to six photos)

d Land use (i.e., residential, commercial, agricultural, and recreational zoning of the area)

e. The location of identified groundwater municipal and monitoring wells within the YRRA, those within one-half mile downgradient of the YRRA, and those within one-quarter mile of all other boundaries of the YRRA. Sources of well location and construction information will include state and local environmental and public health agencies.

AREA INVESTIGATION

A. HYDROGEOLOGY

1. The RI Report will include a description of the geologic and hydrogeologic characteristics in the vicinity of the YRRA, based on the wells installed and sampled as part of this RI. The description may include:

    a. Stratigraphy

    b. Structural geology

    c. Depositional history

    d. Identification and characterization of areas and relative amounts of recharge and discharge

    e. Regional groundwater flow patterns

    f. Characterization of seasonal variations in the groundwater flow regime

2. Based on the field data obtained, a classification and description of the hydrogeologic units which may be part of the migration pathways in the YRRA (including saturated and unsaturated units) will be discussed. This may include:

    a. Hydraulic conductivity, porosity, effective porosity, pore water velocity, and Darcy velocity

    b. Lithology, grain size, sorting, and degree of cementation

    c. An interpretation of the degree to which interconnections between saturated zones exist

    d. Data and results from aquifer (pumping) tests

3. Based on field data, structural geology, and hydrogeologic units cross-sections will be prepared showing the extent (depth, thickness, lateral extent) of hydrogeological units which may be part of the migration pathways identifying:

    a. Sand and gravel layers in unconsolidated deposits

    b. Zones of higher permeability or lower permeability that might direct and restrict the flow of contaminants

    c. The uppermost aquifer (geologic formation or group of formations that are capable of yielding a significant amount of groundwater to wells and springs)

d. Well driller and hydrogeologic logs and observations

4. Based on data obtained from groundwater monitoring wells, a description of water elevation monitoring will be presented, which may include:

   a. Water elevation contours superimposed on YRRA maps

   b. Hydrogeologic cross-sections showing vertical gradients

   c. The flow system including the vertical and horizontal components of flow

   d. Observed temporal changes in hydraulic gradients

5. The RI Report will contain a map (provided by the city of Yakima) of manmade influences that may affect the hydrogeology of the site superimposed on the YRRA basemap.

B. SOURCE CHARACTERIZATION

The RI Report will reference historical data related to known source areas to provide sufficient information to develop conclusions for the RI. This may include location, features, operating practices, period of operation, and general physical conditions (to the extent this information is provided in the Facility Reports to be provided by Ecology).

C. CHEMICAL CHARACTERISTICS

Collected data will be used to evaluate the extent, direction, and rate of movement of PCE. Data will include time and location of sampling, media sampled, measured concentrations, conditions during sampling, and the identity of the individuals performing the sampling and analysis. The RI Report will present the horizontal and vertical extent of PCE in the groundwater, direction of PCE movement, an estimate of the velocity of PCE, description of factors effecting PCE migration, and an estimate of future PCE migration (to the extent that the defined field programs will provide this information). The data will be presented as follows:

1. Table of principal facts related to sampling and analysis results

2. Maps, superimposed on the YRRA basemap, identifying PCE concentrations (one YRRA map to include sample media, sample numbers, and the longitude and latitude for five known points in the YRRA)

3. Quality assurance data validation, which include evaluation of data according to approved QAPP

4. Data appendix, including QA/QC information and field logs with data, time, and activity information (Actual handwritten field notes and boring logs will be provided to Ecology upon written request by Ecology.)

D. RECEPTOR ANALYSIS

The results of the receptor analysis will be included in the RI Report.

7.0 PROJECT ORGANIZATION AND PROJECT RESPONSIBILITIES

7.1 SECOR PERSONNEL

The project organization is summarized on the Organization Chart, Figure 3. SECOR and subcontractors will coordinate, manage, and conduct all data acquisition tasks, analyses, review, and interpretation. All deliverables will be generated by SECOR and submitted to the Group. All documentation to Ecology will be submitted by the Group.

Clifford T. Schmitt, R.G., Senior Hydrogeologist, is the SECOR team's Project Manager. Mr. Schmitt is the main client contact and will be responsible for day to day management of the project. Specifically, Mr. Schmitt will define tasks to meet the client's objectives and assign activities to the pool of task leaders. He is responsible for scheduling, budgetary control, personnel assignments, and review of deliverables.

Peter Jewett, Principal Engineer Geologist, will serve as the Quality Assurance/Quality Control (QA/QC) Officer for this project. Mr. Jewett will be responsible for insuring that Mr. Schmitt and his staff perform all aspects of the project properly, promptly, and to the standards of technical performance established by SECOR and the Group.

Steve Ihnen, R.G., Principal Hydrogeologist, will serve as the key technical advisor for the preparation, execution, and data collection of the aquifer testing. Mr. Ihnen will be in charge of the reduction and interpretation of the data collected during the aquifer tests. His responsibilities will include all phases of planning, scheduling, and supervising aquifer test field operations. His technical work will include groundwater modeling.

Christopher Wade, Associate Scientist, will function as the project team's Database Manager. Mr. Wade's responsibilities will be to maintain the analytical and field data in the electronic data management system.

Curtis Goddard, R.G., Project Geologist, is the SECOR team's field leader. Mr. Goddard's responsibilities will include oversight of all field operations and communications with subcontractors, on-site group personnel, and the SECOR project leaders. His duties will include field operations for the aquifer tests, supervision of field geologists/technicians during drilling and groundwater monitoring activities, and report writing.

Erik Chapman, and Tim Ree, Technicians, are geologists and the SECOR team field technicians who will support the field work components of the project. Mr. Chapman and Mr. Ree will provide direct supervision of the drilling contractors in the field, collect samples, and keep field records of work performed.

7.2 SUBCONTRACTOR

7.2.1 Fitch and Marshall, Inc.

Fitch and Marshall will be conducting the receptor analysis. The firm is comprised of economists and agribusiness consultants, and regularly conducts business surveys in the Central Washington area. Address: 408 North First Street, Yakima, WA 98901, Telephone: (509) 453-2354.

7.2.2 Cascade Drilling Inc.

Soil borings, well installations, and well development will be performed by this drilling firm. License No: CASCAD1088KK, Address: 19404 Woodinville-Snohomish Road, Woodinville, WA 98072, Telephone: (425) 485-8908.

7.2.3 PLSA Engineering and Surveying, Inc.

Wellhead surveys will be performed by PLSA. This firm has conducted business in Central Washington for over 25 years. State Engineering License No: 498, Address: 1120 West Lincoln Ave., Yakima, WA 98902, Telephone: (509) 575-6990.

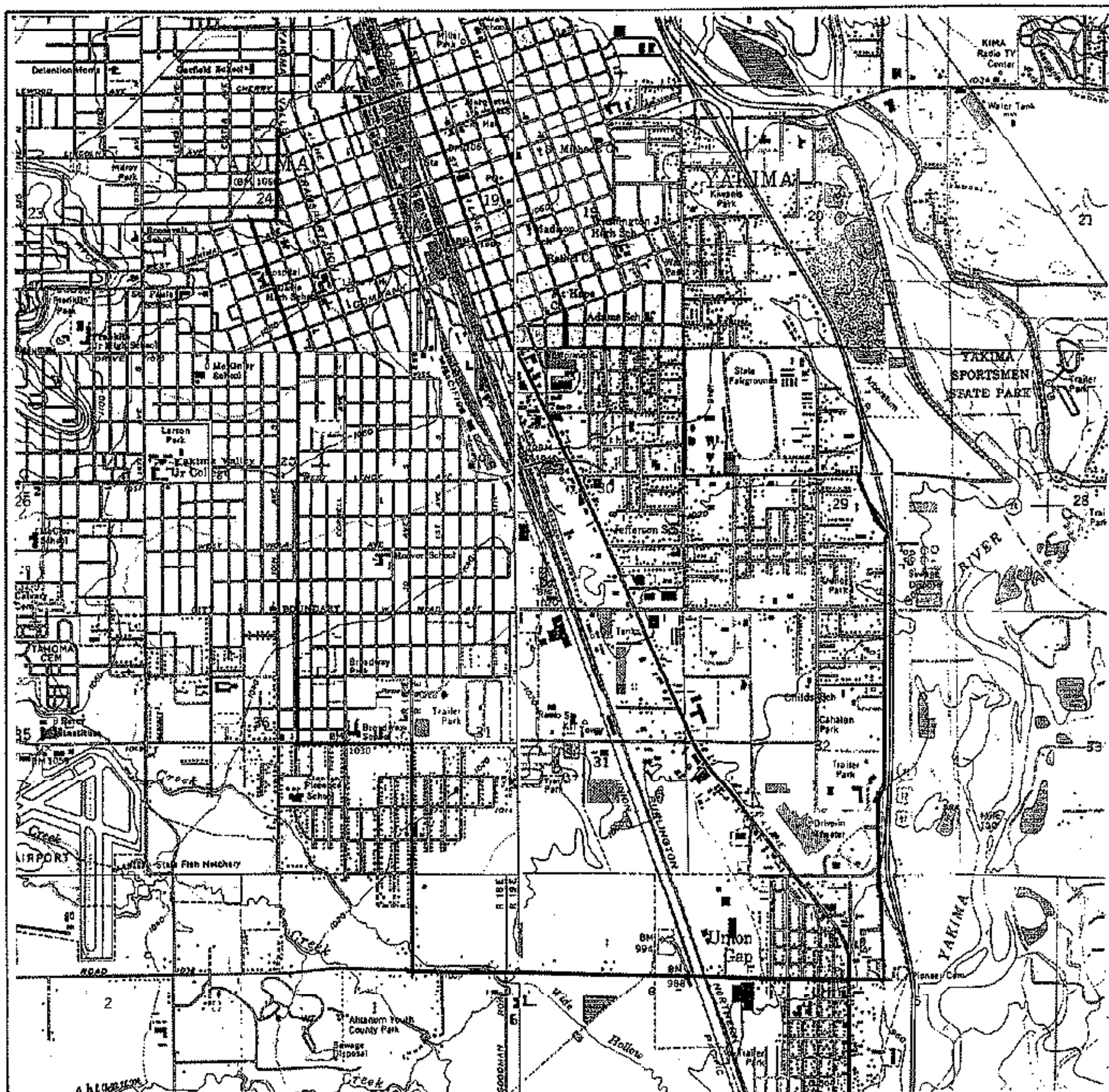
7.2.4 North Creek Analytical, Inc.

North Creek Analytical, a state certified laboratory, will provide all analytical services for the project. License No: WSDOE #C008, Address: 18939 120th Avenue, N.E., Suite 101, Bothell, WA 98011-2569, Telephone.: (425) 481-9200.

8.0 PROJECT SCHEDULE

The preliminary project schedule is summarized in the attached Figure 4. The final schedule will be dependent on the review of the draft Work Plan by Ecology obtaining access agreements, street use permits, and disposal arrangements.

FIGURES



WASHINGTON

North

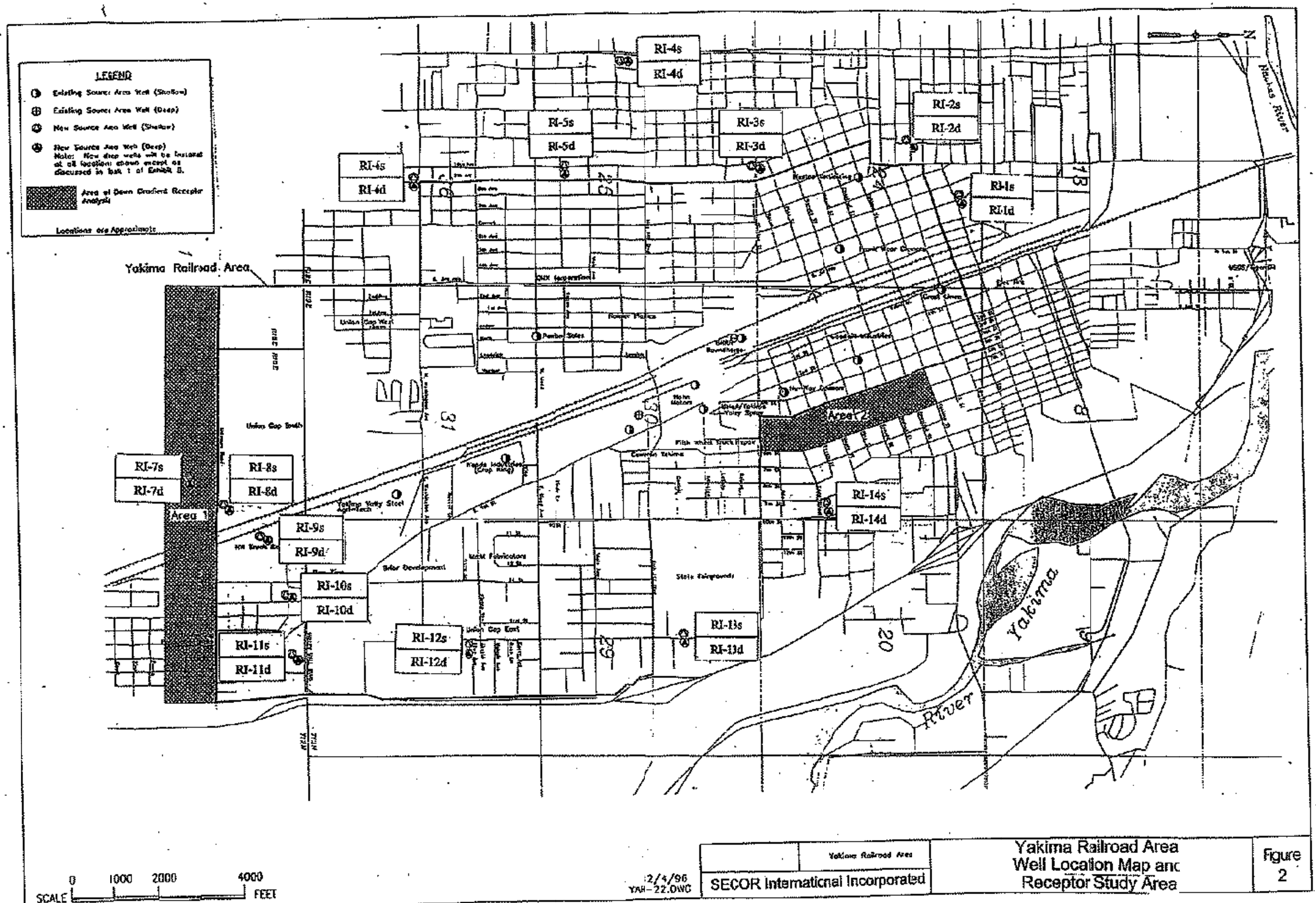
0 1/2 1

SCALE (MILES)

REFERENCE: USGS 7.5 MINUTE QUADRANGLE; YAKIMA, WASHINGTON; 1977

SECOR International Incorporated	SITE LOCATION MAP YAKIMA RAILROAD AREA YAKIMA, WASHINGTON	FIGURE: 1
	JOB#: APPR: DWN: KWW DATE: 7/2/97	

DWG:



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SECOR International Incorporated	Yakima Railroad Area

Yakima Railroad Area
Well Location Map and
Receptor Study Area

Figure 2

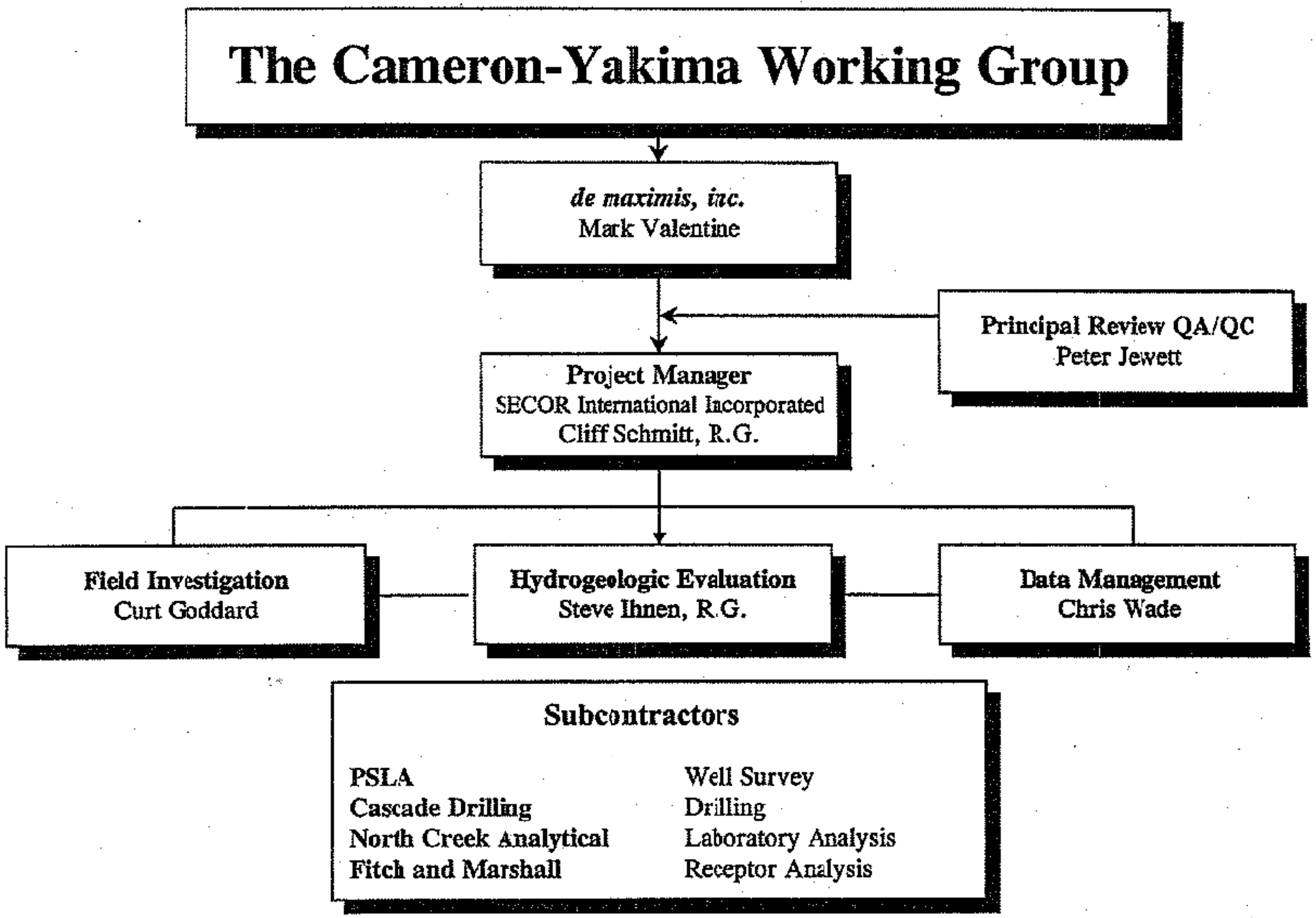
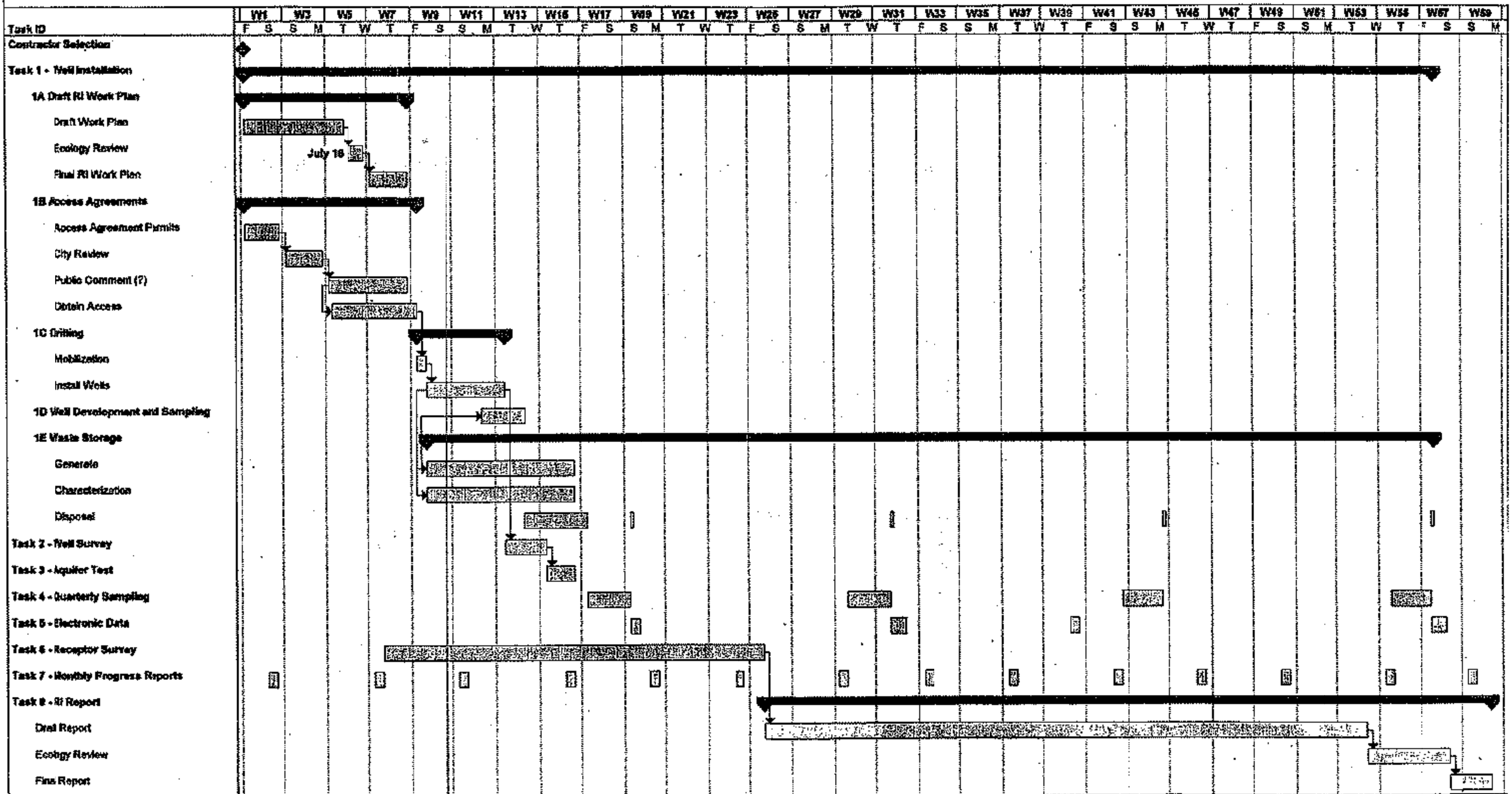


Figure 3

PROJECT ORGANIZATION

Figure 4 - Revised RI Work Schedule 1997 - 1998
Yakima Railroad Area
Yakima, WA



TABLES

TABLE 1
MONITORING WELL LOCATION
Yakima Railroad Area
Yakima, Washington

Well ID	Location	Notes
RI-1d RI-1s	N. 4th Ave. and W. "D" Street, Yakima	Proposed well locations in dirt surfaced area between sidewalk and Paved street - SW side of intersection on W. "D" St.
RI-2d RI-2s	Oregon Ave., Yakima Jefferson Ave. and	Paved street - SE side of intersection on Oregon Ave. and Proposed well locations in landscaped area between sidewalk
RI-3d RI-3s	S. 10th Ave., Yakima Tieton Dr. and	Proposed well locations in street - SW side of intersection on S. 10th Ave.
RI-4d RI-4s	16th Ave., Yakima *W. Prasch Ave. and	Proposed well locations in asphalt surfaced parking lot at the Yakima Valley Vocational Skills Center - NE side of intersection on W. Prasch Ave.
RI-5d RI-5s	S. 9th Ave., Yakima W. Logan Ave. and	Proposed well locations in street - NW side of intersection on S. 9th Ave.
RI-6d RI-6s	S. 9th Ave., Yakima W. Washington Ave.	Proposed well locations in street - SW side of intersection on S. 9th Ave.
RI-7d RI-7s	Bay St., Union Gap Ahtanum Rd. and	Proposed well locations in dirt surfaced area next to paved privite drive (Bay St.) south of Ahtanum Rd. - next to All-Wood Components, Inc.
RI-8d RI-8s	Union Gap Along Ahtanum Rd.	Proposed well locations in asphalt surfaced shoulder, north side of Ahtanum Rd. - next to Valley Septic Service.
RI-9d RI-9s	Union Gap Along Ahtanum Rd.	Proposed well locations north of Ahtanum Rd. on private property - Northwest Truck Repair & Truck Sales, 805 W. Ahtanum Rd., Union Gap
RI-10d RI-10s	4th St., Union Gap Market St. and	Proposed well locations in dirt surfaced alley intersecting west side of 4th St. and just south of Valley Mall Blvd. - alley runs to the SE from 4th St.
RI-11d RI-11s	Union Gap 16 E. Valley Mall Blvd.	Proposed well locations in asphalt covered parking lot - abandoned JB's Restaurant location - south side of E. Valley Mall Blvd.
RI-12d RI-12s	Lilac Ln., Union Gap S. 18th St. and	Proposed well locations in dirt surfaced area next to S. 18th St., south of Lilac Ln. and west of M.L. King Elementary School
RI-13d RI-13s	Central Ave., Yakima *S. 18th St. and	Proposed well locations in shoulder of (oiled gravel surface cover) Central Ave., south of S. 18th St. and near the irrigation ditch
RI-14d RI-14s	S. 10th St., Yakima Race St. and	Proposed well loations not marked due to utility installation project and Street closure. (possibility - alley west of S. 10th St. off Race St.)

* 6-inch diameter aquifer test wells
Well ID: s = shallow well; d = deep well

TABLE 2
EXISTING SOURCE AREA WELLS SUMMARY

Existing Source Area Wells in Monitoring Program	Well Depth
Westco Martinizing	shallow
Frank Wear Cleaners	shallow
Adeline	shallow
Goodwill Industries	shallow
Nu-Way Cleaners	shallow
BNRR Roundhouse	intermediate
BNRR Roundhouse	deep
Hahn Motors	shallow
U-Haul/Yakima Valley Spray	shallow
Cameron Yakima	shallow
Cameron Yakima	deep
Woods Industries (Crop King)	shallow
Yakima Valley Steel/Agri-Tech	shallow
Paxton Sales	shallow
Southgate Laundry	shallow

APPENDIX A
ACCESS AGREEMENT LETTERS

Work Plan, Remedial Investigation
Yakima Railroad Area
Yakima, Washington
SECOR PN: 00378-001-01
August 25, 1997

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 5, 1997

Mr. John Rutter
Public Works Department
City of Yakima
2301 Fruitvale Boulevard
Yakima WA 98902

RE: Request for Access
Installation of Groundwater Monitoring Wells
Public Right-of-Ways and Easements
Yakima Railroad Area
Yakima, Washington

Dear Mr. Harris:

This letter has been prepared to formally request access for SECOR International Incorporated (SECOR) as contractor to the Cameron-Yakima Working Group (the Group) to install groundwater monitoring and aquifer pumping wells in the public right-of-ways and easements. The installation of the wells is required by Ecology for a Remedial Investigation of the Yakima Railroad Area as defined in the Consent Decree No. CY-96-3196-WFN. SECOR will be installing the wells on behalf of the Group with Ecology designated as the owner of the wells. The Group is represented by Mr. Mark Valentine, of *de maximis, inc.*, of Seattle, Washington. I am the Site Manager at Ecology.

The specific well locations are shown on the enclosed Yakima Railroad Area Well Location Map and the detailed proposed well location intersection maps (see proposed well location nos. RI-1s, RI-1d, RI-2s, RI-2d, RI-3s, RI-3d, RI-4s, RI-4d, RI-5s, RI-5d, RI-6s, RI-6d, RI-13s, RI-13d, RI-14s and RI-14d). The wells have been located in the field with white paint, although the exact location of the borings may change based on existing underground utilities. Every effort has been made to locate the borings off the roadways wherever possible. The scope of work for the field program is provided in the enclosed copies of the Draft Work Plan and Draft Sampling and Analysis Plan. These plans have been submitted to Ecology for review and are pending their comments prior to finalization. SECOR anticipates beginning the drilling in September with completion expected by mid-October.

Mr. John Rutter
August 6, 1997
Page 2

Under RCW 90.105D.090, remedial actions carried out under the Model Toxics Control Act, such as the groundwater work for which we need access, are exempt from the procedural requirements of local permitting laws. Thus, although permits for such things as utility breaks or street use need not be obtained for this work, we must still comply with the substantive requirements of those permitting laws. To that end, we wish to work with you in identifying such substantive requirements. We request that you contact Mr. Peter Jewett, of SECOR, by August 13, 1997 to avoid any delays with conducting the field sampling.

We look forward to working with you on this project. If you have any questions, please feel free to contact Mr. Peter Jewett or Mr. Cliff Schmitt of SECOR, at (425) 641-9900, or me at (509) 454-7837.

Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

Enclosures

cc: Peter Jewett, SECOR
Mark Valentine, *de maximis, inc.*
Steve Thiele, AAG

ACCESS PERMISSION AND AGREEMENT

PERMISSION TO ACCESS the property is hereby granted to the Washington State Department of Ecology (Permittee) and SECOR International Incorporated (SECOR), as contractor to the Cameron-Yakima Working Group (the Group) by the City of Yakima upon the following conditions and agreement:

1. **Permittee.** Ecology, as Permittee, will authorize SECOR, contractor to the Group, to conduct the work required by the Consent Decree No. CY-96-3196-WFN (Consent Decree).

2. **Property Defined.** The Property includes, but is limited to, the portion of real property located in the City of Yakima, Washington described as:

   See attached Yakima Railroad Area Well Location Map

3. **Duration.** Access is granted from the date hereof until completion of the Remedial Investigation (RI) report as authorized by Ecology, to the extent necessary to provide services for the installation of groundwater monitoring wells and conduct routine groundwater monitoring required by the Consent Decree. The wells will be constructed in accordance with WAC 173-160 and the requirements of the Consent Decree and will be owned by Ecology. Upon completion of the RI, Ecology will determine if additional access is required by Ecology or others.

4. **Purpose.** SECOR is allowed access only to the extent necessary for the purpose of providing services on the Property as stated in paragraph 3.

5. **Access.** Access to and from the Property shall be only from or to the immediately adjacent street (see attached Yakima Railroad Area Well Location Map).

6. **Soil.** All soil generated for installation of the groundwater monitoring wells shall be removed from the property on a timely basis in accordance with the Consent Decree.

7. **Groundwater.** All groundwater generated for installation and routine monitoring of the groundwater monitoring wells shall be removed in accordance with the Consent Decree.

Date:______________________

____
John Rutter
City of Yakima Public Works Department

Permittee: ________________________________
Washington State Department of Ecology
Central Regional Office
15 W. Yakima Ave., Ste 200
Yakima, WA 98902-3401

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 6, 1997

Mr. Ken Harris
Public Works Department
City of Union Gap
PO Box 3008
Union Gap WA 98903

RE: Request for Access
Installation of Groundwater Monitoring Wells
Public Right-of-Ways and Easements
Yakima Railroad Area
Yakima, Washington

Dear Mr. Harris:

This letter has been prepared to formally request access for SECOR International Incorporated (SECOR) as contractor to the Cameron-Yakima Working Group (the Group) to install groundwater monitoring and aquifer pumping wells in the public right-of-ways and easements. The installation of the wells is required by Ecology for a Remedial Investigation of the Yakima Railroad Area as defined in the Consent Decree No. CY-96-3196-WFN. SECOR will be installing the wells on behalf of the Group with Ecology designated as the owner of the wells. The Group is represented by Mr. Mark Valentine, of *de maximis, inc.*, of Seattle, Washington. I am the Site Manager at Ecology.

The specific well locations are shown on the enclosed Yakima Railroad Area Well Location Map and the detailed proposed well location intersection maps (see proposed well location nos. RI-8s, RI-8d, RI-10s, RI-10d, RI-12s, and RI-12d). The wells have been located in the field with white paint, although the exact location of the borings may change based on existing underground utilities. Every effort has been made to locate the borings off the roadways wherever possible. The scope of work for the field program is provided in the enclosed copies of the Draft Work Plan and Draft Sampling and Analysis Plan. These plans have been submitted to Ecology for review and are pending their comments prior to finalization. SECOR anticipates beginning the drilling in September with completion expected by mid-October.

Under RCW 90.105D.090, remedial actions carried out under the Model Toxics Control Act, such as the groundwater work for which we need access, are exempt from the procedural requirements of local permitting laws. Thus, although permits for such things as utility breaks or street use need not be obtained for this work, we must still comply with the substantive requirements of those permitting laws. To that end, we wish to work with you in identifying such substantive requirements. We request that you contact Mr. Peter Jewett, of SECOR, by August 13, 1997 to avoid any delays with conducting the field sampling.

We look forward to working with you on this project. If you have any questions, please feel free to contact Mr. Peter Jewett or Mr. Cliff Schmitt of SECOR, at (425) 641-9900, or me at (509) 454-7837.

Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

Enclosures

cc: Peter Jewett, SECOR
Mark Valentine, *de maximis, inc.*
Steve Thiele, AAG

ACCESS PERMISSION AND AGREEMENT

PERMISSION TO ACCESS the property is hereby granted to the Washington State Department of Ecology (Permittee) and SECOR International Incorporated (SECOR), as contractor to the Cameron-Yakima Working Group (the Group) by the City of Union Gap upon the following conditions and agreement:

1. **Permittee.** Ecology, as Permittee, will authorize SECOR, contractor to the Group, to conduct the work required by the Consent Decree No. CY-96-3196-WFN (Consent Decree).

2. **Property Defined.** The Property includes, but is limited to, the portion of real property located in the City of Union Gap, Washington described as:

   See attached Yakima Railroad Area Well Location Map

3. **Duration.** Access is granted from the date hereof until completion of the Remedial Investigation (RI) report as authorized by Ecology, to the extent necessary to provide services for the installation of groundwater monitoring wells and conduct routine groundwater monitoring required by the Consent Decree. The wells will be constructed in accordance with WAC 173-160 and the requirements of the Consent Decree and will be owned by Ecology. Upon completion of the RI, Ecology will determine if additional access is required by Ecology or others.

4. **Purpose.** SECOR is allowed access only to the extent necessary for the purpose of providing services on the Property as stated in paragraph 3.

5. **Access.** Access to and from the Property shall be only from or to the immediately adjacent street (see attached Yakima Railroad Area Well Location Map).

6. **Soil.** All soil generated for installation of the groundwater monitoring wells shall be removed from the property on a timely basis in accordance with the Consent Decree.

7. **Groundwater.** All groundwater generated for installation and routine monitoring of the groundwater monitoring wells shall be removed in accordance with the Consent Decree.

Date:____________________ ____________________________

Ken Harris
City of Union Gap Public Works Department

Permittee: ____________________________

Washington State Department of Ecology
Central Regional Office
15 W. Yakima Ave., Ste 200
Yakima, WA 98902-3401

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Wallace Munly
Nu-Way Dry Cleaners
801 S Third Street
Yakima WA 98902

RE: Groundwater Sampling: Property Access

Dear Mr. Munly:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

Please consider this letter to be a formal property access notice for Ecology and/or a SECOR representative. A SECOR representative will be contacting you in the next couple of weeks to make necessary arrangements such as getting keys to locks. Ecology encourages you to provide the necessary access as promptly as possible so that this critical step in the cleanup process can begin.

If you have any questions please feel free to call me at (509)454-7837.

Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
Mark Valentine, *de maximis inc.*
Mark Jobson, AAG
Steve Thiele, AAG

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Ray Paollela
City of Yakima
128 N 2nd St
Yakima WA 98901

RE: Groundwater Sampling: Property Access

Dear Mr. Paollela:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Bruce Sheppard
Burlington Northern Railroad
2454 Occidental Avenue, Suite A1
Seattle WA 98134-1451

RE: Groundwater Sampling: Property Access

Dear Mr. Sheppard:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. William Winkle
Westco Martinizing
PO Box 8224
Boise ID 83707

RE: **Groundwater Sampling: Property Access**

Dear Mr. Winkle:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Site Manager
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Mark Valentine, *de maximis inc.*
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Steve Thiele, AAG

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Greg Stoffers
Frank Wear Cleaners
106 S 3rd Avenue
Yakima WA 98902

RE: **Groundwater Sampling: Property Access**

Dear Mr. Stoffers:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
Mark Valentine, *de maximis inc.*
Mark Jobson, AAG
Steve Thiele, AAG

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Antonio Adeline
c/o Mark Fickes
Valikanje, Moore & Shore
PO Box 02550
Yakima WA 98907

RE: Groundwater Sampling: Property Access

Dear Mr. Adeline:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one groundwater monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Mark Valentine, *de maximis inc.*
Peter Jewett, SECOR International, Inc.
Mark Jobson, AAG
Steve Thiele, AAG

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Gary Slagel
Noel Corporation
1001 S 1st St
Yakima WA 98901

RE: **Groundwater Sampling: Property Access at Southgate Laundry Site**

Dear Mr. Slagel:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Sincerely,

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Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
Mark Valentine, *de maximis inc.*
Mark Jobson, AAG
Steve Thiele, AAG

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Ken Paxton
Paxton Sales Corporation
108 W Mead Ave
Yakima WA 98902

RE: Groundwater Sampling: Property Access

Dear Mr. Paxton:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
Mark Valentine, *de maximis inc.*
Mark Jobson, AAG
Steve Thiele, AAG

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Kevin Roy
Roy & Boutillier
PO Box 2566
Yakima WA 98907

RE: Groundwater Sampling: Property Access at Agri-tech Site

Dear Mr. Roy:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
Mark Valentine, *de maximis inc.*
Mark Jobson, AAG
Steve Thiele, AAG

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Jim Adams
411 N 2nd St
Yakima WA 98902

RE: Groundwater Sampling: Property Access at Hahn Motors

Dear Mr. Adams:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
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Steve Thiele, AAG

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Eric Egbers
Cameron-Yakima, Inc.
PO Box 1544
Yakima WA 98907-1554

RE: Groundwater Sampling: Property Access

Dear Mr. Egbers:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Site Manager
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Steve Thiele, AAG

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima, Suite 200 • Yakima, Washington 98902-3401 • (509) 575-2490

August 4, 1997

Mr. Doug Little
Perkins Coie
1201 Third Ave, 4th Floor
Seattle WA 98101

RE: Groundwater Sampling: Property Access at U-Haul/Yakima Valley Spray Site

Dear Mr. Little:

SECOR International, Inc. (SECOR) is beginning work on the Yakima Railroad Area Remedial Investigation for Ecology. As part of this investigation SECOR will be sampling one ground water monitoring well at your site four times over the next year or so. A SECOR representative will also survey the elevation of the well designated for monitoring by SECOR prior to the first monitoring event. The sample will be analyzed for perchloroethylene and breakdown products.. Results will be available to you once Ecology receives them. You will remain responsible for sampling all additional wells at your site. Ecology will be contacting you in separate correspondence to coordinate your sampling events with those performed by SECOR.

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Sincerely,

Rick Roeder

Rick Roeder
Site Manager
Toxics Cleanup Program

cc: Peter Jewett, SECOR International, Inc.
Mark Valentine, *de maximis inc.*
Mark Jobson, AAG
Steve Thiele, AAG

ATTACHMENT A
DISPOSAL OPTION; ADDENDUM #1

Work Plan, Remedial Investigation
Yakima Railroad Area
Yakima, Washington
SECOR PN: 00378-001-01
August 25, 1997

ADDENDUM NO. 1

WASTE DISPOSAL OPTIONS WORK PLAN ADDENDUM
YRRA REMEDIAL INVESTIGATION
AUGUST 25, 1997

SECOR International Incorporated (SECOR) has prepared this Addendum to the Focused Remedial Investigation (RI), Yakima Railroad Area Work Plan dated August 25, 1997 for the YRRA RI to provide the Washington State Department of Ecology (Ecology) with potential waste disposal options identified by SECOR for the wastes generated from the RI Field Investigation. The wastes generated from the field investigation will include soil cuttings from the borings, extracted groundwater from well development for the quarterly sampling, decontamination water, and extracted groundwater from the aquifer test wells. The potential disposal options identified herein are submitted to Ecology for review, final selection, and approval. The options presented are for disposal of soil and/or water with concentrations of tetrachloroethylene (PCE) only. SECOR has assumed that the wastes do not contain other regulated constituents.

Ecology will select and approve the final disposal option. All waste manifests will be signed by Ecology. The Group will contract with the disposal facility selected by Ecology.

WATER DISPOSAL

Extracted groundwater which has concentrations of PCE less than the Model Toxics Control Act (MTCA) Method B cleanup levels for surface water (840 ppb) can be disposed of to the surface. Based on this disposal criterion, SECOR has identified the following potential disposal options. The wastewater will be characterized for disposal in accordance with the protocols defined in the Sampling and Analysis Plan (SAP), Attachment B of the Work Plan.

OPTION 1- YAKIMA/UNION GAP STORMWATER CONVEYANCE SYSTEM

Mr. Chris Waarvick and Mr. Joe Jackson of the city of Yakima and Mr. Ken Harris of the city of Union Gap have indicated that extracted groundwater with concentrations of PCE less than the MTCA Method B Cleanup Levels of 840 ppb can be disposed of to the city stormwater conveyance system.

OPTION 2 - IRRIGATION CANALS

There is an irrigation canal located directly adjacent to the aquifer test well location on the eastern side of the YRRA and near a number of the proposed wells. SECOR has discussed disposal of the wastewater with PCE concentrations below 840 ppb with the irrigation canal supervisor, Mr. Glen Brower of Union Irrigation Company. According to Mr. Brower, disposal of the water to the irrigation canals would be acceptable.

OPTION 3 - DISPOSAL TO WASTEWATER TREATMENT FACILITY

In the unlikely event that the concentrations of PCE in the extracted groundwater would be above 840 ppb, disposal at a wastewater treatment facility will be necessary. The only wastewater treatment facility which will accept wastewater with PCE is located in the Seattle area which will require trucking of the wastewater. This will likely be extremely difficult for disposal of the volume of water expected from the aquifer tests.

SECOR will assist with coordination and technical support to Ecology for obtaining authorization for the water disposal option selected by Ecology. Ecology will provide written documentation to SECOR that the selected option for disposal is acceptable.

SOIL DISPOSAL

SECOR anticipates that the soil cuttings generated from the installation of the groundwater monitoring wells will consist of a mud/sand and gravel slurry due to the depths of the proposed borings and expected depth to groundwater. The proposed drilling program will discharge the soil cuttings directly to lined drop boxes or lined dump trucks for transportation to the disposal facility. The following options have been identified for the soil disposal. The soil will be characterized for disposal in accordance with the protocols defined in the SAP, Attachment B of the Work Plan.

OPTION 1 - YAKIMA COUNTY LAND FILL

According to Mr. Ron Pepper, the Yakima County Terrace Heights Land Fill can accept soils with concentrations of PCE below MTCA Method A cleanup levels (0.5 ppm); however, there is a "paint filter test" requirement that tests for the liquid content of the soils. If the soil fails the paint filter test, the land fill will not except the wastes. SECOR anticipates that the soil cuttings may fail the paint filter test due to the high water content. It may be possible to de-water the soil slurry for an additional cost prior to disposal at the landfill. The extracted water will require disposal elsewhere.

OPTION 2 - ANDERSEN PIT

According to Mr. Art McKuen of the Yakima Health District, and Mr. Dennis Ingram, Pit Manager of the privately owned Andersen Pit, Andersen Pit will accept soils with PCE concentrations less than MTCA Method A cleanup levels. In addition, the pit will accept a slurry soil. Unfortunately, there is insufficient room to temporarily store the drop boxes pending analytical testing should this be necessary.

OPTION 3 - RABANCO

Soil with concentrations of PCE above 0.5 ppm and below 100 ppm can be disposed of at the Roosevelt Landfill in Vantage, Washington, according to Mr. Gary Schultz of Rabanco. Trucking from Yakima to deliver the waste directly to the landfill can be arranged through Rabanco. Should this option be selected, SECOR will directly discharge the soil cuttings to a lined dump truck for delivery to the landfill.

DANGEROUS WASTE - SOIL AND WATER

Soil or water with concentrations of PCE which are above the State Dangerous Waste Designation Levels based on total and/or TCLP concentrations, can be disposed at the Laidlaw facility in Utah, or Oregon

Waste Systems, Inc. of Arlington, Oregon (soil only). This would require disposal protocols in accordance with RCRA requirements.

SECOR will assist with coordination and technical support to Ecology for obtaining authorization for the water disposal option selected by Ecology. Ecology will provide written documentation to SECOR that the selected option for disposal is acceptable.

SAMPLING AND ANALYSIS PLAN
FOCUSED REMEDIAL INVESTIGATION
YAKIMA RAILROAD AREA
YAKIMA, WASHINGTON

SECOR PN: 00378-001-01

Prepared by
SECOR International Incorporated

for
Cameron-Yakima Working Group
c/o Mr. Mark Valentine
de maximis, inc.
705 Second Avenue, Suite 802
Seattle, Washington 98104

August 25, 1997

Prepared by:

C.F. Goddard by C. Shriver

Curtis F. Goddard, R.G.
Project Geologist

Reviewed by:

Clifford T. Schmitt

Clifford T. Schmitt, R.G.
Senior Project Manager

Peter Jewett

Peter Jewett
Principal Engineering Geologist

ATTACHMENT B
SAMPLING AND ANALYSIS PLAN

Work Plan, Remedial Investigation
Yakima Railroad Area
Yakima, Washington
SECOR PN: 00378-001-01
August 25, 1997

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TABLES

APPENDICES

1.0 INTRODUCTION

The Sampling and Analysis Plan (SAP) has been prepared by SECOR International Incorporated (SECOR) on behalf of the Cameron-Yakima Working Group (the Group) in accordance with the Consent Decree entered into by the Washington State Department of Ecology (Ecology) and the Group, under the Model Toxic Control Act (MTCA), Washington Administrative Code (WAC) 173-340-820. This SAP has been prepared for guidance during implementation of the focused remedial investigation (RI) study activities at the Yakima Railroad Area (YRRA) in Yakima, Washington (Figure 1 and Figure 2), in accordance with the Ecology Model Toxics Control Act (MTCA) Cleanup Regulation (WAC Chapter 173-340-350[6][f]). The SAP has been organized to follow the general format detailed in WAC-173-340-820.

Ecology has identified approximately 19 current or suspected source areas for tetrachloroethylene (PCE) contamination in the approximately six square mile YRRA. Of these, approximately 13 sites have either initiated or are planning to initiate groundwater and soil investigations within the next year that are required to produce areal and spatial information regarding the distribution of PCE.

The Group was issued a Consent Decree by Ecology that requires the Group to conduct a regional RI to address PCE impacts to groundwater in the approximately six square mile YRRA. The Consent Decree requires the Group to install 26 to 28 groundwater monitoring wells, sample the new wells and 14 existing wells for PCE, and conduct a pump test at two locations in the YRRA area. It requires the Group to submit a RI Work Plan which includes a Sampling and Analysis Plan (SAP) prior to conducting the field investigation.

2.0 METHODOLOGY

2.1 ACCESS AND PERMITTING

Prior to mobilization for field work startup, SECOR will meet with Mr. John Rutter, an engineer with the city of Yakima Public Works Department, Mr. Ken Harris of the city of Union Gap, and Mr. Rick Roeder, Project Manager with Ecology, to visit each proposed monitoring well location. Based on conditions at each location, SECOR, with Mr. Rutter, Mr. Harris, and Mr. Roeder, will make a determination concerning specific well locations and whether a Utilities Street Break Permit and post-construction (well installation) inspection will be required by the city of Yakima and the city of Union Gap Public Works Department.

During this initial site visit, traffic control requirements will be evaluated and decided for each drilling location. The city of Yakima and the city of Union Gap may require submittal of a traffic plan which describes sign usage, barriers, and other safety precautions to be implemented while performing the planned field work. Traffic control plans will be submitted to the city of Yakima in the permit applications.

Copies of the permits will be provided to the Group prior to submittal to the city. SECOR will provide the city of Yakima and the city of Union Gap with a permit package which will include: a traffic control plan of each well location in accordance with Washington State Department of Transportation requirements and the estimated time spent at each drilling location and the surface completion proposed for each well. Specific well locations will be marked using white spray paint.

The city of Yakima and/or the city of Union Gap has indicated that they may require a 30-day public review and comment period due to the number and locations of the proposed wells. Ecology has indicated that a 30-day comment period has been completed for the Consent Decree and an additional comment period is unnecessary. Ecology will coordinate this issue as head agency for the project.

A notification (well start card) of the intent to construct each monitoring well will be completed by the drilling contractor and submitted to Ecology in accordance with WAC Chapter 173-160-055. Ecology will be included on the start cards as the owner of the wells.

There are four wells located on private property in Union Gap which will require written access agreements with the property owners. SECOR will coordinate all private property access agreements on behalf of Ecology.

2.2 SOIL BORINGS

SECOR will notify the Underground Utility Council (UUC), of Upper Yakima Valley/Kittitas County, at least 36 hours prior to beginning drilling operations at each monitoring well location. UUC will contact the appropriate agencies or companies with underground utilities located in the proposed boring location. These agencies will then mark the location of their utilities along the right-of-ways. Additionally, a private utility locator, Locating, Inc. of Issaquah, Washington, will be contracted to locate unmarked utilities and to clear the monitoring well boring locations for drilling. Locating, Inc. will utilize city of Yakima street utility maps and on-site electronic survey to locate underground utilities.

A project-specific Health and Safety Plan (HASP) has been prepared in accordance with state and federal regulations, Chapter 49.18 of the Revised Code of Washington (RCW) and (29 CFR 1910) Code of Federal Regulations, for performing work at hazardous or potentially hazardous waste sites. The HASP is attached as Appendix C of the Work Plan.

In accordance with WAC Chapter 173-360, a SECOR geologist registered with Ecology to perform site assessments will be at the drilling site during all drilling operations to supervise the advancement of the soil borings. The geologist will be familiar and experienced with the local lithology. The borings will be drilled by Cascade Drilling, Inc. (Cascade) of Woodinville, Washington, using a truck-mounted Ingersoll Rand T3W top drive air rotary drilling rig equipped with 10-inch and/or 8-inch outside diameter drill casing. All drilling activities will be performed by a Washington state licensed driller.

To further check for potential subsurface utilities, the first 5 feet below surface grade (bsg) of each well boring will be advanced by manual excavation with a post hole digger or hand auger. At each proposed well location if the ground surface is covered with asphalt or concrete, Cascade will core through, using coring equipment, and remove the asphalt/concrete plug prior to initiating manual excavation. If utilities are encountered during the manual excavation process the boring will be re-located appropriately. Upon manually advancing the bore hole to 5 feet bsg and no utilities have been encountered, the driller will mechanically advance the bore hole to the proposed well completion depth.

The shallow boreholes will be advanced to 20 feet below the seasonal low water table and the deep boreholes will be advanced to a depth of 100 feet below the seasonal low water table, 30 and 130 feet bsg, respectively. SECOR will conduct a review of existing groundwater data for each site to determine the seasonally low groundwater elevation. The proposed depths will be submitted to the Group and Ecology for approval prior to drilling.

During the drilling operations, concentrations of volatile organic compound (VOC) vapors in the workers breathing zones will be monitored using a photoionization detector (PID), consistent with the requirements of SECOR's site-specific HASP. The PID is equipped with a 10.2 electron-volt lamp and calibrated in the field to 100 parts per million (ppm) isobutylene (a benzene standard gas). As air is drawn through the PID, volatile organic vapors, if present, are ionized by the 10.2 electron-volt lamp causing a detector response which is then registered on the digital display of the PID. The PID readings are reported in ppm.

In addition to monitoring the workers' breathing zones, soil drill cuttings will be monitored with a PID. If the PID readings are 50 ppm above background, a soil sample will be collected from those cuttings and analyzed for halogenated volatile organics (EPA Method 8010). See Section 3.1.1 for soil sampling procedures. Soil drill cuttings will be handled as waste (Section 2.9.1).

Soil drill cuttings will be visually classified by the field geologist in accordance with the Unified Soils Classification System (USCS). The results of field observations will be recorded on field reports and boring logs. Information recorded on each boring log includes pertinent geologic aspects of the soil units (lithologic descriptions including color, grain size, hardness, moisture, and other features), hydrogeologic conditions encountered during drilling, and well completion details. A typical Drilling Log form is included in Appendix B. Upon completion, the borings will be converted into groundwater monitoring wells or for use during the planned aquifer tests (Section 2.3).

2.3 GROUNDWATER MONITORING AND EXTRACTION WELL CONSTRUCTION

Groundwater monitoring and well construction will be completed in accordance with regulations outlined in Chapter 173-160 WAC, *Minimum Standards for Construction and Maintenance of Wells*. Monitoring wells will be constructed with the following specifications:

- Casing material will consist of threaded flush jointed schedule 40 (2-inch wells) or schedule 80 (6-inch wells) PVC blank casing, with 0.020-inch slotted well screen casing.

- Casing diameters for groundwater monitoring wells will be 2 inches for shallow wells and 2 inches for deep wells.

- Casing diameters for the proposed pumping (aquifer) test wells will be 6 inches.

- Shallow well screens will be 15 feet in length with the base of the screened casing set at 20 feet below seasonal low groundwater. Blank casing will extend from the top of the screen to just below the ground surface, the base of the casing is sealed with a PVC flush-threaded bottom cap, and the top covered with a locking expansion plug-type cap. The plug-type caps will be secured with a padlock.

- Deep well screens will be 10 feet in length, the base of the screened casing will be set at 100 feet below seasonal low groundwater. Blank casing will extend from the top of the screen to just below the ground surface, the base of the casing will be sealed with a PVC, flush-threaded bottom cap, and the top covered with a locking expansion plug-type cap. The plug-type caps will be secured with a padlock.

- Once the well casing is set, the base of the borehole annulus (8-inch diameter for the 2-inch wells and 10-inch diameter for the 6-inch wells) will be packed with clean, inert filter sand. The filter sand interval will extend to approximately 1 to 3 feet above the screened casing section. To form hydrated bentonite is placed above the sand pack. The bentonite seal will be extended to approximately 2 feet bsg. The remainder of the annulus will be filled with a concrete slurry to a point just below the wellhead. Each well will be completed to grade in a watertight, traffic-rated meter box or small utility box. Typical groundwater monitoring well construction is shown in Figure 1.

2.4 GROUNDWATER MONITORING WELL DEVELOPMENT

Groundwater monitoring well development will be conducted by utilizing the drilling rig and a bottom discharge bailer in combination with a surge block and pump. The well will be developed by pulling the surge block slowly past the screened interval of the well. After surging, the well is bailed or pumped removing water and suspended sediments from the well cavity. Pumping rates will begin at very low rates (less than 0.5 gallons per minute) and will slowly increase with time. This process of development reduces the potential of "locking" of sediments in the annulus which can occur if the well is stressed too vigorously during initial development. Development will proceed with the objective of meeting the following criteria:

- Purge water is relatively turbidity free.

- Sediment thickness remaining within the well is less than five percent of the screen length.

- At least five well volumes have been removed from the well, to include the well screen, casing, and saturated annulus.

- Temperature, pH, and electrical conductivity are within ten percent over three consecutive purge volumes.

The field geologist will record field pH, temperature, and conductivity measurements before, during, and after development of each well. Water levels will be measured and recorded both before and after well development. No dispersing agents, acids, disinfectants, or other additives will be used during development or at any other time during well construction.

2.5 GROUNDWATER MONITORING WELL SURVEY

In order to determine groundwater flow direction and calculate the groundwater flow gradient, groundwater levels will be measured relative to a common elevation. A notch will be made on the top of each well casing for use as a monitoring reference point. The monitoring well will be land surveyed to the reference point notch on the casing, to the nearest 0.01 foot, relative to Washington State Plane, South Zone NAD 29 Datum, 1947 adjustment. The survey will also obtain north and east coordinates for each monitoring well. Wellhead surveys will be compiled by PLSA Engineering and Surveying.

2.6 GROUNDWATER MONITORING AND SAMPLING

SECOR will perform quarterly groundwater monitoring and sampling for one year on 14 existing and 28 new groundwater monitoring wells, plus gauge the groundwater level measurement from one Ecology well located near Rainier Plastics. The objective of groundwater sampling is to obtain a volume of water for analysis that is representative of conditions in the aquifer. The following procedures will be performed:

- Record the well number, date, time, and name of field personnel taking measurements.

- Insert the clean water level indicator or interface probe until it reaches water and measure the depth-to-water from the designated measuring point at the top of casing and record the value to the nearest 0.01 foot; repeat the procedure three times to ensure accuracy.

- Measure the total depth (in feet) of the well.

- Compare total depths and water level to previous measurements.

- Record well conditions (e.g., cracked casing, missing cap, subsidence features) and any other pertinent observations.

- Ensure that all markings clearly indicate the well's location and the well number.

- Use the static water level and total well depth measurements to calculate a casing volume of water.

- Remove a minimum of three casing volumes of water from the well using a bailer or pump.
- Measure and record pH, conductivity, and temperature of each purged casing volume.
- Collect and handle groundwater for analyses as described in Section 3.1.2.
- Analyze the groundwater samples for PCE by EPA Method 8010.
- Handle purged groundwater and rinsate water as described in Section 2.9.

2.7 EQUIPMENT DECONTAMINATION

Field equipment decontamination procedures are designed to prevent any cross-contamination from one well or sample to another. The recoverable sampling equipment will be used at each well and then thoroughly cleaned between each use. Equipment or materials that cannot be completely decontaminated will be discarded to a solid waste receptacle and new material used. Decontamination rinsate fluids will be collected and placed in drums for appropriate disposal as described in Section 2.9.

2.7.1 Excavation and Drilling Equipment Decontamination

Prior to entering the site, all drilling equipment that will contact the subsurface will be steam cleaned to remove potential residual chemicals from previous work. Steam cleaning will be performed between drilling locations to minimize cross-contamination. The drilling subcontractor, Cascade, has a self-contained steam cleaning unit which will be used at each drilling location. Fluids generated from the steam cleaning are contained in the decontamination unit and will be decanted into appropriate containers for temporary storage and/or disposal.

2.7.2 Soil and Water Sample Equipment Decontamination

Prior to the start of a sampling episode and between each sample event, all equipment will be cleaned by the following procedures:

- wash in a solution of Liqui-Nox and tap water, soak for approximately five minutes;
- brush inside and out, and remove from the solution;
- rinse repeatedly with tap water; and,
- final rinse with distilled water.

Fluids generated from the decontamination will be contained in appropriate containers for temporary storage and/or disposal.

2.8 AQUIFER EVALUATION

As per the requirements of the RFP, SECOR will perform 24-hour constant-rate discharge aquifer tests at two shallow/deep well pairs at the site. The wells used for the aquifer test will be newly constructed at the state fairgrounds (18th Street and Central Avenue) and at Prasch Avenue and 15th Avenue.

If static water levels in the deep and shallow wells of each pair are within 0.5 feet of one another, then the shallow well shall be used for the pumping well. If the static water levels differ by more than that amount, two tests will be conducted in each well pair, one with the shallow well being pumped and one with the deep well being pumped.

Test procedures shall follow ASTM Procedure D4050-91 (Appendix C) except for the following deviations:

1. The tests shall be conducted for a total duration of 24 hours.

2. The preliminary test described in Section 7.1.3 of the standard will be omitted and the aquifer tests shall be conducted at a constant rate of 25 gpm, previous investigations having shown this to be a sustainable rate.

3. The timing of the measurements for the drawdown portion shall be as specified on Table 1 of the ASTM standard, except that measurements shall be no less frequent than 1 per 30 minutes in the later part of the test.

4. The timing of the measurements for the recovery portion of the test shall be as specified on Table 1, except that the recovery test will be discontinued after a 2-hour period, previous investigations having indicated that recovery times will be short.

5. A period of at least 24 hours will be allowed to pass between pumping of shallow and deep wells (if necessary) at the same location.

6. The field team will record barometric pressure readings once per hour while tests are being conducted or will obtain this information from a weather station located within 10 miles of the test site.

7. The field team will note the presence of pumping wells, irrigation, ponds, irrigation canals or natural watercourses within a 500-foot radius of the tested wells. If canals or natural streams are observed, the field team will estimate the depth of water in the canal or stream at the time of testing.

8. The tests will not be conducted within 72 hours after a significant rainfall event.

2.9 WASTE HANDLING

2.9.1 Containment and Transportation

2.9.1.1 Soil

Soil cuttings generated from the drilling will be discharged directly from the cyclons to 1 cubic yard totes or lined drop boxes at the drilling location and transported to the temporary storage facility pending characterization for disposal. Soil drill cuttings when generated will be monitored with a PID for volatile organic compounds. If the PID readings are 50 ppm above background, a composite soil sample will be collected and analyzed for halogenated volatile organic compounds

(EPA Method 8010). A lift and dedicated flat bed truck will be used on-site for transportation of the soil cuttings.

2.9.1.2 Water

Water generated from the well sampling will be placed in plastic 55-gallon drums, transported to the storage area, and decanted to Baker Tanks pending characterization and disposal by tanker truck. Should the analytical results consistently indicate low concentrations of PCE, disposal to the surface at each location may occur.

Water generated from the aquifer pump test will not be contained for storage and disposal unless elevated PCE concentrations (greater than 840 ppb) are encountered. The proposed pump wells will be sampled prior to initiation of the pumping test. If the concentrations are less than 840 ppb, surface discharge will be used once approval is received from local land owners. Should concentrations of PCE be greater than 840 ppb, alternative measures will be evaluated.

2.9.2 Characterization

2.9.2.1 Soil

Soil will be characterized by composite sampling a batch of storage containers, and composited samples will be analyzed for PCE by EPA Method 8010. Should the results be greater than 6.0 ppm PCE, the composite samples will be analyzed for toxicity characteristics and leaching potential (TCLP) by EPA Method 1311/8010.

2.9.2.2 Water

Water will be characterized by sampling a full Baker Tank or at each well site, and analyzed for PCE by EPA Method 8010.

2.9.3 Disposal

Ecology will determine the disposal for the wastes generated from the study. The results of the characterization will determine the disposal options for the wastes. Ecology will be the signatory as the generator.

2.9.3.1 State Designated Dangerous (Hazardous) Wastes

If the analytical results of the soil and/or water samples collected from the storage area are greater than 6.0 ppm PCE by EPA Method 8010 or 0.7 ppm PCE for TCLP by EPA Method 1311/8010, then the soil and/or water will be designated as a dangerous (hazardous) waste and will require disposal at a permitted facility. A profile characterization required by the disposal facility will be completed for one batch and used as a characterization for all subsequent batches. The wastes will be transported by Laidlaw to their RCRA permitted incinerator in Utah for thermal destruction.

2.9.3.2 Non-Dangerous Wastes, Above Laboratory Detection Limits

If the analytical results of the soil or water samples are greater than the laboratory reporting limits but less than 6 ppm PCE, then the soil and/or water will be disposed of off-site at a permitted facility. The soil will be collected by ENVIROTECH for thermal destruction at TPS in Tacoma, Washington. The water will be collected by ENVIROTECH for treatment or disposed of at the surface, depending on the PCE concentrations.

2.9.3.3 Below Laboratory Detection Limits

If the analytical results of the soil or water samples are less than the laboratory reporting limits, than the soil may be disposed of on-site as fill or at the Andersen Pit in Summerview, Washington. Water will be disposed of to the city of Yakima POTW with a Special Use Discharge Permit or to the surface.

3.0 SAMPLE ANALYSIS

The quantity of samples and the type of laboratory analyses to be performed for each task are presented in the Quality Assurance Project Plan (QAPP) in Appendix B. Detection limits for all analyses will meet cleanup levels established in WAC Chapter 173-340-720 and 173-340-740 for groundwater and soils, respectively.

Included in the QAPP, are quality assurance and control (QA/QC) samples that will be collected as part of the sampling program. QA/QC samples will include:

- Duplicate samples representing approximately 10 percent of the total number of samples collected.
- Trip blanks submitted with each batch of groundwater samples submitted to the laboratory.
- QA/QC sample preparation procedures are described in the QAPP.

3.1 SAMPLE HANDLING AND COLLECTION PROCEDURES

3.1.1 Soil

Soil samples collected at the borings will occur if the PID indicates concentrations of PCE > 50 ppm. All soil samples will be analyzed using EPA Method 8010. The soil samples will be collected and handled following the procedures below:

- Collect a composite sample from the cuttings contained in the 1 yard totes or drop boxes using a clean, stainless steel trowel.
- Using a decontaminated stainless steel digging trowel, scoop the soil into a laboratory supplied, 8 ounce capacity, wide mouth, clear glass jar with a screw-on top cap and Teflon capliner, sample container. Fill to eliminate any headspace in the container before sealing with the cap to prevent headspace gas from forming. Place a portion of recovered sample in a "zip-lock" plastic bag, seal the bag and allow it to sit for approximately 15 minutes. Pierce the plastic bag with the PID tip and log the reading (headspace analysis). Log for soil characteristics including texture, color, hardness, moisture, and other features. Also note the depth of any changes in lithology and first encountered groundwater. A typical Drilling Log form is included in Appendix B.
- For laboratory samples, label sample containers as detailed in Section 4.1.5.
- Log the samples on the Chain-of-Custody form, and place samples in a chilled cooler at 4°Centigrade for transport to the laboratory (Section 4.1.4).
- Handle soil waste as described in Section 2.9.
- Decontaminate the sampling equipment, as detailed in Section 2.7.

Waste characterization soil samples will be collected from each batch of soil to be disposed. The size of the batch will depend on schedule or rate of waste generation. SECOR anticipates at least weekly disposal. Soil samples collected for waste characterization will be handled by following the procedures below:

- Using a decontaminated stainless steel digging trowel, scoop the soil into a laboratory supplied, 8 ounce capacity, wide mouth, clear glass jar with a screw-on top cap and teflon capliner, sample container. Fill to eliminate any headspace in the container before sealing with the cap to prevent headspace gas from forming.

- Label sample containers as detailed in Appendix D.

- Log the samples on the Chain-of-Custody form (Appendix D), and place samples in a chilled cooler at 4°Centigrade for transport to the laboratory.

- Handle soil waste as described in Section 2.9.

- Decontaminate the sampling equipment, as detailed in Section 2.7.

3.1.2 Water

All water samples will be analyzed using EPA Method 8010. Water samples will be collected and handled following the procedures below:

- Collect the groundwater sample using a disposable polyethylene single check valve bailer.

- Lower the bailer into the monitoring well or Baker Tank, with a disposable cord, to below the water level.

- Slowly retrieve the bailer.

- Drain the sample from the bottom of the bailer into a laboratory-supplied. 40 ml VOA vial sample container, with minimal turbulence. If heavy sediments are present in the bailer, allow the sediments to exit by opening the bottom of the bailer and emptying into a waste container. Only open the sample container at the moment the sample is to be dispensed from the bailer to preserve the sample integrity. Care will be taken not to handle the seal or lid of the container when placing the sample in the containers. Fill the vial to eliminate any headspace and secure the cap.

- Once the VOA is capped, check if air bubbles are present in the sample vial. If air is present, repeat the steps above until the sample collected is free of air bubbles.

- Label the sample container with the client's name, project name and project number, sample name (well ID), date, time sampled, and the sampler's initials as detailed in Section 4.1.5.

- Log on a Chain-of-Custody form (see Section 4.1.4), and place sample in a chilled cooler at 4°Centigrade for transport to the laboratory using Chain-of-Custody protocol.

- Decontaminate the sampling equipment, as detailed in Section 2.7.

4.0 SAMPLE DOCUMENTATION

An established document control system to be implemented during investigation activities includes the following, as appropriate: field documentation, boring logs, monitoring well data forms, sampling event data forms, Chain-of-Custody forms, and sample labels. Examples of each of these documents are presented in Appendix D. Documentation generated during the field program will be included in the supplemental site assessment report and retained in the project file.

4.1 FIELD DOCUMENTATION

Field personnel will be required to keep a daily field log. Field notes will be as descriptive and as inclusive as possible, allowing independent parties to reconstruct the sampling situation from the recorded information. Language will be objective, factual, and free of inappropriate terminology. A summary of each day's events will be completed on a three-part Field Report form. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, field equipment used, and any activities performed in a manner other than specified in this work plan. In addition, if other forms are completed or used (e.g., Chain-of-Custody form, maps, etc.) they will be referred to on, and attached to, the Field Report form. Field personnel will sign the Field Report form.

4.1.1 Boring Logs

A Boring Log form will be prepared for each boring by the attending geologist. The log includes hydrogeologic conditions, lithologic descriptions, (i.e., lithology, texture and grain size, color, hardness, moisture, and other properties as noted in the field) using the Unified Soil Classification System and information on the potential presence of contamination (e.g., sheen test results, PID readings, staining, and odors). Well construction details will also be included on the boring log.

4.1.2 Monitoring Well Data Form

The Monitoring Well Data form is used to record water-level and other hydrogeologic measurements collected during field work.

4.1.3 Groundwater Purge and Sample Form

The Groundwater Purge and Sample form includes information on specific activities related to collection of a single sample. The sampling form is completed in the field at the time of sample collection by sampling personnel.

4.1.4 Chain-of-Custody Form

The written procedures that are followed whenever samples are collected, transferred, stored, analyzed, or destroyed are designed to create an accurate written record which can be used to trace the possession and handling of the sample from the moment of its collection through analysis and reporting of analytical values. This written record, the Chain-of-Custody form, will be filled out by the field sampling team at the time the sample is obtained.

All samples submitted to the laboratory are accompanied by the Chain-of-Custody record. This form is checked for accuracy and completeness, and then signed and dated by the laboratory sample custodian accepting the sample. At the laboratory, each sample is assigned a unique, sequential laboratory identification number which is stamped or written on the Chain-of-Custody form.

All samples are held under internal Chain-of-Custody in the Sample Control room using the appropriate storage technique (ambient, refrigeration, frozen). The laboratory Project Manager assigned to a particular client is responsible for tracking the status of the samples throughout the laboratory. Samples are signed out of the Sample Control room in a sample control log book by the analyst who will prepare the samples for analysis.

The Chain-of-Custody form includes the following information: site name, sample identification number (assigned by the sampler in the field), sample date, sample location, and type of analysis required (if any). Whenever the sample is transferred from one party to another, both parties sign the Chain-of-Custody form and record the date and time of the transfer. In this manner, the sample integrity is insured from collection through analysis.

4.1.5 Sample Label

Sample labels are filled out and affixed to appropriate containers immediately prior to sample collection. The label is filled out in indelible ink and includes the following information: job number and name, sample ID number, sample location (and depth if applicable), date, analytes preservative(s), if any, and sampler's initials.

4.1.6 Waste Material Label

The waste material labels are filled out and affixed to the appropriate waste container immediately upon filling. The label is filled out in indelible ink and includes the following information: job number and name, address where waste was generated, contents of the container, boring or well number (and depth if applicable), operation, date, consultant's name and phone number, and sampler's initials.

4.1.7 QA/QC Samples

QA/QC samples will be collected during the course of the field investigation. The following types of QC samples will be collected and shipped to the laboratory with the other samples. The type and frequency of these field QC samples are summarized below. The exact number of samples may change as the SAP is finalized. However, the frequency given below will be followed.

- Blind decon rinsate blank: 1 per 20 natural samples
- Blind field external contamination blank: 1 per 20 natural samples
- Split field duplicates: 1 per 20 natural samples
- Travel blank: 1 per episode
- Bottle blank: 1 per bottle lot
- Blind field blank: 1 per 20 natural samples

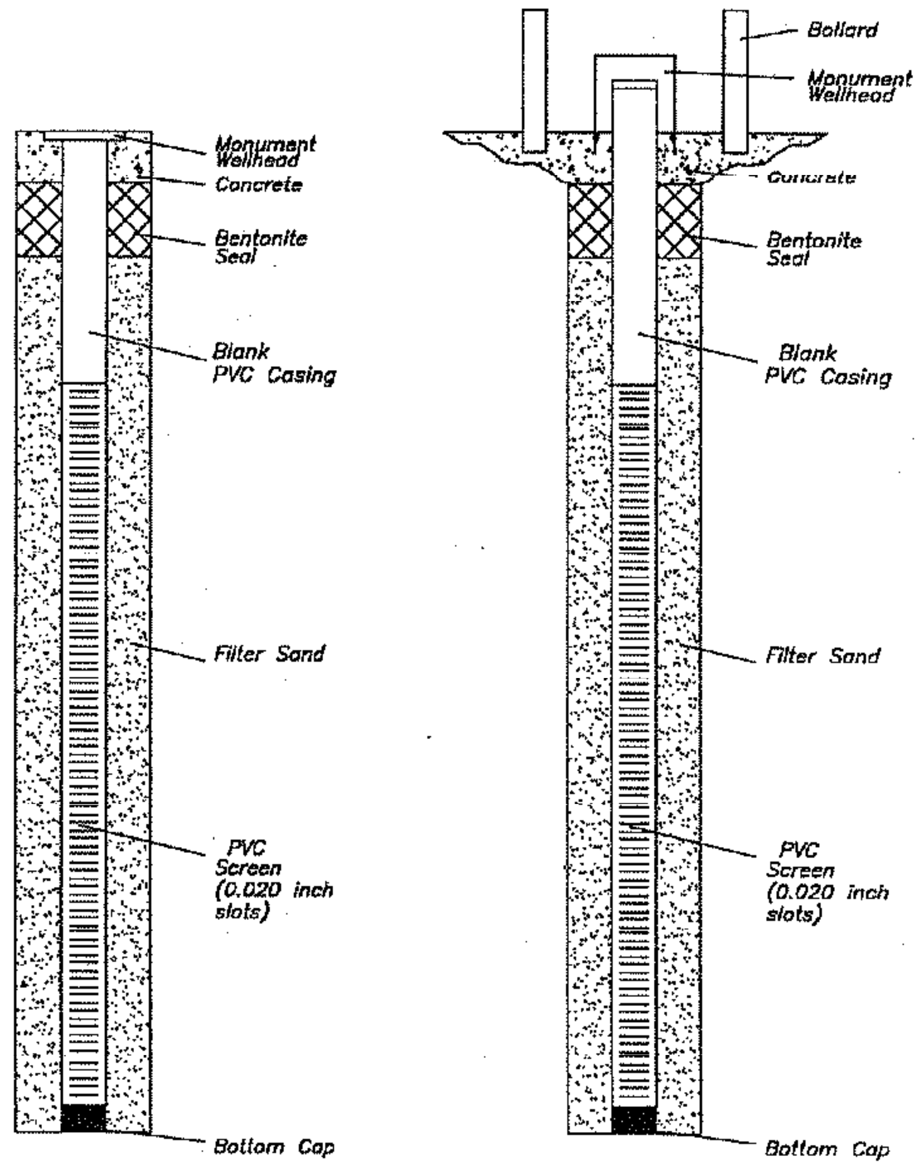
4.1.8 Data Management

SECOR will maintain analytical chemistry, ground water level, and well construction detail records in a MicroSoft Access-based data management system. Analytical data will be received by electronic transfer from the laboratory and uploaded into the database. Water level records will be submitted in spreadsheet format by the field crews. All data will be stored in a previously developed ("SECOR standard") database format. Paper copies of the analytical data will also be maintained in the project files.

Data from the SECOR standard system can be exported for use in all major mapping, contouring, and spreadsheet programs including MapINFO, AutoCAD, and SURFER. Necessary tables will be generated from the database and may be imported into word processing programs for reports, if desired. All data will undergo a QA/QC review at time of receipt (see Appendix B, Quality Assurance Project Plan). Portions of this review are automated and are performed by the SECOR database management system.

FIGURES

WELL CONSTRUCTION DETAILS



SECOR International Incorporated	**TYPICAL WELL CONSTRUCTION DETAIL** **YAKIMA RAILROAD AREA** **YAKIMA, WASHINGTON**	FIGURE: **1**
	JOB#: APPR: DWN: **KWW** DATE:	

DWG:

TABLES

TABLE 1
EXAMPLE
MONITORING WELL CONSTRUCTION DETAILS
Yakima Railroad Area

Well Identification	Location	Date Installed	Boring Depth (feet)	Well Depth (feet)	Screen Interval (feet)	Filter Pack Interval (feet)	Surface Seal Interval (feet)	Well Diameter (inches)	Screen Slot Size (inches)
MW-1	301 18th Street, Yakima	7/25/97	40	40	20 - 40	18 - 40	0 - 18	6	0.020

Note: All wells constructed using flush-threaded Schedule 40 PVC (2-inch wells) or Schedule 80 PVC (6-inch wells).

TABLE 2
EXAMPLE
GROUNDWATER ANALYTICAL RESULTS
HALOGENATED VOLATILE ORGANIC COMPOUNDS
Yakima Railroad Area
Yakima, Washington

[Laboratory Analytical Results in micrograms per liter (µg/l)]

Well ID	Date	Chloroethane	*cis*-1, 2-Dichloroethene	Trichloroethene (TCE)	Tetrachloroethene (PCE)
MW-1	01/22/96	(0.5)	(0.5)	(0.5)	31
	04/10/96	--	--	--	--
	09/05/96	(0.5)	(0.5)	(0.5)	21
	12/10/96	1	(0.5)	(0.5)	20
MW-2	01/22/96	(0.5)	(0.5)	0.7	20
	04/10/96	(0.5)	(0.5)	(0.5)	21
	09/05/96	(0.5)	(0.5)	(0.5)	19
	12/10/96	(2)	(0.5)	(0.5)	13
MW-3	01/22/96	(0.5)	2.4	2.6	16
	04/10/96	(0.5)	(0.5)	1.3	16
	09/05/96	(0.5)	0.7	1.0	9.3
	12/10/96	(2)	(0.5)	0.8	8.4
MW-4	01/22/96	(0.5)	(0.5)	0.7	32
	04/10/96	(0.5)	(0.5)	(0.5)	20
	09/05/96	(0.5)	(0.5)	0.7	18
	12/10/96	(2)	(0.5)	(0.5)	18
MTCA Method A Groundwater Cleanup Level:		N/A	N/A	**5.0**	**5.0**

Notes:

µg/l = micrograms per liter

Chloroethane, *cis*-1, 2-Dichloroethene, Trichloroethene (TCE), and Tetrachloroethene (PCE), by U.S. Environmental Protection Agency Methods 5030A/8010A.

(0.5) Indicates constituent not detected above the (enclosed) method reporting limit.

-- = sample not analyzed

Groundwater samples were analyzed by North Creek Analytical of Bothell, Washington.

Groundwater cleanup levels from Model Toxics Control Act (MTCA) Method A cleanup regulations, Washington Administrative Code (WAC), Chapter 173-340-740(2)(a)(i), dated February 11, 1991, (revised December 1993).

N/A = does not apply, MTCA Method A groundwater cleanup level has not been established for the listed compound.

Only the analytes detected are presented in this table, for a complete list of analytes see the attached laboratory analytical report.

TABLE 3
EXAMPLE
ACCESS AGREEMENTS
Yakima Railroad Area
Yakima, Washington

Boring ID #	Proposed Boring Location	Location Approved			Traffic Control Plan		Street Break Permit		Property Owner	Access Obtained
		YRRA Group	City of Yakima	Dept. of Ecology	Required (yes/no)	Approved (yes/no)	Required (yes/no)	Approved (yes/no)		
MW-1	301 18th Street, Yakima	Y	Y	Y	Y	Y	N		City of Yakima	Y

TABLE 4
EXAMPLE
WASTE HANDLING AND TRACKING FORM
Yakima Railroad Area
Yakima, Washington

Container Identification	Container Type	Matrix	Date Generated	How Generated (decon/drilling/purge)	Volume	Profiled		Method for Disposal	Disposal Description/Date
						Yes	No		
MW1/soil/30-45'/01	Drop box	Soil	7/31/97	Drilling	1 cu yd	Y		landfill	Anderson pit/08-15-97

APPENDIX A
AQUIFER TEST PROCEDURES

Sampling and Analysis Plan
Focused Remedial Investigation
Yakima Railroad Area
Yakima, Washington
Cameron-Yakima Working Group
SECOR PN: 00378-001-01
August 25, 1997

Standard Test Method (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems[1]

This standard is issued under the fixed designation D 4050; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes the field procedure for selecting well locations, controlling discharge or injection rates, and measuring water levels used to analyze the hydraulic properties of an aquifer or aquifers and adjacent confining beds.

1.2 This test method is used in conjunction with an analytical procedure such as Test Method D 4105 or D 4106 to determine aquifer properties.

1.3 The appropriate field and analytical procedures are selected as described in Guide D 4043.

1.4 The values stated in SI units are to be regarded as standard.

1.5 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)[2]

D 4043 Guide for Selection of Aquifer-Test Field and Analytical Procedures in Determination of Hydraulic Properties by Well Techniques[2]

D 4105 Test Method (Analytical Procedure) for Determining Transmissivity and Storativity of Nonleaky Confined Aquifers by the Modified Theis Nonequilibrium Method[2]

D 4106 Test Method (Analytical Procedure) for Determining Transmissivity and Storativity of Confined Nonleaky Aquifers by the Theis Nonequilibrium Method[2]

D 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)[2]

3. Terminology

3.1 *Definitions:*

3.1.1 *aquifer, confined*—an aquifer bounded above and below by confining beds and in which the static head is above the top of the aquifer.

3.1.2 *confining bed*—a hydrogeologic unit of less permeable material bounding one or more aquifers.

3.1.3 *control well*—well by which the head and flow in the aquifer is changed, for example, by pumping, injection, or imposing a constant change of head.

3.1.4 *hydraulic conductivity (field aquifer tests)*—the volume of water at the existing kinematic viscosity that will move in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

3.1.5 *observation well*—a well open to all or part of an aquifer.

3.1.6 *piezometer*—a device so constructed and sealed as to measure hydraulic head at a point in the subsurface.

3.1.7 *specific storage*—the volume of water released from or taken into storage per unit volume of the porous medium per unit change in head.

3.1.8 *storage coefficient* —the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. For a confined aquifer, the storage coefficient is equal to the product of the specific storage and aquifer thickness. For an unconfined aquifer, the storage coefficient is approximately equal to the specific yield.

3.1.9 *transmissivity*—the volume of water at the existing kinematic viscosity that will move in a unit time under a unit hydraulic gradient through a unit width of the aquifer.

3.1.10 For definitions of other terms used in this test method, see Terminology D 653.

4. Summary of Test Method

4.1 This test method describes the field practices in conducting withdrawal and injection well tests. These methods involve withdrawal of water from or injection of water to an aquifer through a control well and measurement of the water-level response in the aquifer. The analysis of the data from this field practice is described in standards such as Test Methods D 4105 and D 4106.

5. Significance and Use

5.1 Withdrawal and injection well test field procedures are used with appropriate analytical procedures in appropriate hydrogeological sites to determine transmissivity and storage coefficient of aquifers and hydraulic conductivity of confining beds.

6. Apparatus

6.1 Various types of equipment can be used to withdraw or inject water into the control well, measure withdrawal and

[1] This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

Current edition approved June 15, 1991. Published August 1991.

[2] *Annual Book of ASTM Standards*, Vol 04.08.

injection rates, and measure water levels. The test procedure may be conducted with different types of equipment to achieve similar results. The objectives to be achieved by the use of the equipment are given in this section and in Sections 7 and 8.

6.2 *Control Well*—Discharge or injection well test methods require that water be withdrawn from or injected into a single well. This well, known as the control well, must be drilled and completed such that it transmits water to or from the aquifer (usually the entire thickness of the aquifer) at rates such that a measurable water level change will occur at observation wells. The control well should be as efficient as possible, to reduce the head loss between the aquifer and the well. Well development should be as complete as possible to eliminate additional production of sand or silt and consequent changes in well efficiency and pumping water levels during the test. The cuttings from the control well should be described and recorded according to Practice D 2488. The analytical method selected for analysis of the data may specify certain dimensions of the control well such as screen length and depth of screen placement. Specific requirements for control wells may be given in standards for specific analytical methods (see, for example, Test Methods D 4105 and D 4106).

6.3 *Observation Wells or Piezometers*—Numbers of observation wells and their distance from the control well and their screened interval may be dependent upon the test method to be employed. Refer to the analytical test method to be used for specifications of observation wells (see, for example, Test Methods D 4105 and D 4106).

6.4 *Control Well Pump*—A pump capable of withdrawal of a constant or predetermined variable rate of water from the control well. The pump and motor should be adequately sized for the designed pumping rate and lift. The pump or motor must be equipped with a control mechanism to adjust discharge rate. In the case of diesel-, gasoline-, or natural-gas-fueled engines, throttle settings should allow for small adjustments in pumping rates. Pumps equipped with electric motors are usually controlled by adjusting backpressure on the pump through a gate valve in the discharge line. Take care to select a discharge rate small enough such that the rate can be maintained throughout the test without fully opening the gate valve. If neither method of control is practical, split the discharge and route part of the discharge back to the well through a separate discharge line.

6.5 Many aquifer tests are made at "sites of opportunity," that is, using existing production wells as the control well and using other existing wells for observation of water level. In such cases the locations and screened intervals of the wells should be compatible with the requirements of the method of test analysis.

6.6 *Water-Level Measurement Equipment*—Manual measurements can be made with a steel tape or electric tape as described in Test Method D 4750, with a mechanical recorder linked to a float, or combination of pressure transducer and electronic data logger.

6.6.1 *Mechanical Recorders*—Mechanical recorders employ a float in the well to produce a graphic record of water level changes. Early in the test, it may be difficult to distinguish small increments of time on the recorder chart, therefore the recorder should be supplemented with additional early time measurements or by marking the trace of an automatic water-level recorder chart and recording the time by the mark. Check the mechanical recorder periodically throughout the test using the steel tape.

6.6.2 *Pressure Transducers and Electronic Data Loggers*—A combination of a pressure transducer and electronic data logger can provide rapid measurements of water-level change, and can be programmed to sample at reduced frequency late in the test. Select the pressure transducer to measure pressure changes equivalent to the range of expected water level changes. Check the transducer in the field by raising and lowering the transducer a measured distance in the well. Also check the transducer readings periodically with a steel tape.

7. Conditioning

7.1 *Pre-Test Procedures:*

7.1.1 *Selecting Aquifer-Test Method*—Develop a conceptual model of the site hydrogeology and select the appropriate aquifer test method according to Guide D 4043. Observe the requirements of the selected test method with regard to specifications for the control well and observation wells.

7.1.2 *Field Reconnaissance*—Make a field reconnaissance of the site before conducting the test to include as much detail as possible on depth, continuity, extent, and preliminary estimates of the hydrologic properties of the aquifer and confining beds. Note the location of existing wells and water-holding or conveying structures that might interfere with the test. The control should be equipped with a pipeline or conveyance structure adequate to transmit the water away from the test site, so that recharge is not induced near the site. Make arrangements to ensure that nearby wells are turned off well before the test, and automatic pump controls are disabled throughout the anticipated test period. Alternately, it may be necessary to pump some wells throughout the test. If so, they should be pumped at a constant rate and not started and stopped for a duration equal to that of the test before nor should they be started and stopped during the test.

7.1.3 *Testing of Control Well*—Conduct a short-term preliminary test of the control well to estimate hydraulic properties of the aquifer, estimate the duration of the test, and establish a pumping rate for the field procedure.

7.1.4 *Testing Observation Wells*—Test the observation wells or piezometers prior to the aquifer test to ensure that they are hydraulically connected to the aquifer. Accomplish this by adding or withdrawing a known volume of water (slug) and measure the water-level response in the well. The resultant response should be rapid enough to ensure that the water level in the piezometer will reflect the water level in the aquifer during the test. Redevelop piezometers with unusually sluggish response.

7.1.5 *Measuring Pre-Testing Water-Level Trends*—Measure water levels in all observation wells prior to starting pumping for a period long enough to establish the pre-pumping trend. This period is at least equal to the length of the test. The trend in all observation wells should be similar. A well with an unusual trend may reflect effects of local disturbances in the hydrologic system, or may be inadequately developed.

7.1.6 *Selecting of Pumping Rate*—Select the pumping rate, on the basis of the preliminary test (see 7.1.3), at which the well is to be pumped, such that, the rate can be sustained by the pump for the duration of the test. The rate should not be so large that the water level is drawn down below the perforations in the control well, causing cascading water and entrained air in the well. Under no circumstances should the rate be so large that the water level is drawn down to the water-entry section of the pump or tailpipe.

8. Procedure

8.1 *Withdrawing or Injecting Water from the Aquifer*—Regulate the rate at which water is withdrawn from, or injected into, the control well throughout the test. The short-term discharge should not vary more than 10 % about the mean discharge. For constant-discharge tests, long-term variation of discharge from the beginning to end of test generally should be less than 5 %.

8.2 Measure discharge frequently, for example every 5 min, and if necessary adjust discharge during the beginning of the test. When the discharge becomes more stable, reduce the frequency of adjustments and check discharge at least once every 2 h throughout the test. Variations in electric line load throughout the day will cause variations in discharge of pumps equipped with electric motors. Changes in air temperature and barometric pressure will likewise affect diesel motors. Late in a lengthy test, measure and adjust discharge much more frequently than the water levels are measured.

8.3 *Measuring Water Level; Frequency of Measurement*—Measure water levels in each observation well at approximately logarithmic intervals of time. Measure at least ten data points throughout each logarithmic interval. A typical measurement schedule is listed in Table 1.

8.4 *Duration of Pumping Phase of Test*—Make preliminary analysis of the aquifer-test data during the test using the appropriate test method (such as Test Methods D 4105 and D 4106). Continue the test until the analysis shows adequate test duration.

8.5 *Measuring Recovery of Water Levels:*

8.5.1 The recovery of water levels following pumping phase should be measured and recorded for a period of time equal to the pumping time. Analyze the recovery data to determine the hydraulic parameters of the system. The frequency of measuring water levels should be similar to the frequency during the pumping phase (see Table 1).

8.5.2 If water level data during the early part of the recovery phase are to be used from the control well, the pump should be equipped with a foot valve to prevent the column pipe fluid from flowing back into the well when the pump is turned off.

8.6 *Post-Testing Procedures:*

8.6.1 Tabulate water levels, including, pre-pumping water levels, for each well or piezometer, date, clock time, time since pumping started or stopped, and measurement point (Test Method D 4750).

8.6.2 Tabulate measurements of the rate of discharge or injection at the control well, date, clock time, time since pumping started, and method of measurement.

8.6.3 Prepare a written description of each well, describing the measuring point, giving its altitude and the method of obtaining the altitude, and the distance of the measuring point above the mean land surface.

8.6.4 Make plots of water-level changes and discharge measurements as follows:

8.6.4.1 Plot water levels in the control well and each observation well against the logarithm of time since pumping began. Plot the rate of discharge, Q, of the control well on arithmetic paper.

8.6.4.2 Prepare a plot of the log of drawdown, s, versus the log of the ratio of time since pumping began, t, to the square of the distance from the control well to the observation well, r, that is $\log_{10}s$ versus $\log_{10}t/r^2$, on a single graph and maintain the graph as the test progresses. Unexpected, rapid deviations of the data from the type curves may be caused by variations in discharge of the control well, or by other wells in the vicinity starting, stopping or changing discharge rates, or by other changes in field conditions. Such interfering effects may need to be measured, and adjustments made in the final data, or it may be necessary to abort the test.

8.6.4.3 *Plot Recovery of Water Levels*—Plot recovery data, consisting of plots of water level versus log of the ratio of time since pumping started (t) to the time since pumping stopped (t'). Prepare mass plots of log of recovery versus log of the quantity: ratio of time since pumping stopped (t') to the square of the distance from the control well to the observation well (r^2), that is $\log_{10}t$ versus $\log_{10}t'/r^2$.

9. Report

9.1 Prepare a report containing field data including a description of the field site, plots of water level and discharge with time, and preliminary analysis of data.

9.1.1 An introduction stating purpose of the test, dates and times water-level measurements were begun, dates and times discharge or injection was begun and ended, and the average rate of discharge or injection.

9.1.2 The "as built" description and diagrams of all control wells, observation wells, and piezometers.

9.1.3 A map of the site showing all well locations, the distances between wells, and location of all geologic boundaries or surface-water bodies which might effect the test.

9.1.3.1 The locations of wells and boundaries that would affect the aquifer tests need to be known with sufficient accuracy to provide a valid analysis. For most analyses, this means the locations must provide data points within plotting accuracy on the semilog or log-log graph paper used in the analysis. Radial distances from the control well to the observation wells usually need to be known within ±0.5 %. For prolonged, large-scale testing it may be sufficient to locate wells from maps or aerial photographs. However, for small-scale tests, the well locations should be surveyed. All faults, streams, and canals or other potential boundaries should be located. When test wells are deep relative to their

TABLE 1 Typical Measurement Frequency

Frequency, One Measurement Every:	Elapsed Time, For the First:
30 s	3 min
1 min	3 to 15 min
5 min	15 to 60 min
10 min	60 to 120 min
20 min	2 to 3 h
1 h	3 to 15 h
5 h	15 to 60 h

spacing it may be necessary to conduct well-deviation surveys to determine the true horizontal distance between well screens in the aquifer.

9.1.4 Include tabulated field data collected during the test.

10. Precision and Bias

10.1 It is not practicable to specify the precision of this test method because the response of aquifer systems during aquifer tests is dependent upon ambient system stresses. No statement can be made about bias because no true reference values exist.

11. Keywords

11.1 aquifers; aquifer tests; discharging wells; drawdown; ground water; hydraulic conductivity; injection wells; recovery; storage coefficient; transmissivity

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

APPENDIX B
FORMS

Sampling and Analysis Plan
Focused Remedial Investigation
Yakima Railroad Area
Yakima, Washington
Cameron-Yakima Working Group
SECOR PN: 00378-001-01
August 25, 1997

SECOR

Field Report

Field Office: ______________________

____

____

To: ______________________

____

____

____

Attn: ______________________

Page ________ of ________

Date	
Job No	Task No.
Project	
Location	
Weather	Temp.
Client	
Contractor	

Equipment Used:

Contractor Hours: Staff Hrs. Mileage:

Copies To:	Project Manager:
	Reviewed By:
	Prepared By:

SECOR *International Incorporated*
Bellevue, Washington

FACILITY ____ JOB # ____ BORING/WELL ____
LOCATION ____ SURFACE ELEVATION ____
START ____ FINISH ____ CASING TOP ELEVATION ____
LOGGED BY ____ MONITORING DEVICE ____
SUBCONTRACTOR AND EQUIPMENT ____
COMMENTS ____

PENETRATION RESULTS BLOWS 6"/6"/6"	Sample Depth Interval, feet	PID Reading	Sheen	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Depth Below Surface, feet	Well Construction Schematic
				5			5	
				0			0	
				5			5	
				10			10	
				15			15	
				20			20	
				25			25	

Boring terminated at , sampler advanced to feet.
Groundwater encountered at approximately feet during drilling.
Boring converted to a

Field Screen/Lithologic Description Sample
Preserved Sample
No Recovery
Sample Submitted for Laboratory Analysis

Groundwater Level at Time of Drilling
Static Groundwater Level
SD Sheen Detected
NS No Sheen Detected
NT Not Tested
(7.5Y 4/2) Munsell (1990) Soil Color Charts

Gradational Contact
Contact Located Approximately
Contact

Concrete
Bentonite
10/20 Colorado Silica Sand
2" PVC Blank Casing
2" PVC Screen Casing (0.010 slots)
End Cap

DWG LOCBLK23

SECOR MONITORING WELL DATA FORM

Project Number:______________________ Unit Number:______________________
Client:______________________ Samplers:____________ Date:____________
Site Location:______________________

Date	Time	Well I.D.	Elevation Top of Casing	Depth to Water	Depth to Product	Elevation Groundwater	Apparent Product Thickness	Stick Up (+) Down (-)	Depth to Bottom	Odor/Sheen	Remarks

SECOR GROUNDWATER PURGE AND SAMPLE FORM

Date________

Project Name:________________ Project No.________________ Well No.:________________

Field Personnel:________________ Static Water Level:________________

Water Level Measurement Method:________________

Time Start Purge:________________ Time End Purge:________________ Time Sampled:________________

Measuring Point Description:________________

Purge Method:________________ Purge Depth:________________

Well Volume Calculation (Fill in before purging)	Total Depth (ft)	Depth to Water (ft)	Water Column (ft)	Multiplier for Casing Diameter (in) (Circle)			Casing Volume (gal)
				2	4	6	
				0.16	0.64	1.44	

Time							
Volume Purged (gal)							
Purge Rate (gpm)							
Temperature (°C)							
pH							
Specific Conductivity (uncorrected) (μmhos)							
Turbidity/Color							
Odor/Sheen							
Depth to Water During Purge (ft)							
Number of Casing Volumes Removed							
Dewatered?							

Comments:________________

SAMPLE DATA:

Percent Recovery:________________ Depth to Water at Sampling (ft):________________

Sampling Equipment:________________

Comments:________________

Sample No.	No. of Containers	Container Type	Preservative	Field Filtration	Analysis Request (Method)	Comments

PURGE WATER DISPOSAL NOTES:

Total Discharge (gal):________ Disposal Method:________ Drum Designation(s)/Volume:________

Comments:________________

WELL HEAD CONDITIONS CHECKLIST (Circle YES or NO – if NO, add comments)

Well Security Devices OK (Bollards, Christy Lid, Casing Lid and Lock)?: YES NO

Inside of Well Head and Outer Casing Dry?: YES NO

Well Casing?: YES NO

Comments:________________

FRM\GWPRGSPL.FRM

Chain-of Custody Number:

SECOR Chain-of Custody Record

Field Office: ______

Address: ______

☐ Additional documents are attached, and are a part of this Record.

Job Name: ______

Locaton: ______

Project # ______ Task # ______

Project Manager ______

Laboratory ______

Turnaround Time ______

Sampler's Name ______

Sampler's Signature ______

				Analysis Request															
Sample ID	Date	Time	Matrix	HCID	TPHg/BTEX/WTPH-G 8015 (modified)/8020	TPHd/WTPH-D 8015 (modified)	TPH 418.1/WTPH 418.1	Aromatic Volatiles 602/8020	Volatile Organics 624/8240 (GC/MS)	Halogenated Volatiles 601/8010	Semi-volatile Organics 625/8270 (GC/MS)	Pesticides/PCBs 608/8080	Total Lead 7421	Priority Pollutant Metals (13)	TCLP Metals			Comments/ Instructions	Number of Containers

Special Instructions/Comments:

Relinquished by: ______
Sign ______
Print ______
Company ______
Time ______ Date ______

Received by: ______
Sign ______
Print ______
Company ______
Time ______ Date ______

Relinquished by: ______
Sign ______
Print ______
Company ______
Time ______ Date ______

Received by: ______
Sign ______
Print ______
Company ______
Time ______ Date ______

Sample Receipt	
Total ro. of containers:	
Chain of custody seals:	
Rec'd. in good condition/cold:	
Conforms to record:	

Client: ______

Client Contact: ______

Client Phone: ______

SECOR CUSTREC Rev. 1/95

Date: __/__/__ Page ____ of ____

NORTH
CREEK
ANALYTICAL
Environmental Laboratory Services

CLIENT ____________________

PROJECT ____________________

SAMPLE ____________________

DATE ____________ TIME ____________

UNPRESERVED

WASTE MATERIAL

- Warning: Do not open or move without prior approval from Consultant/Contractor. Contents may be hazardous or flammable.
- LABORATORY ANALYSIS IN PROGRESS
- Store #: ____________________
- Address: ____________________
____
- Contents: ____________________
____
- Boring or Well #/depth: ____________________
____
- Operation: ____________________
- Accumulation Date: ____________________
- Consultant or Contractor/Phone Number: ____________________
____

Note: Contents of this container have not yet been classified and must be managed as Hazardous Waste until classified. This container cannot be shipped until classification is complete (as indicated by either a Hazardous or Non-Hazardous label on the container).

201595 9-94

WASTE INVENTORY TRACKING SHEET

Page ____/____

Site Name: ____________________
Site Address: ____________________
____
Reason For Site Visit: ____________________
____

Date of Inventory: ____________________
Field Personnel: ____________________
____
____
____

Container I.D.	Fullness	Contents	Date(s) Accumulated	Labeled (Y/N)	Sampled (Y/N)	Comments

NOTES: Contents should be specified and include identification of well/boring, media, source, depth of soil (if applicable), and any other applicable information.

FORMS4:DRUMINV.FRM

ATTACHMENT C
QUALITY ASSURANCE PROJECT PLAN

Work Plan, Remedial Investigation
Yakima Railroad Area
Yakima, Washington
SECOR PN: 00378-001-01
August 25, 1977

QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION
YAKIMA RAILROAD AREA
YAKIMA, WASHINGTON

SECOR JOB NO. 00378-001-01

Submitted by
SECOR International Incorporated

for
Cameron-Yakima Working Group
c/o Mr. Mark Valentine
de maximis, inc.
705 Second Avenue, Suite 802
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August 25, 1997

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Clifford T. Schmitt, R.G.
Senior Project Manager

Peter Jewett
Principal Engineering Geologist

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APPENDIX

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) identifies data quality objectives and standard operating procedures to be implemented during interim actions and a remedial investigation (RI) to be conducted at the Yakima Railroad Area (YRRA) located in Yakima, Washington. This QAPP and all work to be performed during the Remedial Investigation (RI) will be conducted in accordance with Agreed Order No. DE95TC-C212 and *The Model Toxics Control Act Cleanup Regulation* (MTCA), Washington Administrative Code (WAC) Chapter 173-340. The purpose of this QAPP as stated in the Washington State Department of Ecology's (Ecology) *Guidance and Specifications for Preparing Quality Assurance Project Plans* is to:

- Help the project manager and project team focus on the factors affecting data quality during the planning stage of the project;
- Facilitate communication among field, laboratory and management staff as the project progresses; and
- Provide a record of the project to facilitate final report preparation.

To insure that the data quality objectives are achieved, this QAPP details aspects of sample collection and analysis including: sample collection procedures, analytical methods, quality assurance/quality control (QA/QC) procedures, and data quality reviews. This QAPP describes both quantitative and qualitative measures of data quality which will be obtained to assure that data quality objectives are achieved.

1.1 DEFINITION OF THE FACILITY

The YRRA, as defined by Ecology, consists of approximately six square miles of predominantly industrial and commercial property that parallels the railroad corridor on the east side of Yakima, Washington (Figure 1 and 2). The four-mile-long railroad corridor trends diagonally from Lincoln Avenue in the northwest to Ahtanum Road in the southeast (Figure 2). The YRRA consists of a broad, gently sloping plain located west of the Yakima River. The ground surface slopes from northwest to southeast with maximum elevation of 1,080 feet above mean sea level (msl) at Lincoln Avenue to elevations of less than 960 feet above msl near Ahtanum Road in Union Gap (Woodward-Clyde, 1996).

1.2 BACKGROUND INFORMATION

This section summarizes the SECOR team's understanding of the YRRA background pertinent to the proposed scope of work. To date, Ecology has identified approximately 19 current or suspected source areas for tetrachloroethylene (PCE) contamination in the approximately 6 square mile YRRA. Of these, approximately 13 sites have either initiated or are planning to initiate groundwater and soil investigations that are required to produce area 1 and vertical information regarding the distribution of PCE within the next year. To date, only four sites have provided data to Ecology.

Ecology has identified approximately 200 reports in their files pertaining to investigations in the YRRA. Ecology states that pre-1985 reports have been moved to micro-fiche and were not included in this inventory. Also, this inventory was apparently conducted in mid-1994 and is not current.

Ecology has constructed a database of their report inventory. Each report is flagged if it contains analytical data. Reportedly, over half of the analytical data is from one site (U-Haul). Ecology does not appear to be identifying analytical data by media sampled or representativeness, which limits the utility of the existing database.

The Cameron-Yakima Working Group (the Group) was issued a Consent Decree by Ecology that requires the Group to conduct a regional RI to address tetrachloroethylene (PCE) impacts to groundwater in the approximately six square mile YRRA. The Consent Decree requires the Group to install 28 groundwater monitoring wells, sample the new wells and 14 existing wells for PCE, and conduct a pump test at two locations in the YRRA. It requires the Group to submit a draft RI Work Plan which includes a QAPP, Sampling and Analysis Plan (SAP), and Health and Safety Plan (HASP) prior to conducting the field investigation. The Group has developed the Scope of Work presented in the RFP to initiate a response to the Consent Decree.

1.3 PROJECT OBJECTIVES

The key objectives of this work are to efficiently and effectively:

- Evaluate the regional groundwater flow regime in the vicinity of the YRRA;
- Evaluate the extent of and potential receptors to PCE in groundwater in the vicinity of the YRRA;
- Present the results in an RI report in accordance with Ecology MTCA WAC Chapter 173-340-400.

1.4 VICINITY DESCRIPTION

The YRRA, as defined by Ecology, consists of approximately six square miles of predominantly industrial and commercial property that parallels the railroad corridor on the east side of Yakima, Washington. The four-mile-long railroad corridor trends diagonally from Lincoln Avenue in the northwest to Ahtanum Road in the southeast. The YRRA consists of a broad, gently sloping plain located west of the Yakima River. The ground surface slopes from northwest to southeast with maximum elevation of 1,080 feet above mean sea level (msl) at Lincoln Avenue to elevations of less than 960 feet above msl near Ahtanum Road in Union Gap (Woodward-Clyde, 1996).

2.0 PROJECT ORGANIZATION

The Facility involves multiple potential liable parties (PLPs) associated with several potential source areas. Several of the PLPs have organized a group, the Cameron-Yakima Working Group (the Group), to conduct the RI. The primary contact for the Group is:

Mr. Mark Valentine
de maximis, inc.
705 Second Avenue, Suite 802
Seattle, Washington 980104

The Group has contracted with SECOR to conduct the RI. The project manager and primary contact for SECOR is:

Clifford T. Schmitt, R.G.
SECOR International Incorporated
15400 SE 30th Place, Suite 100
Bellevue, WA 98007
(425) 641-9900 FAX (425) 641-9092

Ecology is acting as the lead public agency for the project. The primary contact for Ecology is:

Rick Roeder
Site Manager
Central Regional Office
Toxics Cleanup Program
106 South 6th Avenue
Yakima, Washington 98902
(509) 454-7834

3.0 DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) for this project will be used to develop and implement procedures to ensure that data of sufficient quality to assess the need for remedial action, and if needed, plan and evaluate remedial actions. All observations and measurements will be made and recorded in such a manner as to yield consistent results representative of the media and conditions observed and/or measured. Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, natural variation at a sampling point, or an environmental condition. Representativeness will be achieved through strict adherence to the SAP. Goals for representativeness will be met by ensuring that sampling locations are selected properly and that a sufficient number of samples are collected.

The quality of the laboratory data will be assessed by precision, accuracy, representativeness, comparability, and completeness (the "PARCC" parameters). Definitions of these parameters and the applicable quality control procedures are described in Subsections 3.1 through 3.5 of the QAPP. Quantitative DQOs for applicable parameters (e.g., precision, accuracy, completeness) are provided following each definition. Laboratory DQOs have been established by the analytical laboratory and are specified in the analytical laboratory Quality Assurance Program provided in Appendix A.

3.1 PRECISION

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of two or more measurements compared to their average values. Precision is calculated from results of duplicate sample analyses. Precision is quantitatively expressed as the relative percent difference (RPD), and is calculated as follows:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100$$

Where:

RPD = relative percent difference

C_1 = larger of the two duplicate results (i.e., the highest detected concentration)

C_2 = smaller of the two duplicate results (i.e., the lowest detected concentration)

Quantitative RPD criteria for laboratory duplicate results have been developed by the U.S. Environmental Protection Agency (EPA) for inorganic analysis. The criteria are $\pm$ 20 percent for water samples and $\pm$ 35 percent for soil. There are no specific RPD criteria for organic analyses.

3.2 ACCURACY

Accuracy is a measure of the closeness (bias) of the measured value to the true value. The accuracy of chemical analyses results is assessed by "spiking" samples in the laboratory with known standards (surrogates or matrix spikes of known concentration) and determining the percent recovery. The accuracy is measured as the percent recovery (%R) and is calculated as follows:

$$\%R = \frac{(M_{sa} - M_{ua})}{C_{sa}} x\ 100$$

Where:

$\%R$ = percent recovery

M_{sa} = measured concentration in spiked aliquot

M_{ua} = measured concentration in unspiked aliquot

C_{sa} = actual concentration of spike added

Laboratory matrix spikes and surrogates will be carried out at the analytical laboratory in accordance with SW-846 requirements for organic and inorganic analyses. Quantitative percent recovery criteria have been developed by the EPA for laboratory matrix spikes for inorganic analysis. The criteria are 75 to 125 percent, when the sample concentration exceeds the spike concentration by a factor of four or more. There are no specific accuracy criteria for organic analyses. Where the EPA and Ecology have not provided data validation guidelines, laboratory derived control limits will be used to assess surrogate recovery and matrix spike results.

The accuracy of sample results can also be affected by sample contamination. Sample contamination can occur because of improperly cleaned sampling equipment, exposing samples to high chemical concentrations in the field or during transport to the laboratory, or because of high chemical concentrations in the laboratory. To ascertain that the samples collected are not contaminated, several types of blank samples will be analyzed.

3.2.1 Equipment Rinsate Blanks

Equipment rinsate blanks, consisting of analyte-free water which has been used as a final rinse of sampling equipment (following equipment decontamination), will be used to determine if sample contamination occurred as a result of improperly cleaned sampling equipment. Where decontamination is required (e.g., soil sampling equipment), the number of equipment rinsate blanks will be at least five percent of the total number of samples collected or one per day, whichever is greater.

3.2.2 Trip Blanks

Trip blanks, consisting of analyte-free water provided by the laboratory, will accompany samples collected for analysis of volatile organic compounds (VOCs) (e.g., tetrachloroethylene [PCE]). Trip blanks will follow the sample containers from the laboratory to the field and be returned to the lab with collected samples. The purpose of trip blanks will be to assess potential contamination of samples by volatile organics during transport in the field, transport to the laboratory, and from sample handling within the laboratory. A trip blank will be included in each lot of samples sent to the analytical laboratory which contains samples intended for analysis of PCE.

3.2.3 Laboratory Method Blanks

The laboratory will run method blanks at a minimum frequency of 5 percent or one per batch to assess sample contamination within the laboratory. Laboratory blanks are discussed in the Quality Assurance Program provided in Appendix A.

3.3 REPRESENTATIVENESS

Representativeness is a qualitative measure of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sampling collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to assure the results obtained are representative of site conditions. These issues are addressed in detail in the SAP and this QAPP.

3.4 COMPLETENESS

Completeness is defined as the percentage of measurements judged to be valid. Results will be considered valid if they are not rejected during data validation (see Section 5.0 Data Reduction, Validation and Reporting). Completeness © is calculated as follows:

$$C = \frac{(Number\ of\ Valid\ Measurements)}{(Total\ Number\ of\ Measurements)} \times 100$$

The target completeness goal for this work will be 90 percent for a given analysis.

3.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The use of standard EPA and Ecology methods and procedures for both sample collection and laboratory analysis will make data collected comparable to both internal and other data generated.

4.0 SAMPLING PROCEDURES

Procedures that will be used to collect, preserve, transport and store samples are described in the Yakima Railroad Area-Cameron-Yakima Project SAP, included as Appendix A of the Work Plan.

5.0 ANALYTICAL PROCEDURES

Chemical and physical analyses to be conducted during this project are discussed in the Yakima Railroad Area-Cameron-Yakima Project SAP, included as Appendix A of the Work Plan.

6.0 DATA MANAGEMENT, REDUCTION, REVIEW AND REPORTING

This section outlines procedures to be followed for the inventory, control, storage, and retrieval of data collected during performance of the Yakima Railroad Area, Cameron-Yakima Project RI. The procedures contained in this plan are designed to ensure that integrity of the collected data is maintained for subsequent use. Moreover, project tracking data (e.g., schedules and progress reports) will be maintained to monitor, manage, and document the progress of this investigation.

SECOR will maintain the project files according to the procedures outlined in this document and the Agreed Order. As stated in the Agreed Order all records will be maintained for 10 years. Data generated during field activities and by laboratory analyses will be submitted directly to SECOR. Laboratory documentation from the analytical laboratories will be maintained in SECOR's project file for purposes of validating analytical data collected during the investigation.

6.1 DATA TYPES

A variety of data will be generated by this investigation, including sampling and analytical data, aquifer test data, review of published reports, and calculation results based on mathematical expressions. Where possible, laboratory analytical data and survey data will be transmitted from subcontractors to SECOR on a computer diskette in addition to a hard copy. This will facilitate the subsequent validation and analysis of these data while avoiding transcription errors that may occur with computer data entry.

6.2 DATA TRANSFER

Procedures controlling the receipt and distribution of incoming data packages to SECOR and outgoing data reports from SECOR are outlined below.

6.2.1 Receipt of Data and Reports

The incoming documents will be date stamped and filed as follows. Correspondence and transmittal letters for all reports, maps, and data will be filed chronologically. Data packages, such as those from field personnel, driller, laboratories, and surveyors (such as water data, water-level data, aquifer test data, etc.), will be filed by project task, subject heading, and date, such as water quality data, water-level data, and aquifer test data. If distribution is required, the appropriate number of copies will be made and distributed to appropriate persons or agencies. The original document will not be distributed to project personnel.

6.2.2 Outgoing Data and Reports

A transmittal sheet will be attached to all project data and reports sent out. A copy of each transmittal sheet will be kept in the project file. All outgoing reports and maps will be reviewed by the Project Manager.

6.3 DATA INVENTORY

Procedures for filing, storage, and retrieval of project data and reports are discussed below.

6.3.1 Document Filing and Storage

As previously discussed, project files, and raw data files will be maintained at SECOR. Files will be organized by project tasks or subject heading, and maintained by the document control clerk.

6.3.2 Access to Project Files

Access to project files will be controlled and limited to the Cameron-Yakima Working Group and SECOR personnel. Project documents will be listed according to task. Project documents will be assigned a document control number and a log will be maintained for all documents contained in the file. When a file is removed for use, a sign-out procedure will be used to track custody.

If a document is to be used for a long period, a copy will be used, and the original will be returned to the project file.

6.4 DATA REDUCTION AND ANALYSIS

The Project Manager and Project QA/QC Officer are responsible for data review and validation. Data validation parameters are outlined in Section 3.0. The analysis of the project data is likely to require data reduction for the preparation of tables, charts, and maps, etc. To ensure that data are accurately transferred during the reduction process, all reduced data will be checked by someone other than the person that prepared the map, table, or chart. All items checked will be initialed and dated. Any incorrect transfers of data will be highlighted and changed.

The particular type of analyses and presentation method selected for any given data set will depend on the type, quantity, quality, and prospective use of the data in question.

6.4.1 Data Reporting Formats

The physical and chemical characterization information developed for soils and water at the Site in connection with the RI will be presented in the final report in the following format.

6.4.1.1 Summary Tables

The laboratory reports will be sorted according to various parameters to summarize the information for easier assimilation and presentation. Groundwater data will be sorted several ways, including by well number, constituent, and date of sample collection. The parameters chosen for sorting will depend on the determination of the most appropriate format, and the utility of that format in demonstrating the physical and chemical characteristics of interest.

6.4.1.2 Graphs

Line graphs will be used to display the relationship of certain chemical and physical parameters with respect to time. Examples of such graphs (also known as X-Y graphs) include:

- Water-level fluctuations in monitoring wells with respect to time.

- Concentration changes of selected chemical constituents in monitoring wells with time or distance.

6.4.1.3 Maps

Plan maps needed to illustrate results of the RI will be assembled or prepared. They may include, but are not limited to:

- Groundwater elevation contour maps in plan section (both water table and piezometric).
- Plan maps of the site showing chemical concentration for individual chemicals and groups of chemicals.

6.4.1.4 Cross-Section

Vertical profiles, or cross-sections, may be generated from field data to display site stratigraphy, hydrogeologic properties, and vertical and lateral extent of waste constituent in groundwater.

6.5 TELEPHONE LOGS AND MEETING NOTES

All notes from project meetings and telephone conversations will be maintained by personnel assigned to the project. These notes will be retained by project personnel until the conclusion of the project when they will be filed with the other project documents.

7.0 QUALITY CONTROL PROCEDURES

7.1 FIELD QUALITY CONTROL

Field Quality Control samples (e.g., duplicate samples and trip blanks) to be collected during this project are described in the SAP (Appendix A of the Work Plan). The purpose of these samples was also discussed in Section 3.0 of this QAPP.

7.2 LABORATORY QUALITY CONTROL

Analytical laboratory quality assurance/quality control procedures are provided in the laboratory Quality Assurance Program in Appendix A of this QAPP.

7.3 DATA QUALITY CONTROL

All data will undergo two levels of quality assurance/quality control evaluation: one by the laboratory and one by SECOR.

Initial data reduction, evaluation, and reporting will be performed by the laboratory as specified in the laboratory Quality Assurance/Quality Control (QA/QC) Project Plan (Appendix A of this QAPP.

The analytical data will then be validated at SECOR under supervision of a qualified project QA/QC individual. The following types of quality control information will be reviewed, as appropriate:

- Method deviations;
- Sample extraction and holding times;
- Detection limits;
- Blank samples (rinsate, trip and laboratory method);
- Duplicate samples;
- Matrix spike/matrix spike duplicate samples;
- Surrogate recoveries; and
- Percent completeness.

SECOR will review field records and results of field observations and measurements to insure procedures were properly performed and documented. The review of field procedures will include:

- Completeness and legibility of field logs;
- Preparation and frequency of field quality control samples;
- Equipment calibration and maintenance; and
- Chain-of-Custody forms.

8.0 PERFORMANCE AND SYSTEM AUDITS

Performance audits will be completed for both sampling and analysis work. Field performance will be monitored through regular review of chain-of-custody forms, field notebooks, and field measurements. Periodic on-site review of work in progress will also be performed by the Project Manager and/or the Project QA/QC Officer.

Accreditations received for each analysis by the analytical laboratory from Ecology demonstrates the laboratory's ability to properly perform the requested methods. Therefore, a system audit of the analytical laboratory during the course of this project will not be conducted.

The Project Manager and/or Project QA/QC Officer will oversee communication with the analytical laboratory on a weekly basis (at a minimum) while samples are being processed and analyzed at the laboratory. This will allow SECOR to assess progress toward obtaining the data quality objectives, and to take corrective measures as problems arise.

Corrective measures will be the joint responsibility of the Project Manager and the Project QA/QC Officer. Corrective measures can include:

- Identifying the source of the violation;
- Re-analyzing samples if holding time criteria permit;
- Re-sampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and/or
- Qualifying data to indicate the level of uncertainty.

In addition the analytical laboratory will be responsible to identify, communicate to the Project Manager or Project QA/QC Officer, and correct (as appropriate) any performance standards as listed above and discussed in their QA/QC Plan.

9.0 PREVENTIVE MAINTENANCE

Operation and Maintenance manuals will accompany all field sampling and measurement equipment. Included in these manuals will be procedures for start-up, calibration and system checks. All maintenance activities will be documented in field logs and/or equipment log books. A schedule of preventive maintenance activities will be maintained. In addition, spare parts and tools will be included in each equipment storage case to minimize equipment downtime.

10.0 DATA ASSESSMENT PROCEDURES

The Project Manager and Project QA/QC Officer are responsible for data review and validation. Upon receipt of each data package from the laboratory, calculations using the equations presented for precision, accuracy and completion will performed. Results will be compared to qualitative DQOs. Data validation parameters are outlined in Section 3.0 of this QAPP.

11.0 CORRECTIVE ACTION

Corrective actions will be the joint responsibility of the Project Manager and the Project QA/QC Officer. Corrective procedures can include:

- Identifying the source of the violation;
- Re-analyzing samples if holding time criteria permit;
- Re-sampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and/or,
- Qualifying data to indicate the level of uncertainty.

During field operations and sampling procedures, the Project Manager and field team members will be responsible for identifying and correcting equipment malfunctions. All equipment malfunctions and corrective actions taken will be documented in the field notes. Corrective actions will be the joint responsibility of the Project Manager and the Project QA/QC Officer. Corrective procedures can include:

- Identifying the source of the violation;
- Re-analyzing samples if holding time criteria permit;
- Re-sampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and/or,
- Qualifying data to indicate the level of uncertainty.

During field operations and sampling procedures, the Project Manager and field team members will be responsible for identifying and correcting equipment malfunctions. All equipment malfunctions and corrective actions taken will be documented in the field notes.

12.0 QUALITY ASSURANCE REPORTS

The final RI report will include a quality assurance section which summarizes data quality information. This summary will include:

- Assessment of data accuracy and completeness;
- Results of performance and/or system audits; and,
- Significant quality assurance problems and their impacts on the DQOs.

APPENDIX A
LABORATORY QUALITY ASSURANCE PROGRAM

Quality Assurance Project Plan
Remedial Investigation
Yakima Railroad Area
Yakima, Washington
Cameron-Yakima Working Group
SECOR PN: 00378-001-01
August 25, 1997

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

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SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Quality Assurance Program

Revision 8

May, 1996

Approvals:

Name: Dennis Wells
Title: Vice President Quality and Technical Services

Signature: Dennis Wells **Date:** 5/3/96

Name: Ricardo Marroquin
Title: Vice President Business Development and Marketing

Signature: **Date:** 5/3/96

Name: Scot Cocanour
Title: President - Laboratory Director

Signature: Scot Cocanour **Date:** 5/3/96

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 ▪ (206) 481-9200 FAX 485-2992
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NORTH CREEK ANALYTICAL

Quality Assurance Program Internal Distribution List
Revision 8
May 1996

Copies of the QA Manual are provided to each department of the laboratory. The following is a list of responsible individuals in each department who have received copies of the QA Manual. On-going distribution lists for controlled and uncontrolled copies of the Manual are maintained in the QA Director's office.

Bothell and Spokane Facilities

NAME	DEPARTMENT	DATE DISTRIBUTED
Dennis D. Wells	Quality Assurance	5/15/96
Scot Cocanour	Management	5/15/96
Ricardo Marroquin	Marketing	5/15/96
Laura Dutton	Project Management	5/15/96
Shannon Stowell	Project Management	5/15/96
Matt Essig	Project Management	5/15/96
Dana Heinz	Sample Receiving	5/15/96
Steve Kouri	Data Validation	5/15/96
Dan Harmon	GC/MS	5/15/96
Dave Vandel	Inorganics	5/15/96
Jack Cooper	Extraction Lab	5/15/96
Sandy Keyes	Microbiology	5/15/96
Jeff Wright	Wet Chemistry	5/15/96
Russ Lister	GC Volatiles	5/15/96
Kim Hansen	Administration	5/15/96
Scott Armand	Spokane Lab	5/15/96
Melinda Siebel	Semivolatiles GC	5/15/96

Portland Facility

NAME	DEPARTMENT	DATE DISTRIBUTED
Susan Schimelfining	Quality Assurance	5/15/96
Philip Nerenberg	Management	5/15/96
Howard Holmes	Project Management	5/15/96
Joy Chang	Project Management	5/15/96
William Littell	GC Volatiles	5/15/96
Delores Johnson	Administration	5/15/96
Sara Cole	Sample Receiving	5/15/96
Leland Samuelson	GC Semivolatiles	5/15/96
Ken Yeomans	GC/MS	5/15/96
Marshall Pattee	Inorganics	5/15/96
Dineen Voss-Smith	Extraction Lab	5/15/96
Kent Patton	Marketing	5/15/96
Pam Black	Wet Chemistry	5/15/96

1.0 INTRODUCTION

1.1.0 Quality Assurance Policy Statement

The North Creek Analytical (NCA) Quality Assurance Program (QAP) is a company wide network of policies and procedures designed to ensure that data produced by the company conforms to the highest standards set by state and federal regulations. The network functions at the management level through company goals and management policies. It functions at the analytical level through standard operating procedures and quality control. These two levels are spanned by data control and data review. The result is a data package of known and documented quality, that is accurate, reproducible, highly useful and legally defensible.

1.2.0 Scope

North Creek Analytical, Inc. requires the application of sound QA/QC principles to all aspects of data generation from the initial planning of a project through field activities, sample container preparation, sample receipt, analysis and, ultimately, the assembly and review of the final data report.

This QA Program not only determines the precision and accuracy of the analytical data, but also confirms, by documentation, all phases of sample handling, analysis, data acquisition, report preparation and report review.

North Creek Analytical analyzes thousands of environmental and industrial samples every month. Chemical, physical, and biological parameters must often be measured on the same sample. To meet this need, the Quality Assurance Program must be able to accommodate the complications implicit in the analysis of many samples of widely varying matrices.

1.3.0 Purpose

The Quality Assurance Program provides a means by which the integrity of data can be verified. Because industrial, engineering, and environmental decisions are based on the data produced, that information must have clear and extensive verification procedures. Accuracy, precision, completeness, comparability and representativeness of a data package all verify the integrity of the analysis.

Finally, the Quality Assurance Program is the format through which North Creek Analytical can express its goals, policies, and commitment to generating the highest quality data. We believe quality assurance is an identifiable, documented activity to be given sufficient time, equipment, and personnel to meet each project's data quality goals.

1.4.0 Goals

North Creek Analytical is dedicated to producing a broad range of high-quality data at a reasonable cost and to providing a convenient service to our clients. The company's organization, management policies, resources, and routine activities are all designed to meet these goals. The Quality Assurance Program operates within this framework of Corporate goals to achieve the following specific quality objectives:

- to ensure that all services provided meet the high quality and reliability standards of North Creek Analytical.
- to provide effective guidance for the verification of characteristics of all services that produce data of known quality.
- to provide a mechanism to continually monitor the use and effectiveness of the QA Program.
- to provide a mechanism for recommending improvements in all areas of NCA operations where quality may be affected.
- to assure that control measures applied to all factors having a bearing on the final results are adequately documented.
- Comparability- to ensure that results of similar activities conducted by different parties are comparable through the rigorous application of industry standard methodologies and to ensure that results of similar activities conducted at North Creek Analytical over varying periods of time are comparable through the rigorous application of consistent internal protocols.
- Representativeness- to ensure that the methodologies selected for a project will yield results that are representative of the parameters to be measured and to ensure that the sample handling techniques selected for an analysis will yield results representative of that matrix.

1.5.0 Statement of Compliance

The NCA Quality Assurance Program has been prepared to be consistent with the requirements of the following guidance documents:

1. QAMS-004/80, *Guidelines for Preparing Quality Assurance Program Plans*, EPA-600/8-83-024, June 1983.

2. QAMS-005/80, *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, EPA, February 1983.

3. EPA-600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories*, EPA, March 1979.

4. EPA SW-846, *Test Methods for the Evaluation of Solid Waste*, 3rd Edition, Rev. 2,1994.

5. EPA 910/9-92-032, *Guidance on Preparation of Quality Assurance Plans, 10/92.*

6. ISO/IEC Guide 25, *General requirements for the competence of calibration and testing laboratories.*

7. EPA QA/R-2, *EPA Requirements for Quality Management Plans, August*, 1994.

8. EPA QA/R-5, *EPA Requirements for QAPPs for Environmental Data Operations*, 1994

2.0 ORGANIZATION AND RESPONSIBILITY

The following are brief descriptions of responsibilities for key personnel:

Laboratory Director

The Laboratory Director is responsible for all laboratory activities. The Laboratory Director's work includes selecting and promoting technical staff, purchasing major instruments, and interpreting analytical methods. Ultimately, the Laboratory Director is responsible for quality assurance procedures and the overall quality of laboratory results.

Laboratory Manager

The Laboratory Manager is responsible for day-to-day operations of the laboratory. Responsibilities include: asset allocation, setting priorities, interpretation and data review, overseeing technical aspects of laboratory and other managerial responsibilities.

Quality Assurance Manager

The Quality Assurance Manager is responsible for implementing, reviewing and assuring conformance with the laboratory's Quality Assurance Program, implementing quality control procedures, and performing internal checks and audits.

Quality Assurance Coordinator

The QA Coordinator is responsible for day-to-day administration of QA/QC activities at a specific location. QA Coordinators collect and summarize QC data, oversee PE sample analysis, collect and evaluate non-conformance reports, review data, control QA documentation such as SOPs and assist the QA Manager in assuring conformance to the laboratory Quality Assurance Program.

Project Manager/Department Manager

Project Managers are responsible for interacting with clients to ensure that clients' needs are met and for setting appropriate priorities for analytical work. Project Managers also check all data reports before releasing them to a client. Department Managers oversee the activities of a particular department to ensure that adequate personnel, equipment time and other company resources are allocated to specific project's analytical demands.

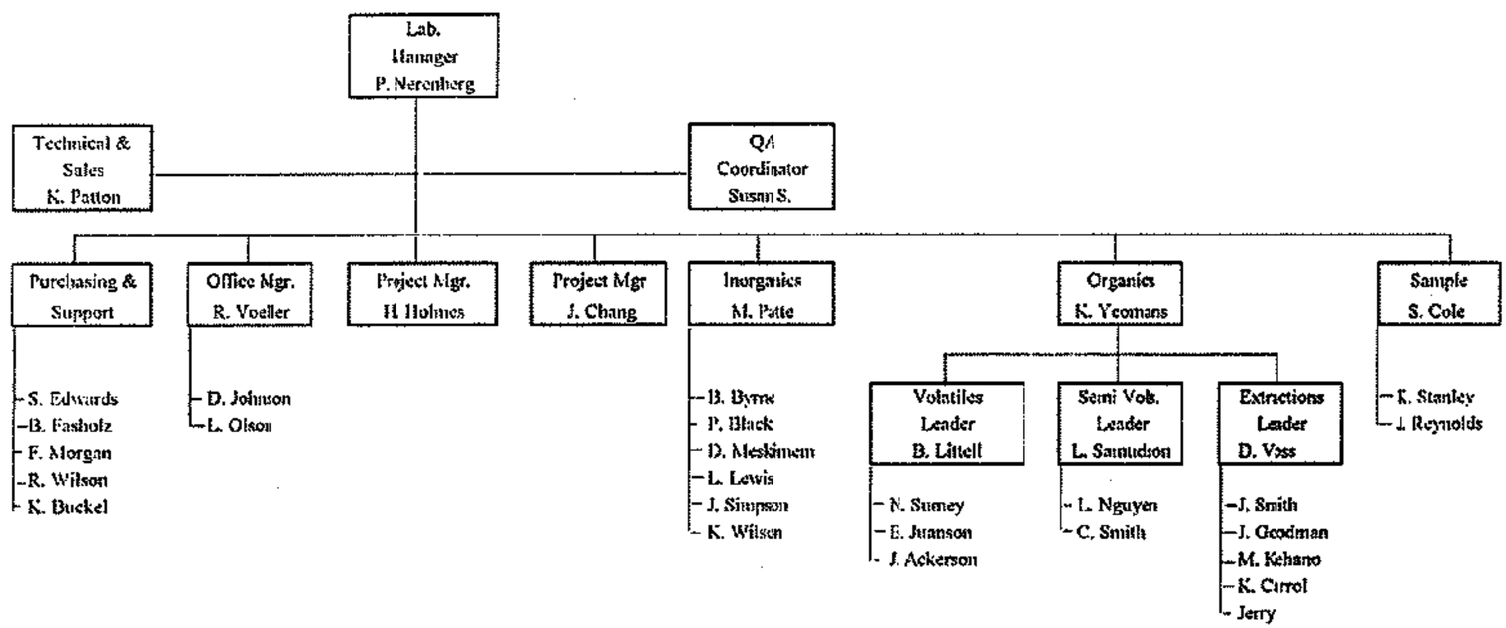
Health and Safety Officer

The Health and Safety Officer is responsible for implementing and overseeing the Health and Safety Program. These duties include routine internal health and safety audits of the facility, as well as management of the Chemical Hygiene Plan.

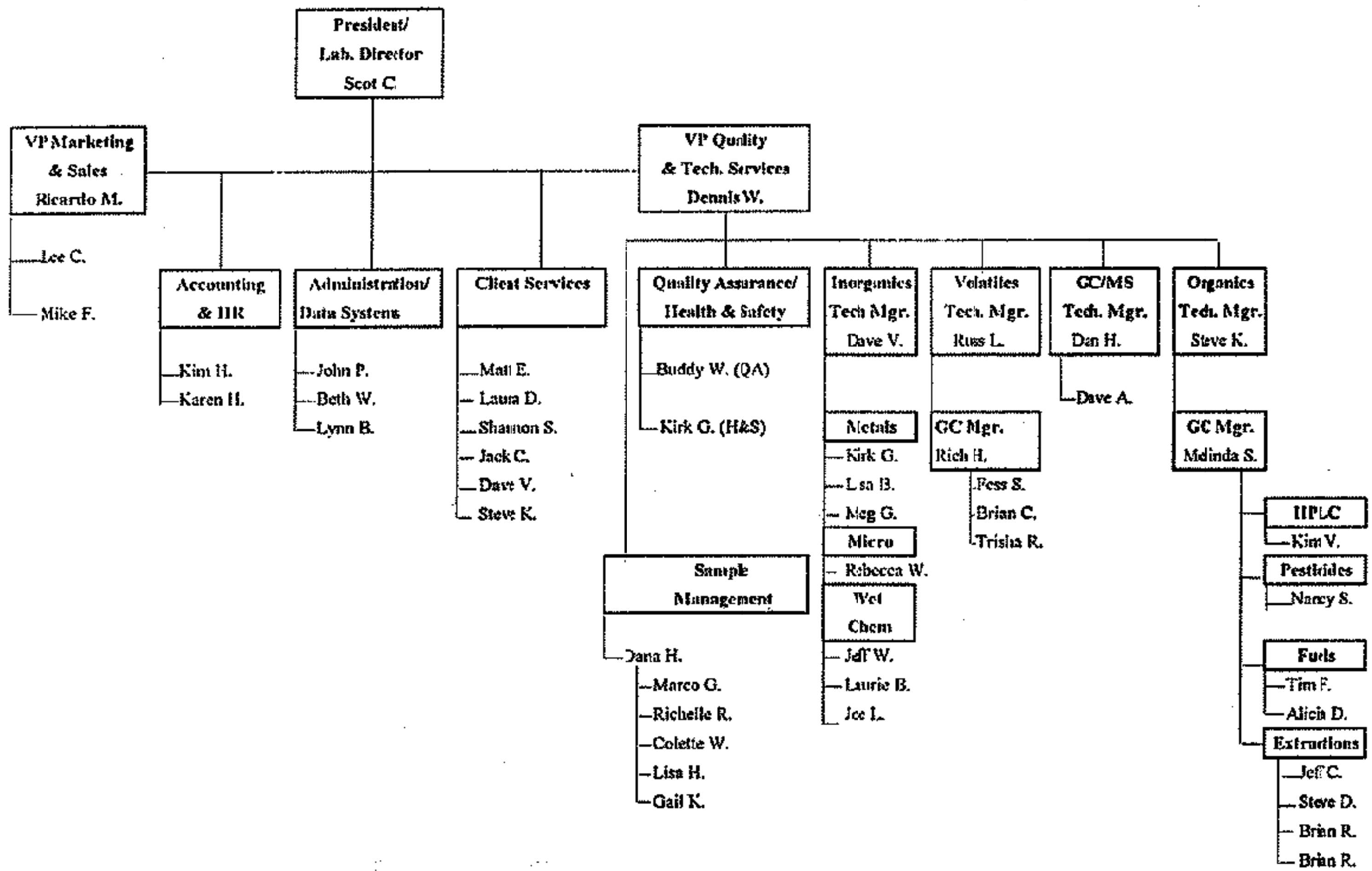
Figure 1
Organizational Charts

1. Bothell Laboratory
2. Portland Laboratory
3. Spokane Laboratory

NORTH CREEK ANALYTICAL, PORTLAND
ORGANIZATIONAL CHART

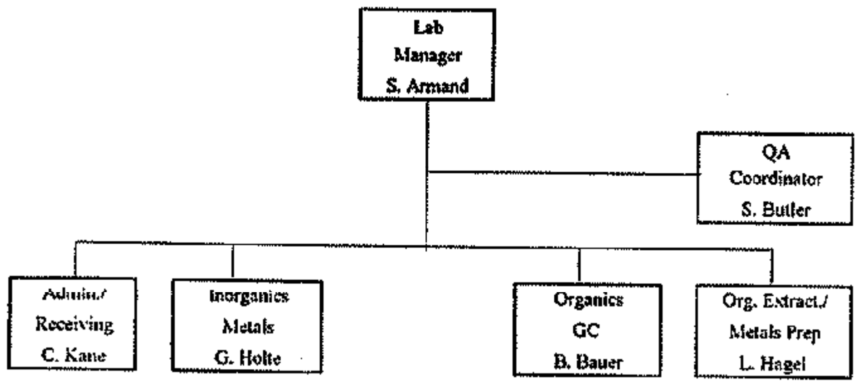


NORTH CREEK ANALYTICAL, Bothell
ORGANIZATIONAL CHART



NCAORG96.xls

NORTH CREEK ANALYTICAL, SPOKANE
ORGANIZATIONAL CHART



Sample Management Personnel

Sample Management personnel are responsible for receiving and logging-in samples delivered to North Creek Analytical. They record the condition of the samples, maintain a chain of custody, assign laboratory numbers and record them in a sample logbook. They also ensure that samples are preserved properly, are delivered in appropriate containers, are present in sufficient quantity for analysis, and are stored properly. If the sample received is not appropriate, the client will be notified immediately by the project manager.

Analyst

As the primary staff member position, an Analyst is responsible for all steps in the assigned analytical procedures. This laboratory assignment includes overseeing sample preservation and preparation, performing analysis, and reporting results. An Analyst must adhere to all quality control procedures specified in the analytical method for each parameter tested and must fully document these procedures. In addition, an Analyst conducts routine maintenance of equipment and ensures that laboratory supplies are sufficient for analyses.

2.1.0 QUALITY ASSURANCE MANAGEMENT

The organizational structure, functional responsibilities, levels of authority and lines of communication for management and execution of the Quality Assurance Program are outlined as follows:

2.1.1 Quality Assurance Manager - Responsibilities

- The Quality Assurance Manager (QAM) is responsible for the establishment and execution of the Quality Assurance Program (QAP) and for defining and measuring its overall effectiveness.

- The Quality Assurance Manager reports directly to the Laboratory Director assuring the authority necessary to make the Quality Assurance Program effective.

- The QA Manager shall have independence from cost and scheduling considerations. However, the QA Manager shall have sufficient authority to control production by stopping, starting or interrupting the normal processing schedule in order to rectify any nonconformance or deficiency that will impact upon the overall quality of the final results.

- The QA Manager is responsible for reviewing and revising the QA Program on a continuing basis. A formal review will take place at least once per year.

2.1.2 Quality Assurance Coordinator - Responsibilities

- The QA Coordinator is responsible for assuring day-to-day compliance with QA/QC policies as outlined in the Quality Assurance Program and laboratory SOPs.

- The QA Coordinator is responsible for collecting and organizing QC data in the laboratory.

- The QA Coordinator may assume these responsibilities on a full-time or part-time basis as required.

- The QA Coordinator is responsible for evaluating non-conformance (corrective action) reports. The QA Coordinator must notify the QA Manager, on a timely basis, of any deficiencies or non-conformances that will have a negative impact on the overall quality of the laboratory.

- The QA Coordinator will administer all in-house check sample programs and EPA Performance Evaluation Studies.

2.1.3 Quality Control - Lines of Authority

- Receipt, preparation and analysis of environmental samples is performed by analysts at the bench level. The analyst is directly responsible for the quality of the results of all analyses within their control. It is the analyst's responsibility to carry out, evaluate and document the specific Analytical Quality Control measures stated in the Quality Assurance Program, Standard Operating Procedures and individual Analytical Methods.

- Primary review of all results including QC is the responsibility of the Department Manager. It is also the responsibility of the Department Manager to assure that the proper level of Analytical Quality Control is being carried out by the analyst and that this QC is properly documented.

- Secondary review of all data including QC is the responsibility of the Project Manager. It is the responsibility of the Project Manager to assure that adequate and proper QC has been carried out to fulfill the requirements of each client's Project Plan or Contract.

Tertiary review of Quality Control data is the responsibility of the Quality Assurance Manager and QA Coordinators at each location. Through periodic surveillance of the review process and System and Performance Audits the Quality Assurance Manager and QA Coordinators assure that the review process is sufficiently meeting the requirements of the Quality Assurance Program.

3.0 CERTIFICATIONS, ACCREDITATIONS AND AFFILIATIONS

North Creek Analytical, Inc. holds accreditations/certifications at its various locations from the following private organizations and governmental departments:

A2LA - American Association for Laboratory Accreditation -
A2LA is a national accreditation agency. Their accreditation is maintained through on-site quality audits conducted by independent auditors every two years and continued acceptable performance under the U.S. EPA WP Performance Evaluation Studies. This accreditation extends to non-potable water, solids and Hazardous waste. The full Scope of Accreditation is contained in Appendix A.

WADOE - State of Washington, Department of Ecology -
This certificate is updated semi-annually and is subject to continued acceptable performance under the U.S. EPA WP Performance Evaluation Studies. This accreditation extends to non-potable water and sediments under PSDDA criteria. The full Scope of Accreditation is contained in Appendix A.

WADOH - State of Washington, Department of Health -
This certificate is updated annually and is subject to continued acceptable performance under the US EPA WS Performance Evaluation Studies. This certification extends to inorganic, organic and microbiological parameters in Drinking Water samples.

ORDOH - State of Oregon, Department of Health -
This certificate is updated annually and is subject to continued acceptable performance under the US EPA WS Performance Evaluation Studies. This certification extends to inorganic, organic and microbiological parameters in Drinking Water samples.

IDDOH - State of Idaho, Department of Health and Welfare -
This certificate is updated annually and is dependent upon reciprocity with the State of Washington, DOH.

MNDOH - State of Montana, Department of Health and Environmental Sciences -
This certificate is updated annually and is dependent upon reciprocity with the State of Washington, DOH.

ADEC - State of Alaska, Department of Environmental Conservation -
This certification extends to hydrocarbon analysis and reporting for the LUST/UST program.

USDA - U.S. Department of Agriculture -
This approval allows the laboratory to receive and transport soil samples including soils from foreign sources.

NEESA - U.S. Navy CLEAN Program

USACE - U.S. ARMY Corp of Engineers

The following chart summarizes NCA's accreditations per location:

ACCREDITATION SUMMARY

North Creek Analytical, Inc.

	Bothell	Portland	Spokane
A2LA	X	X	
WADOE	X	X	X
WADOH	X		
ORDOH	X	X	
IDDOH	X		
MNDOH	X		
ADEC	X	X	
NEESA	X		
USACE	X	X	

North Creek Analytical,Inc is a member of the following trade organizations:

IAETL - International Association of Environmental Testing Laboratories
WEIA - Washington Environmental Industry Association
SAME - Society of American Military Engineers
PEMA - Professional Environmental Marketing Association
OETA - Oregon Environmental Technology Assocciation

4.0 PROFESSIONAL STAFF

The scientific staff at North Creek Analytical are all professionals, holding either Master's or Bachelor's degrees in a variety of scientific disciplines. A complete listing of our professional staff's resumes are available for review.

4.1.0 Code of Ethics

The employees, management and ownership of North Creek Analytical are committed to the production of analytical results within an honest and ethical framework. The framework shall provide and promote the following;

- quality results that meet or exceed requirements of regulations and expectations of clients,
- a dedication to serve the analytical needs of the client supported by the integrity and the ability of the laboratory staff.
- the continuous effort to provide value and timely completion or results to the client while balanced with the need for profitability of the operation.

The laboratory management shall endeavor to reduce and prevent activities generally recognized by the laboratory industry as inappropriate or unethical. These activities include, but are not limited to;

- bias not inherent in the analytical method. The bias may be intentional or unintentional, and may be introduced by the client, the analyst or a laboratory action,
- waste, fraud and abuse in the laboratory's day-to-day activities.

4.1.1 Policy on Waste, Fraud and Abuse

Waste
North Creek Analytical, Inc. will in its operations utilize the most economical alternatives available that still meet the criteria of Quality specified in this QA Program.

Abuse
North Creek Analytical, Inc. will operate in a manner that avoids conflict of interest and that protects the environment and the health and safety of employees and the public.

Fraud
North Creek Analytical, Inc. will not tolerate fraud at any level of its operations. Incidences of willful, improper manipulation of data will be grounds for immediate dismissal.

Such incidences may include misrepresentation of analytical results, misrepresentation of date or time of analysis, misrepresentation of QC results, creation of fictitious data, manipulation of chromatographic or calibration data to enhance results and/or willful violation of a contract agreement without proper notice to the client.

All staff members are encouraged to report, in confidence, any example of fraud no matter how trivial to their supervisor or if they feel this would compromise themselves to the QA Officer and/or Lab Director. No staff member will be retaliated against in any way for reporting instances of fraud.

This policy is also posted in the NCA Employee Manual, Rev. 7.

4.2.0 Training

When reporting for work for the first time, all new analysts at North Creek Analytical receive a copy of the *North Creek Analytical Employee Policy Manual*, the *Chemical Hygiene Plan*, a copy of the *Health and Safety Manual* and a copy of the *Quality Assurance Program*. These guides are each new employee's reference material. Each new analyst must read and understand the contents of these guides then sign a document agreeing to adhere to the requirements prescribed in manuals. These records are kept on file with the Personnel Manager. Only then does further training take place.

The *Employee Policy Manual* contains information on the company's history and goals, administrative scheduling, benefits, and general administrative policies. The *Chemical Hygiene Plan* contains pertinent information about the chemicals to which employees may be exposed and how to properly handle those chemicals. The *Health and Safety Manual* contains preventative procedures to avoid emergencies, as well as procedures for coping with emergencies such as spills, injuries, and fire. The *Quality Assurance Program* contains information on the laboratory's quality assurance goals and objectives how those goals are implemented in the laboratory.

In each analytical area there is a reference binder that includes copies of the methods for which an analyst may be held responsible and all related extraction, cleanup, and dilution methods. Also included are all relevant quality control documentation, standard operating procedures, and procedures for troubleshooting and corrective action. The analyst must read and understand the contents of the binder and be able to answer questions demonstrating that understanding. Additional verbal instruction from both the experienced analyst and a quality assurance staff member provides the new analyst with a working understanding of the requirements set out by the *Quality Assurance Program* and the analytical methods.

The experienced analyst then introduces new analysts to all the instrumentation involved in their analyses. Standard operating procedures, preventative maintenance, and troubleshooting for the instrument are reviewed by both the previous and new analyst. The maintenance logbook is explained and any history specific to an instrument is reviewed by the previous and the new analyst.

Once new analysts have learned all the documentation requirements and are able to operate the instrumentation satisfactorily, they observe the analysis, gradually helping the experienced analyst at various steps in the process.

Eventually, new analysts perform the entire analysis in the presence of the previous analyst to ensure adequate proficiency. Once the new analyst has demonstrated proficiency in the

analytical procedures and has demonstrated the ability to maintain quality assurance documentation, the Quality Assurance Manager or the Department Manager reviews the results of these analyses. These records are kept on file.

To successfully complete the analyses of the known and unknown internal quality control check samples, a new analyst must submit a value that is within the acceptable range established for that check sample by the EPA. A satisfactory audit entails documenting all quality control parameters and any corrective action that may have been necessary. Pending the successful completion of the analyses of the internal quality control check samples and a successful audit, the new analyst assumes responsibility for the analysis. If the new analyst does not meet these requirements he/she continues to work with the previous analyst until both requirements are passed successfully.

Once the new analyst has assumed full responsibility for the analysis, a supervisor routinely reviews the analyst's data as part of regular data review processes at North Creek Analytical. Regular auditing by quality assurance staff members ensures continued compliance with the established Quality Assurance Program requirements set forth in this manual.

Specific guidelines and procedures for training and documentation of training are found in SOP *NCAB-2008.0 "General Training"*.

5.0 EQUIPMENT AND FACILITIES

North Creek Analytical operates three laboratory facilities in the Pacific Northwest. The company headquarters located just off I-405 in Bothell, Washington occupies a modern, 14,000-square-foot facility; a satellite laboratory in Spokane,Washington occupies a 3,000-square-foot facility and another satellite laboratory in Beaverton, Oregon occupies an 9,800-square -foot facility.

All of the facilities were designed by chemists and constructed to meet the specific needs of a modern environmental chemistry laboratory. The buildings feature separate areas for sample receiving and preparation, organic gas chromatograph (GC) analyses, organic Gas Chromatography/Mass Spectroscopy (GC/MS) analyses, inorganic analyses, microbiological analysis, bioassay, and administrative functions.

All North Creek Analytical locations are operated as secure facilities. Sample receiving and reception entrances are continually staffed to screen visitors. Laboratory, office and storage areas are restricted and visitors must be accompanied by an NCA employee at all times while in the facility.

The laboratories are designed to accommodate an efficient work flow and to provide a safe and comfortable work environment for our employees. Work areas are spacious and provide substantial amounts of natural lighting. OSHA regulations regarding required amounts of bench and fume hood space are met or exceeded. Laboratory ventilation systems are designed to quickly exchange room air so as to remove potential trace contaminants.

Ample space has been provided in all locations for refrigerated storage of samples before analysis and unrefrigerated archival storage of samples after analysis.

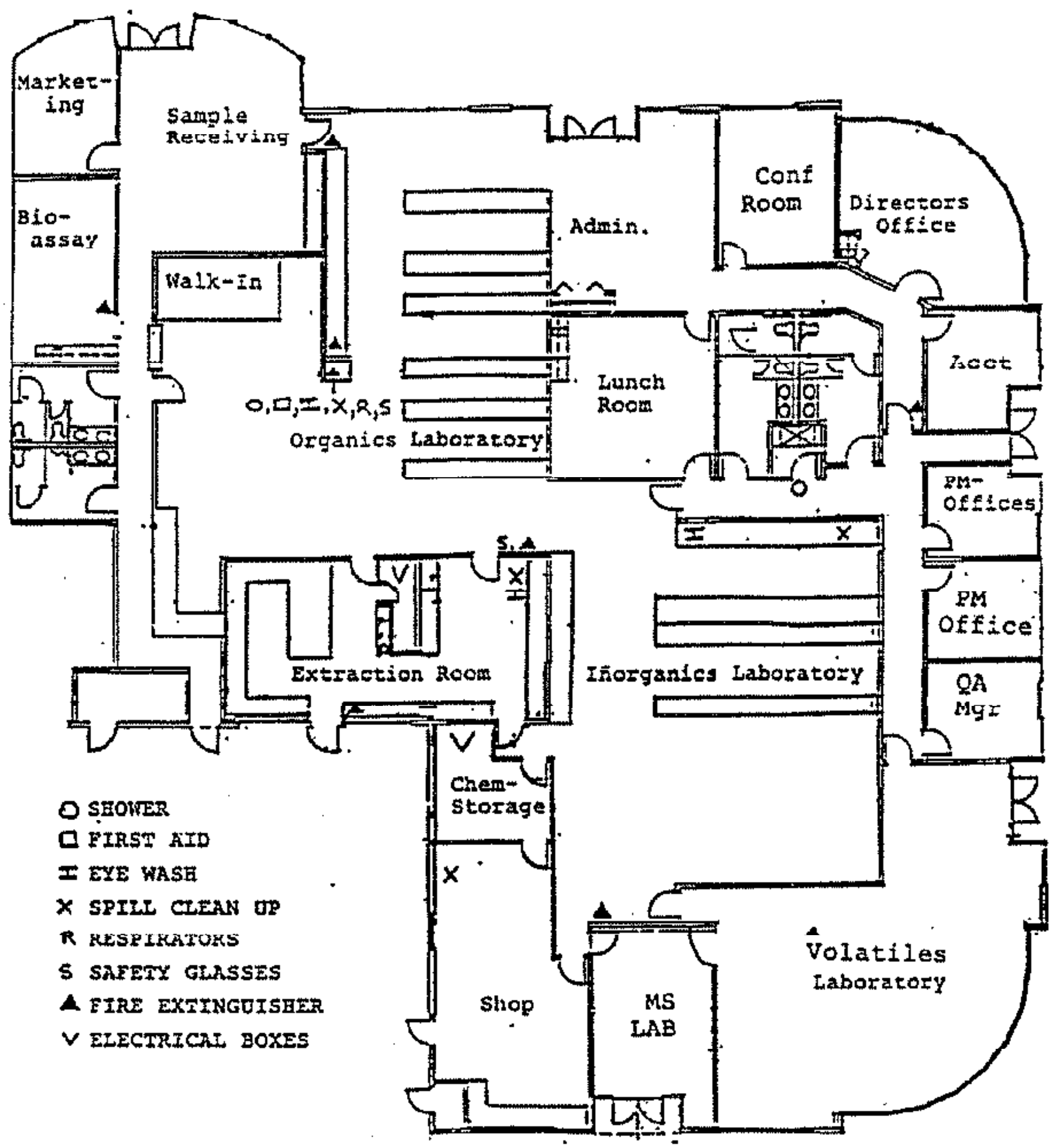
(See Figure 2 for floor plans.)

North Creek Analytical is continually upgrading and expanding its instrumentation capabilities. For a complete listing of the laboratories' major instruments and equipment see Appendix D.

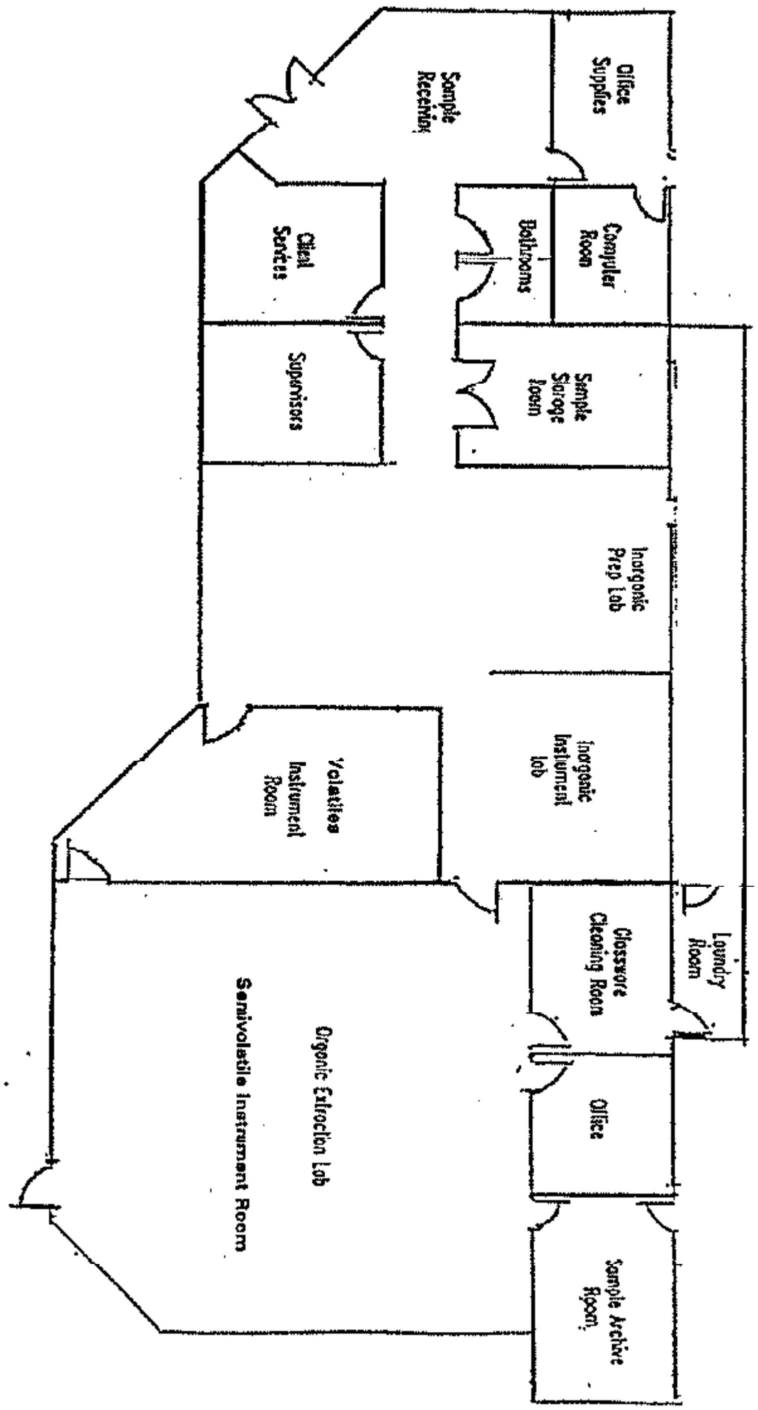
Figure 2
Laboratory Floor plans

1. Bothell Laboratory
2. Portland Laboratory
3. Spokane Laboratory

North Creek Analytical, Inc. - Bothell, WA



North Creek Analytical, Inc. - Portland,OR.



North Creek Analytical -- Spokane, Washington

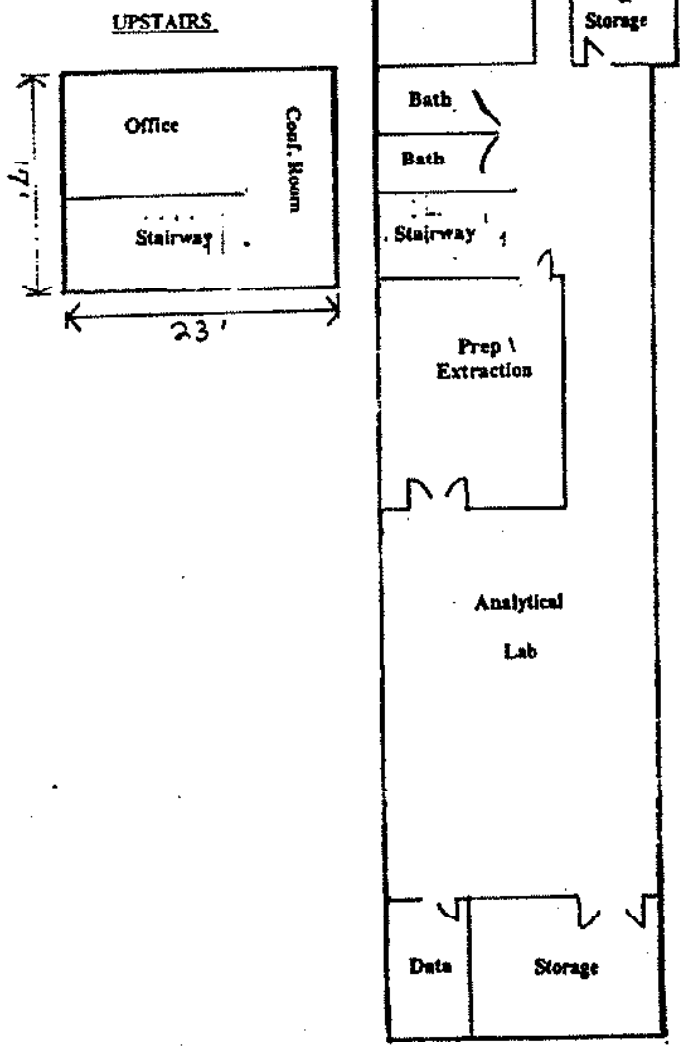


FIGURE 2.

6.0 SAMPLE HANDLING

6.1.0 Sampling Procedures

Sampling is an important part of any analysis: data are only as useful as the quality of the sampling effort. Clients of the laboratory must assume the responsibility for developing and implementing an appropriate sampling plan. North Creek Analytical does not provide field sampling services for our clients at this time. However, North Creek Analytical can give advice on a variety of field sampling procedures. NCA also maintains written sampling criteria for drinking water.

6.2.0 Sample Containers and Preservation

Sample containers are purchased in large lots from various sources. All sample containers are equivalent in construction, materials, and cleaning procedures to those listed in the Federal Register (October 26, 1984) and the U. S. Environmental Protection Agency (EPA) SW-846 (Revision 2, September 1994). EPA SW-846 is the *Test Methods for Evaluating Solid Waste: Physical and Chemical Methods.*

Bottles for organic analyses are purchased from suppliers who certify that the containers have been cleaned by protocols prescribed in the various EPA methods. (See Figure 3 for a list of the containers, preservatives, and holding times used at North Creek Analytical.)

Figure 3

Required Containers, Preservation Techniques and Holding Times

The following pages summarize NCA sample preservation and sample bottle criteria.

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (206) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

SAMPLE CONTAINER AND PRESERVATIVE GUIDE

	METHOD	CONTAINER	SUGGESTED VOLUME	PRESERVATIVE	HOLDING TIME
Volatile Organics					
Gasoline	WTPH-G	VOA-glass	2--40 mL vials	HCl--pH <2 *	14 Days Water&Soil
Gasoline/BTEX	WTPH-G / 8020A	VOA-glass	2--40 mL vials	HCl--pH <2 *	14 Days Water&Soil
BTEX	8020A	VOA-glass	2--40 mL vials	HCl--pH <2 *	14 Days Water&Soil
Halocarbons	8010B	VOA-glass	2--40 mL vials	HCl--pH <2 *	14 Days Water&Soil
Halocarbons	502.2 / 524.2	VOA-glass	2--40 mL vials	HCl--pH <2 **	14 Days
Aromatics	8260A	VOA-glass	2--40 mL vials	HCl--pH <2 *	14 Days Water&Soil
Aromatics	502.2 / 524.2	VOA-glass	2--40 mL vials	HCl--pH <2 **	14 Days
Purgeables	8260A	VOA-glass	2--40 mL vials	HCl--pH <2 *	14 Days Water&Soil
Purgeables	502.2 / 524.2	VOA-glass	2--40 mL vials	HCl--pH <2 **	14 Days
EDB / DBCP	504	VOA-glass	2--40 mL vials	HCl--pH <2 *	28 Days
Semi-Volatile Organics					
Diesel Range Hydrocarbons	AK102 / WTPH-D	Glass Amber Bottle	1--L	Unpreserved *	7 Days/14 Soil
Semi-Volatile (BNAs)	8270	Glass Amber Bottle	1--L	Unpreserved *	7 Days/14 Soil
Semi-Volatile (BNAs)	525.2	Glass Amber Bottle	1--L	HCl--pH <2 ***	7 Days
Pesticides & PCBs	8081	Glass Amber Bottle	1--L	Unpreserved *	7 Days/14 Soil
Pesticides & PCBs	508	Glass Amber Bottle	1--L	HCl--pH <2 *	7 Days
Herbicides	8151	Glass Amber Bottle	1--L	Unpreserved *	7 Days/14 Soil
Herbicides	515.1	Glass Amber Bottle	1--L	HCl--pH <2 ****	7 Days
PNAs	8310 / 8270 SIM	Glass Amber Bottle	1--L	Unpreserved *	7 Days/14 Soil
Metals					
Mercury	245.1 / 7470 / 7471	Poly	500 mLs	HNO_3--pH<2 *	28 Days
Chromium VI	7196	Poly	500 mLs	Unpreserved *	24 Hours
Organic Lead	DHS (LUFT)	Glass Amber Bottle	1--L	Unpreserved *	14 Days
All Other Metals	200 / 6010 / 7000	Poly	500 mLs	HNO_3--pH<2 *	6 Months

SAMPLE CONTAINER AND PRESERVATIVE GUIDE

	METHOD	CONTAINER	SUGGESTED VOLUME	PRESERVATIVE	HOLDING TIME
Inorganic & Wet Chemistry					
Alkalinity	310.1	Poly or Glass	500 mLs	Unpreserved *	14 Days
COD	410.4	Poly or Glass	500 mLs	H_2SO_4--pH<2 *	28 Days
Chloride	300.0	Poly or Glass	500 mLs	Unpreserved *	28 Days
Cyanide	335.2 / 9010	Poly or Glass	1--L	NaOH--pH>12 *	14 Days
Flashpoint	1010	Poly or Glass	500 mLs	Unpreserved *	NA
Fluoride	340.2	Poly or Glass	500 mLs	Unpreserved *	28 Days
Hardness	SM 2340B / 6010	Poly or Glass	500 mLs	HNO_3 or H_2SO_4--pH<2 *	6 Months
Nitrate or Nitrite	300.0	Poly or Glass	500 mLs	Unpreserved *	48 Hours
Oil & Grease	413.1 / 413.2 / 418.1	Glass Amber Bottle	1--L	H_2SO_4--pH<2 *	28 Days
Phenols	420.1 / 9065 / SM 5530 C	Glass Amber Bottle	1--L	H_2SO_4--pH<2 *	28 Days
Phosphorous	365.1	Poly or Glass	500 mLs	H_2SO_4--pH<2 *	28 Days
pH	150.1 / 9045	Poly or Glass	500 mLs	Unpreserved *	Immediate
Solids (TDS, TSS, TS)	160.1 / 160.2 / 160.3	Poly or Glass	500 mLs	Unpreserved *	7 Days
Specific Conductance	120.1 / 9050	Poly or Glass	500 mLs	Filtered at site*	28 Days
Specific Gravity	SM 2710 F	Poly or Glass	500 mLs	Unpreserved *	NA
Sulfate	300.0	Poly or Glass	500 mLs	Unpreserved *	28 Days
Sulfide	376.1 / 376.2 M	Poly or Glass	500 mLs	ZnAcetate and NaOH--pH>09 *	7 Days
Total Organic Carbon	415.1 / 9060	Poly or Glass	500 mLs	H_2SO_4--pH<2 *	28 Days
Total Organic Halides	9020	Poly or Glass	500 mLs	Unpreserved *	28 Days

* Samples should remain stored cool at 4°C

** If residual chlorine is present, add 25 mg of ascorbic acid. Store samples cool at 4°C.

*** If residual chlorine is present, add 80 mg of Sodium thiosulfate. Store samples cool at 4°C.

**** If residual chlorine is present, add 40-50 mg of Sodium sulfite or Sodium arsenite. Store samples cool at 4°C.

Containers are prepared in a designated area according to the standard operating procedure for sample container preservation as detailed in the Federal Register. Next, containers are clearly marked to indicate the preservative added, given a sample description label, and then stored in an orderly fashion. Sample containers with appropriate preservatives and related transport equipment are provided to clients as part of the analytical process at no additional charge. Samples brought to the laboratory by clients in non-preserved containers are appropriately preserved and stored upon arrival.

6.3.0 Chain of Custody

An overriding consideration for data resulting from chemical analyses is the ability to demonstrate that the samples were obtained from the locations stated and that they reached the laboratory without alteration. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal must be documented. Documentation shall be accomplished through a Chain-of-Custody form that records each sample and the individuals responsible for sample collection, shipment, and receipt.

The Chain of Custody begins at the sample site when sampling personnel first collect and label the sample and continues on through transport to the laboratory. At the laboratory, chain of custody becomes the laboratory's documentation of receipt and storage of the sample (Figure 4).

6.4.0 Sample Documentation

At the sampling site, each sample should be labeled with the date and time of sampling, the client's name, the sampler's name, the client's sample identification, and any other pertinent information. At the same time, the chain-of-custody form and a field sampling logbook should be filled out with this information, as well as the address and phone number of the client, the containers and preservatives used, and the analyses requested.

6.5.0 Laboratory Receipt and Log-In

6.5.1 Sample Receiving

Upon receipt in the laboratory, Sample management personnel shall open the shipment containers, compare the contents with the chain-of-custody record and inspect shipment containers. On a routine basis, sample receiving personnel shall verify that all sample containers are of the type suitable for the designated analysis, holding times have not been exceeded and preservatives have been utilized as required. After verification sample receiving personnel sign and date the record. Any discrepancies shall be noted on the chain-of-custody record. Samples are then stored in an area accessible only to North Creek Analytical personnel .

Figure 4
Chain-of-Custody Report

Containers are prepared in a designated area according to the standard operating procedure for sample container preservation as detailed in the Federal Register. Next, containers are clearly marked to indicate the preservative added, given a sample description label, and then stored in an orderly fashion. Sample containers with appropriate preservatives and related transport equipment are provided to clients as part of the analytical process at no additional charge. Samples brought to the laboratory by clients in non-preserved containers are appropriately preserved and stored upon arrival.

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Figure 4
Chain-of-Custody Report

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2102

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order #

REPORT TO:	INVOICE TO:
ATTENTION:	ATTENTION:
ADDRESS:	ADDRESS:
PHONE: FAX:	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME:	Analysis Request:
PROJECT NUMBER:	
SAMPLED BY:	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)												MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.															
2.															
3.															
4.															
5.															
6.															
7.															
8.															
9.															
10.															

RELINQUISHED BY (Signature)		DATE:	RECEIVED BY (Signature)		DATE:
PRINT NAME:	FIRM:	TIME:	PRINT NAME:	FIRM:	TIME:
RELINQUISHED BY (Signature)		DATE:	RECEIVED BY (Signature)		DATE:
PRINT NAME:	FIRM:	TIME:	PRINT NAME:	FIRM:	TIME:

ADDITIONAL REMARKS:

PAGE OF

In cases where samples are transported without completed chain-of-custody forms, North Creek Analytical will provide a blank chain-of-custody form to be filled by the client's representative. In some instances samples are delivered to the laboratory without a completed chain-of-custody form, the waybill shall serve as an extension of the chain-of-custody record between the field custodian and the laboratory. Upon receipt, the client is notified immediately and a completed chain-of-custody form is requested to be sent to the laboratory via facsimile. Once all samples are verified and agree with the chain-of-custody, copies of the completed signed form and the waybill, are then returned to the client.

In addition to ensuring that a sample is fully documented, Sample management personnel determine the following:

- If sample is sufficient to conduct analyses requested
- If samples are preserved appropriately
- If holding times have been violated or likely to be exceeded
- If information on the COC matches with the sample container label

They are also responsible for splitting those samples scheduled for multiple analyses.

Paperwork inconsistencies and any problems with sample integrity are reported to the Project Manager, who will take corrective action.

6.5.2 Sample Log-In.

6.5.2.1 Bothell and Spokane Laboratories

Upon receipt at the laboratory the chain-of-custody (COC) documents are reviewed and signed. Coolers are opened and the condition of the samples are assessed and recorded using a sample receipt checklist (Figure 5).

Sample information taken from the COC and container labels is then entered into the computer LIMS called Environmental Laboratory Manager (ELM). ELM assigns a unique work order number to each set of samples received. Individual samples within this work order are assigned individual sample numbers which are fractions of the work order number. Sample information entered into the ELM database includes the following: Sample name or client ID, matrix type, analysis requested, turn-around-time requested, container types, comments on sample preservation and the condition of the samples upon receipt and comments on any unusual treatment or special care to be given to the sample. ELM uses the sample information to print a sample label for each container (Figure 5). Also, a variety of client information is entered or accessed from the data base by ELM and linked to the samples in a work order report (Figure 5). The client information includes the following: name, address, phone, contact name, project name, project number, invoice address, report address, etc.

Additionally, this database is used to schedule and track test status in the laboratory.

6.5.2.2 Portland Laboratory

Upon receipt at the Portland laboratory, each sample is assigned a separate laboratory ID number which is inscribed on the sample container, entered in the custody record for the project file and logged into the computer LIMS system.

The project record also includes the client's name, sample description, sample matrix types, required analysis and date received, date due and any other pertinent information. The LIMS data base is then used to track the status of each analysis in the laboratory.

The sample receiving staff places and logs the samples into designated storage areas. When a sample is checked in or out of storage for analysis, the date and analyst's name are recorded in the LIMS tracking system providing a record of internal sample handling. When samples are returned to the client or disposed of, a note of the action is made in the LIMS. If aliquots or sub-samples are required, care is taken so that the sub-samples are representative of the original sample.

6.5.3 Hazardous Samples

Some samples received by the laboratory are hazardous or potentially hazardous. Although clients may or may not know the hazard status, they should provide the laboratory any pertinent hazard information. Hazardous samples are handled under a fume hood, categorized according to hazard type, and "red tagged" with tape. After analysis, the type and concentration of the contaminant MUST be shown on the outside of the container. The hazardous categories include, but are not limited to, flammable, asbestos, PCBs, cyanide, and acids. All hazardous samples are stored separately and disposed appropriately through a hazardous waste disposal firm that lab-packs and removes the samples from the laboratory.

6.6.0 Sample Storage

Samples are kept in house for four to six weeks after analysis unless special arrangements have been made by the client. Storage shelves are organized numerically in library fashion. The walk-in and upright coolers are maintained at 4° C. The temperature for each cooler is recorded every business day. Under North Creek Analytical's sample storage system, analysts are to retrieve from storage the sample container allocated for their analysis, withdraw an appropriate aliquot, and promptly return the sample to the same shelf.

6.7.0 Sample Shipping

If North Creek Analytical needs to ship samples or if samples are to be shipped to our laboratory, samples must be placed in a cooler with enough blue ice to ensure a temperature of 4° C. Shipped samples must be carefully surrounded by packing material to prevent breakage. A trip blank should accompany any samples scheduled for volatile organic analyses, and a chain-of-custody form must be enclosed to document sample transfer. Most samples are shipped via overnight express.

Figure 5
Log-in Forms

1. Sample Receipt Checklist
2. Work Order Report
3. Sample Label

Client/Project:______________________

NCA W.O. #:______________________

NORTH CREEK ANALYTICAL SAMPLE RECEIPT LOG

1. Does the information on Chain of Custody and sample labels agree?		YES	NO*
2. Sample Condition:	Intact	Leaking*	Broken*
3. Proper Preservatives Used:		YES	NO*
4. Hold Times:	Not Expired		Expired*
5. Sample Temperature:		______________	
6. Custody Seals on Cooler:	Absent/Present		Intact/Broken
7. Custody Seals on Samples:	Absent/Present		Intact/Broken

*If circled was corrective action record given to the Project Manager? YES NO

Completed by: ______________________________ Date: ______________

Comments:

North Creek Analytical - Bothell Work Order
B604401

Project/Client Information

Submitted By	Report To	Invoice To
[illegible]	[redacted]	[redacted], Inc.
	Peter [redacted]	Accounts Payable
Project Name	11040 [redacted] Street, Ste 240	P.O. Box 4032
EXXON #7-9078,#09380034	Bellevue, WA 98004	Concord, CA 94524-2032
Project Number	Phone: 206/[redacted]-0280	Phone: 713/[redacted]-7934
00091-288-01	Fax: 206/[redacted]-0283	Fax: 713/[redacted]-1120

Work Order Information

Project Manager	Received	Received By
Matthew Essig	04/23/96	Lisa Hurley
Report TAT - Due	**Logged In**	**Logged In By**
5 day(s) - 04/30/96	04/23/96	Gail Kelley

Work Order Comments

Samples Received at 3°C
Custody seals are intact.
Containers are unbroken.
Sample labels/COC agree.
Samples preserved properly.

Sample/Analysis Information

Lab Number	Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	TAT	Comments
[illegible]11-01	W9078-INF	Water	04/23/96				
			05/07/96	WTPH-G/BTEX	04/29/96	5	
B604401-02	W9078-EFF	Water	04/23/96				
			05/07/96	WTPH-G/BTEX	04/29/96	5	

Reviewed By____________________

Date____________________

B604536-01A

MW-2

4/29/96

Water - Voa Vial - HCl

7.0 ANALYTICAL QUALITY CONTROL

7.1.0 Analytical Objectives

Quality Assurance and Quality Control are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. It is defined as "the total integrated program for assuring the reliability of monitoring and measuring data".

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with Analytical Quality Control (AQC).

AQC refers to the routine application of statistically-based procedures to evaluate and control the accuracy of results from analytical measurements. The AQC program includes procedures for estimating and controlling precision and bias and for determining limits of detection.

North Creek Analytical approaches the AQC program by first defining the analytical quality objectives. It is essential to produce analytical results that are capable of providing the required information. This implies the need to clearly define the physical and chemical parameters, the range of concentrations of interest, and the required accuracy of results. Normally this is the responsibility of the client in consultation with the Laboratory Director or Project Managers.

North Creek Analytical's Chain-of-Custody Report, proposals/bid documents and Sampling and Analysis Plans provide a mechanism for the client and the laboratory to discuss the data objectives in order to assure that the analytical services closely correspond to their needs.

Once clear data quality objectives are established they are monitored through the use of trending techniques such as control charts. Outliers are identified and appropriate corrective action is taken according to the guidelines given in Corrective Action SOPs for each analytical area.

7.2.0 Analytical Methods

Analytical Methods are chosen to meet the requirements of the defined analytical data objectives. In accordance to the criteria described in the previous section, the methods should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required accuracy.

We understand an analytical method to be "the set of written instructions completely defining the procedure to be adopted by the analyst in order to obtain the required result." It is clear that the analytical method must be very specific, and that in order to obtain good results the method must be closely followed. Also, since the method is only a set of written instructions, it is the task of the laboratory to determine the precision and bias by using the method.

In some instances there may not be complete freedom in selecting an analytical method. For example, federal regulations specify the analytical methods that may be used for NPDES monitoring (Clean Water Act). When specified, such requirements will be closely followed.

In general, North Creek Analytical follows procedures established by EPA SW 846 Methods, EPA Series 500 and 600 Methods, ASTM, Code of Federal Regulations 40, and Standard Methods 18th Edition. EPA Method 7000 from EPA SW-846 establishes general quality control requirements for metals analysis while EPA Method 8000 EPA SW-846 establishes them for organic analysis. North Creek Analytical adheres to the quality control measures set out in EPA 7000 for inorganic analyses and in EPA 8000 for organic analysis. Other quality control measures set out in the individual methods and in *Standard Methods for the Examination of Water and Wastewater*, 18th Edition, may also be included.

Specific procedures for individual techniques such as General Chemistry, Organic Analysis, Inorganic Analysis and Bioassay tests are described in the Standard Operating Procedures (SOP) found in each section of the laboratory.

Standard operating procedures for the analytical methods for organics and inorganics and all quality control documentation measures are kept in the analysts' notebooks and reference binders.

7.3.0 Internal Quality Control Checks

The following specific Quality Control measures are employed at North Creek Analytical to assure that results of analyses are within acceptable quality limits:

Accuracy:

- Certified standard materials are employed as calibration standards for all analyses.
- Certified standard materials are also employed as second source Check Standards and as Laboratory Control Samples.
- Matrix, Blank and Surrogate spike samples are monitored for percent recovery.

Precision:

- Sample and Spike duplicates are monitored for Relative Percent Difference.

Bias:

- Method blanks are employed to ensure that bias is not introduced from background laboratory contamination.
- Matrix spike samples are employed to monitor bias introduced by the sample matrix.
- Control Charts are used to establish limits of acceptability. They are also employed to evaluate long term trends which may introduce bias in the results.
- Materials and reagents are verified to be free of contamination which would introduce bias.

Comparability:

- Both single blind internal and single blind external check samples are analyzed to assure comparability of results with external sources.

Completeness:

- Periodic data quality audits are performed to assess completeness.

The specific quality control measures outlined above are described in more detail in the following section.

7.4.0 Instrument Calibration

In general, calibration procedures can be divided into two major types: (1) fixed calibration or (2) within-batch (run) calibration. In fixed calibration, a calibration curve is determined and then used over a number of analytical batches. In within-batch calibration, a calibration curve or factor is determined for each batch (run) of samples analyzed.

Calibration procedures can also be classified as being either external or internal standard calibration (see glossary).

Initially, each instrument is calibrated for the analytical method for which it is allocated. Once the operating parameters have been established according to that method, the analyst prepares standard solutions containing all the analytes of interest, any internal standards, and any surrogate standards appropriate to the method. To establish the calibration curve for a particular analyte, these standard solutions are prepared at graduated dilutions. One of the concentrations must be just above the detection limit while the others should define the working range for the instrument.

Standards for instrument calibration are obtained from a variety of sources. Elemental standards are purchased from commercial suppliers, dated upon receipt, and replaced as needed according to the methodology. A standard log is kept containing the following identification :

- Name of analyte
- Date of receipt
- Supplier lot number
- Concentration
- Any dilutions of the analyte
- Unique code number.

Analysts document the use of standards by entering the code number in their notebooks.

Specific guidelines for standards handling, preparation and traceability are contained in:

NCAB-SOP# 2040 *"Handling and Preparation of Standard Materials for Organic Analysis"*
NCAB-SOP# 2050 *"Handling and Preparation of Standard Materials for Inoraganic Analysis".*
NCAP-SOP# 004 *"Handling of Standards, Solvents, Acids and Reagents"*

7.4.1 Calibration Frequency

Organic Analysis

Instrument calibration is performed on an as needed basis in accordance with the specific method requirements. Recalibrations are performed when fundamental changes to the instrument characteristics take place (i.e. change of analytical column,etc.) or when results of QC Check Standards or Samples indicate an out-of-control condition.

Metals Analysis

Instruments are calibrated each time they are used.

Inorganic Analysis

Instrument calibration is performed on an as needed basis in accordance with the specific method requirements. Recalibrations are performed when fundamental changes to the instrument characteristics take place (i.e. change of analytical column, etc.) or when results of QC Check Standards or Samples indicate an out-of-control condition.

Miscellaneous Equipment

Balance calibration and service is performed once per year by an outside company. Calibration is checked using "in house" weights each day of use.

Critical thermometers are checked against a NIST traceable reference thermometer on an annual basis.

Specific guidelines for calibration are contained in NCAB-SOP #2003 "*Calibration of Measurement Equipment*".

7.4.2 Calibration Equations

The following are equations used to calculate calibration factors and response factors:

Calibration factors (CF) are calculated for those methods that use external standards and the response factor (RF) for those methods that use internal standards.

$$CF = \frac{\text{Total area of Peak}}{\text{Mass injected in Nanograms}} \qquad (1)$$

$$RF = \frac{(\text{Area of Analyte})\ (\text{Conc. of Internal Std.})}{(\text{Area of Internal Std.})\ (\text{Conc. of Analyte})} \qquad (2)$$

Tabulate the CFs or RFs for each of the five concentrations for each of the analytes and for each of the surrogates. In general, the five CFs or RFs for each analyte or surrogate should have a Percent Relative Standard Deviation (% RSD) of less than 20%.

The following is the equation for calculating % RSD:

$$\%RSD = (SD / \overline{X}) * 100 \qquad (3)$$

Where the Standard Deviation (SD) of the initial five CFs or RFs for each compound is calculated with the follow equation:

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}} \qquad (4)$$

Where: $\bar{x}$ = Mean of initial five CFs or RFs for each compound.

If the % RSD is less than 20%, then the calibration curve can be considered linear through the origin, and a mean CF or RF can be used. The CFs and RFs for each compound are graphed, and all calculations are kept in the analyst's notebook.

The validity of the calibration curve must be checked daily for most instruments and more frequently for instruments with particularly sensitive detectors that tend to drift. The analyst prepares a daily calibration check standard solution in the same manner as that prepared for the initial calibration standard solutions. The daily calibration check standard solution CF or RF must be within 20% of the average CF or RF of the calibration curve. The following is the equation for calculating the percent difference of the average CF or RF calibration curve:

$$\%\ Difference = \frac{(Average\ CF\ or\ RF) - (Calibration\ Check\ CF\ or\ RF)}{(Average\ CF\ or\ RF)} * 100 \qquad (5)$$

Some methods for organic analyses have prescribed limits that may differ from these calculations. In those cases, individual method specifications override these general procedures. In addition, in some methods calibration procedures may be prescribed that are not described here such as GC/MS tuning with BFB or DFTPP. The individual method guidelines should be followed in these case.

7.5.0 Retention Time Windows

Most organic analyses use gas chromatography or liquid chromatography instrumentation. Some inorganic analyses use liquid chromatography instrumentation as well. As the key to analyte identification, retention time windows must be established for every analyte in a particular method on every column used for that method.

These retention times (RTs) are recorded in the notebooks kept for each instrument and are used later for tentative qualitative identification of the analytes.

Once the analyst has determined through calibration and calibration verification procedures that the instrument is working optimally, the analyst makes three injections of the same standard over a 72-hour period and tabulates the RTs for each analyte for each of the three injections. The SD of the three RT values for each analyte is calculated by using Equation Four. The retention time window is defined as the daily mean retention time ± 3 SDs.

7.6.0 Quantitation

Organic compounds analyzed by gas chromatography are tentatively identified by comparing the RTs of the sample and the standard. Under most conditions, tentatively identified compounds must be confirmed on a second column of different affinity.

Sample quantitation procedures are outlined in each method depending on the type of calibration used for the method. All calculations and instrumentation parameters are documented in the analysts' notebooks.

7.7.0 Surrogates

In most organic analyses, surrogate compounds are spiked into all environmental samples and into the matrix spike and matrix spike duplicate and blanks. Surrogates are a check on efficiency of the extraction. The percent recovery of surrogates is documented and compared to established control limits. The use of surrogates ensures that all environmental samples have gone through the analytical process with acceptably uniform recovery. The control limits for surrogate recovery are defined as the mean recovery for 30 representative samples ± 3 SDs and should be updated yearly. Some methods, however, have pre-established acceptance limits. The SD for surrogates is calculated from Equation Four.

7.8.0 Detection Limit Verification

The Method Detection Limit (MDL) is determined yearly for each analyte on each instrument allocated to a method. The analyst prepares seven replicates of solution spiked at one to two times the estimated Method Detection Limit with all the analytes of interest. Each of these aliquots is subjected to the entire analytical process.

The variance (S*) and SD of the seven replicates are calculated as follows:

$$S^* = \frac{1}{n-1}\left[\sum_{i=1}^{n} x^2 - \frac{\left(\sum_{i=1}^{n}\right)^2}{n}\right] \qquad (6a)$$

$$SD = (S^*)^{1/2} \qquad (6b)$$

The following is the equation for calculating the detection limit:

$$Detection\ Limit = t_{(n-1,\ 1-\alpha = 0.99)} * SD \qquad (7)$$

Where: $t_{(n-1,\ 1-\alpha = 0.99)} = 3.143$ *for seven replicates.*

From equation #7, an MDL is calculated. The laboratory uses Practical Quantitation Limits (PQL's) for reporting purposes. The PQL is established as the lowest concentration that the laboratory feels can be reliably quantitated. In general PQLs are two to ten times the MDL.

7.9.0 Control Charts

Control charts are statistical mechanisms used to graphically monitor data quality objectives in the laboratory. Quality Control sample results are grouped and plotted as individual points. Warning and Control limits are established for each data quality parameter at +/- 2 and +/- 3 times the standard deviation from the mean of the group of data points used to construct the control chart. These warning and control limits trigger levels of corrective action as defined in specific laboratory SOPs.

Warning limits are established such that only 5% of all possible results will fall outside of these limits. In general, specific corrective action measures need not be taken when results fall outside of these limits, however, the root cause of the outliers should be investigated.

Control limits are established such that only 0.3% of all results are expected to fall outside of these limits. In general, specific corrective action measures must be taken when any result falls outside of these limits. Also results of unknown samples analyzed on the same day should be considered suspect.

There are three types of quality control samples typically monitored. They are:

-- Spiked samples
These include matrix spikes, surrogate spikes and blank spikes.

-- Duplicate samples
These include sample duplicates and spike duplicates.

-- Standards
These are generally check standards made from sources different than those used for quantitation.

In addition, blank determinations may be plotted on a sequential chart to aid in detection of abnormal values.

Generally, control charts should be done once for every 20-30 data points analyzed. The calculations from the latest 20 30 entries define the control limits for the next 20 30 entries. If all entries are within the control limits, the analysis is considered "in control". While the identification of outliers is the primary use for control charts they are also very useful in identifying trends.

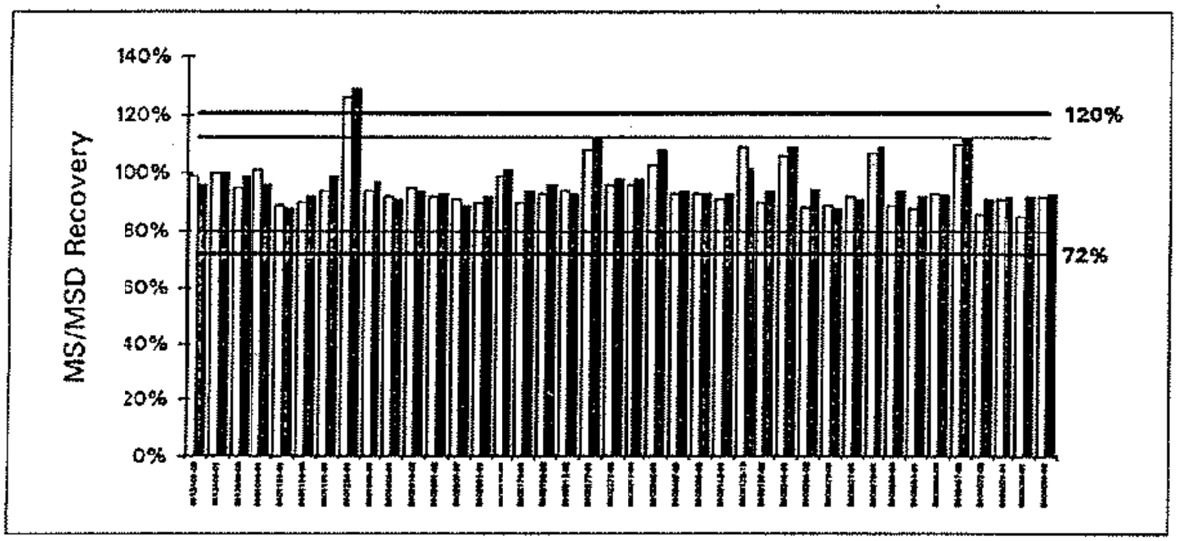
Figure 7
Control Charts

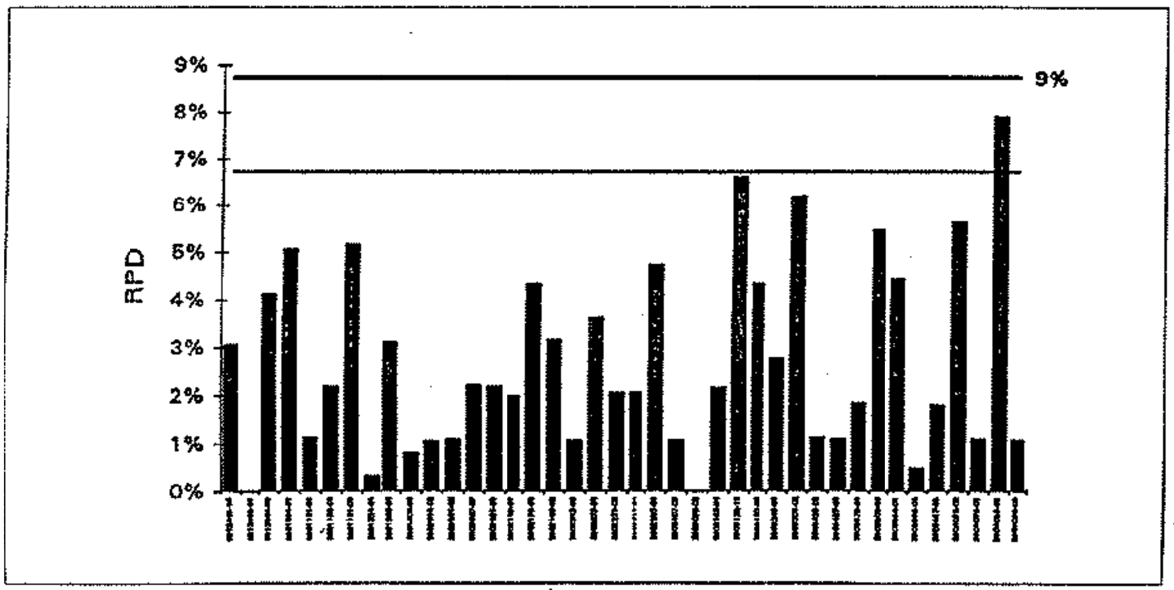
1. Matrix Spike/Duplicate Chart
2. Surrogate Spike Control Chart

BTEX QC Data

Matrix: water
Instrument(s): GC#2, GC#4, GC#6, GC#8
Dates of Analysis: 12/27/95 to 4/9/96

Analyte: TOLUENE



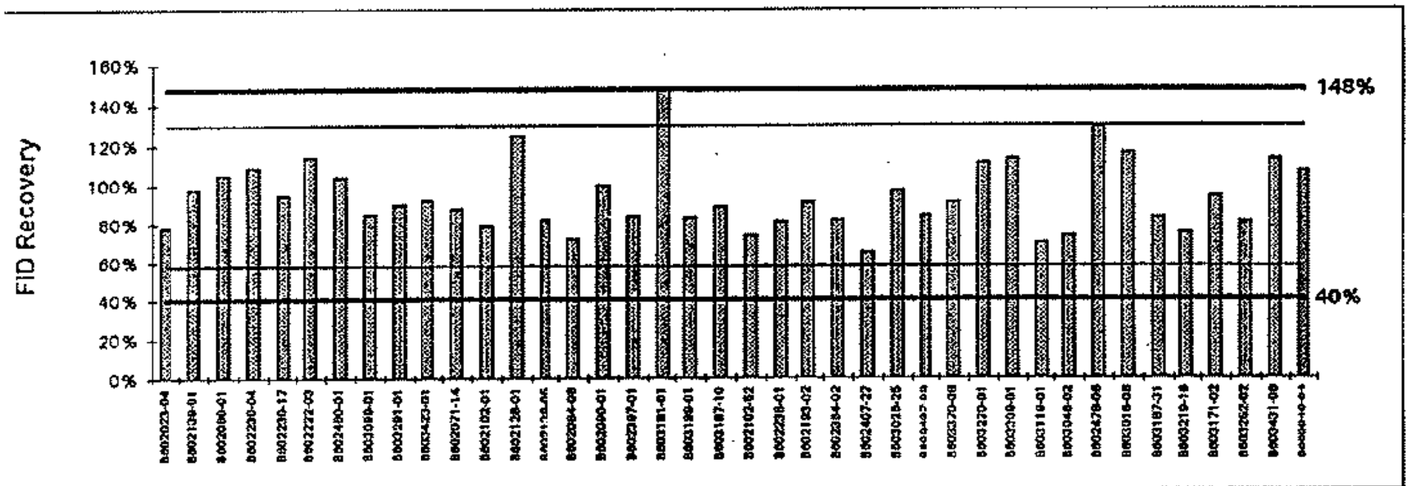


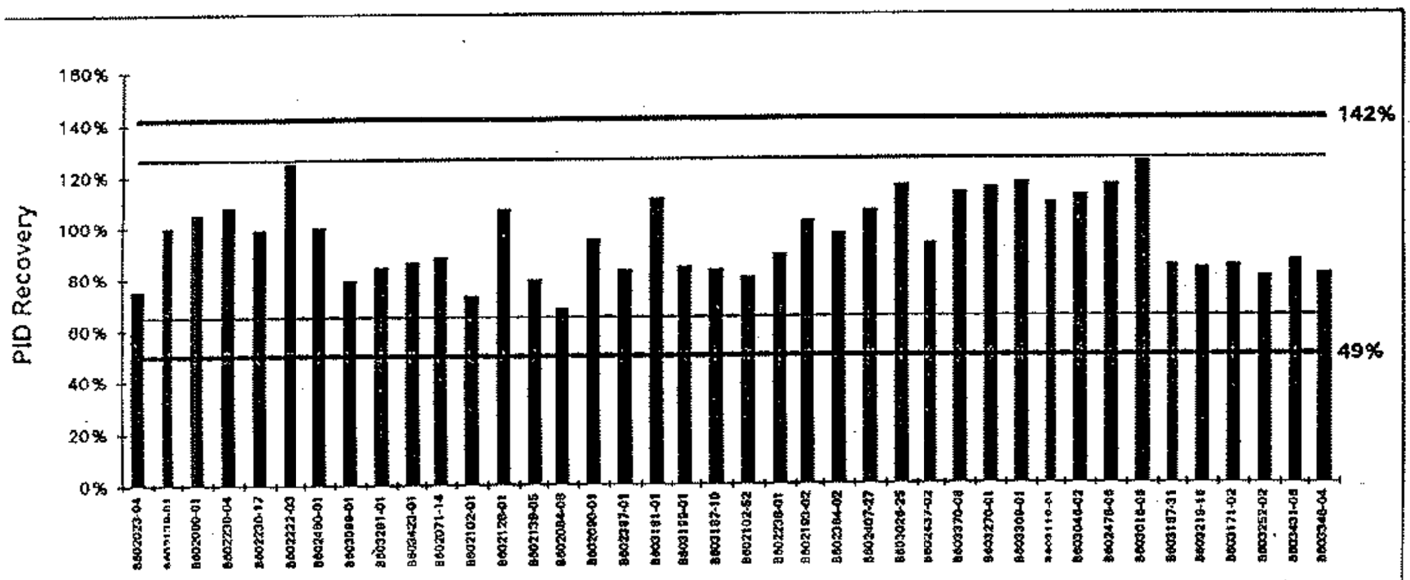
Sample	Spike Recovery	Spike Dup. Recovery	RPD
B512105-03	99%	96%	3%
B512106-01	100%	100%	0%
B512504-02	95%	99%	4%
B601064-01	101%	96%	5%
B601181-01	89%	88%	1%
B601150-04	90%	92%	2%
B601191-01	94%	99%	5%
B601224-01	126%	129%	0%
B601365-01	94%	97%	3%
B601404-01	92%	91%	1%
B602014-02	95%	94%	1%
B602001-02	92%	93%	1%
B602007-07	91%	89%	2%
B602081-01	90%	92%	2%
B602119-01	99%	101%	2%
B602176-01	90%	94%	4%
B602182-02	93%	96%	3%
B602312-02	94%	93%	1%
B602377-01	108%	112%	4%
B602271-03	96%	98%	2%
B603011-04	96%	98%	2%
B602382-01	103%	108%	5%
B602407-09	93%	94%	1%
B603026-05	93%	93%	0%
B603142-01	91%	93%	2%
B603122-13	109%	102%	7%
B603137-02	90%	94%	4%
B603245-01	106%	109%	3%
B603204-02	88%	94%	6%
B603429-03	89%	88%	1%
B603427-01	92%	91%	1%
B603376-01	107%	109%	2%
B603506-04	89%	94%	5%
B603554-01	88%	92%	4%
B603396-04	93%	93%	0%
B603457-05	110%	112%	2%
B604072-02	86%	91%	6%
B604076-01	91%	92%	1%
B604058-01	85%	92%	8%
B604056-03	92%	93%	1%

Mean recovery:	96%
Std. deviation of recovery:	8%
Upper Control Limit:	120%
Lower Control Limit:	72%
Mean RPD:	3%
Std. deviation of RPD:	2%
Maximum RPD:	9%

FID/PID Surrogate QC Data

Matrix: soil (WTPH-G)
Instrument(s): GC#2, GC#4, GC#6
Dates of Analysis: 2/1/96 to 3/27/96





Date	Sample #	FID Recovery	PID Recovery
2/1/96	B602023-04	71%	75%
2/12/96	B602139-01	91%	100%
2/13/96	B602080-01	105%	105%
2/15/96	B602230-04	109%	108%
2/16/96	B602230-17	95%	99%
2/17/96	B602222-03	114%	125%
3/1/96	B602480-01	104%	100%
3/7/96	B603099-01	85%	79%
3/18/96	B603291-01	90%	84%
3/25/96	B603423-01	92%	86%
2/6/96	B602071-14	88%	88%
2/7/96	B602102-01	79%	73%
2/8/96	B602128-01	125%	107%
2/9/96	B602139-05	82%	79%
2/9/96	B602084-08	72%	68%
2/10/96	B602090-01	100%	95%
2/27/96	B602397-01	84%	83%
3/12/96	B603181-01	149%	111%
3/14/96	B603199-01	83%	84%
3/15/96	B603187-10	89%	83%
2/7/96	B602102-52	74%	80%
2/16/96	B602238-01	81%	89%
2/20/96	B602193-02	91%	102%
2/24/96	B602364-02	83%	97%
3/5/96	B602407-27	65%	106%
3/6/96	B603026-25	97%	116%
3/8/96	B602437-02	84%	93%
3/22/96	B603370-08	91%	113%
3/23/96	B603270-01	111%	115%
3/24/96	B603309-01	113%	117%
3/8/96	B603119-01	73%	109%
3/6/96	B603046-02	74%	112%
3/4/96	B602478-06	129%	116%
3/3/96	B603016-06	116%	125%
3/15/96	B603187-31	83%	84%
3/14/96	B603219-16	75%	83%
3/12/96	B603171-02	94%	84%
3/18/96	B603252-02	81%	80%
3/27/96	B603431-06	113%	86%
3/26/96	B603348-04	107%	81%

	FID	PID
Mean Recovery:	94%	96%
Standard deviation:	13%	15%
Upper Control Limit:	148%	142%
Lower Control Limit:	40%	49%

7.10.0 Blanks

7.10.1 Method Blanks

The method blank is a determination which is intended to estimate the analytical response attributable to all factors other than the analyte in the sample. Method blanks are analyzed identically to samples, however, they are prepared from laboratory matrices and do not contain analytes. For most analyses, method blanks are processed at the beginning of the analytical sequence for each batch of samples. The specific frequency of use for method blanks during the analytical sequence is generally defined in the specific standard operating procedure for each analysis.

With the exception of a few compounds for some analyses, the analytes found in a method blank should quantitate to a value of less than half the reported detection limit for the analytes of interest. If not, the source of contamination must be investigated and a corrective action followed to verify that the analysis is in control. The exceptions are enumerated in the specific standard operating procedures for each analysis.

7.10.2 Calibration Blanks

Calibration blanks are prepared and analyzed along with calibration standards. The are prepared using the same reagents that were used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.

7.10.3 Instrument Blanks

Blank reagents or reagent water may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.

7.11.0 Accuracy

Accuracy measurements are performed to verify the agreement of an analytical result with the true value. These measurements are performed every 20 samples or once every analytical batch per matrix type, whichever contains less samples. Depending upon the specific requirements of the method either an environmental sample of the appropriate matrix or a laboratory blank is spiked with a known quantity of the analyte(s) and analyzed in the same manner as the rest of the analytical batch. The percent recovery is calculated and documented.

Percent recovery is calculated as follows:

$$\% \ Recovery \ = \ \frac{(Conc. \ of \ Spike) \ - \ (Conc. \ of \ Sample)}{Spike \ Conc. \ Added} * 100 \qquad (8)$$

The percent recovery of an analyte in a spiked sample must fall within the control limits set for that analyte. The control limits are defined either by the analytical method or by the laboratory through the use of control charts.

7.12.0 Precision

In general, precision measurements are performed every 20 samples or once every analytical batch per matrix type, whichever contains less samples. Either the results of duplicate sample analyses or duplicate spike analyses are used to determine precision. The relative percent difference between the two duplicates is calculated and documented. The relative percent difference is calculated as follows:

$$Relative \ \% \ Difference \ = \ \frac{|D1 \ - \ D2|}{(D1 \ + \ D2) \ / \ 2} * 100 \qquad (9)$$

$$D1 = \ Result \ of \ first \ duplicate$$
$$D2 = \ Result \ of \ second \ duplicate$$

The relative percent difference for a particular analyte must fall within the control limit established for that analyte. The control limit is defined either by the analytical method or by the laboratory through the use of control charts.

7.13.0 Completeness

Completeness is calculated as a percentage of the amount of usable results divided by the minimum number of required results and will be calculated using the following formula:

%Completeness = (V/N) X 100 **(10)**

Where : V = Number of valid results.
N = Total number of required results.

A control limit of a minimum of 95% completeness will be used laboratory wide.

7.14.0 Equipment Maintenance

In order for the laboratory to achieve required accuracy and precision, all equipment must be in optimum working order. This is accomplished by a preventive maintenance program which includes manufacturer maintenance contracts and in-house expertise.

North Creek Analytical is dedicated to providing our clients with state-of-the-art technology. Instrumentation is purchased with sensitivity, accuracy, efficiency, and dependability as criteria. All instruments have logbooks in which calibrations, adjustments, routine maintenance, and any repairs are recorded. Routine maintenance schedules and required spare parts lists are recorded in specific maintenance SOPs for each analytical area. Instrument operators are responsible for performing and recording of routine maintenance for their equipment. Supervisors periodically verify that maintenance has been performed and recorded. Also, service contracts are in place for many of the instruments for any major repairs. The highest quality gases, reagents, and spare parts are kept on hand to minimize repair time and optimize instrument performance.

Each entry in the instrument logbook includes the date, the analyst, a detailed description of the problem, a detailed explanation of the solution and a verification that the instrument is functioning properly. In addition, standard operation procedures for organic methods specify and require documentation of routine maintenance procedures such as changing septa in injection ports, changing gas tanks, and cleaning detectors.

7.15.0 Materials

Materials purchased for use in the analytical process are all of the highest purity or quality commercially available. This includes all gases used in gas chromatography, all solvents, acids, and bases used in extraction or digestion, dilution, and standard preparation, stock standards, and any other routinely restocked items. On receipt of any of these items, the lot number from the manufacturer is recorded and the purity of the lot established through a method blank and/or a calibration check.

7.16.0 Check Samples - Performance Evaluation

North Creek Analytical participates in both the WP and WS intercomparison studies conducted by the EPA for a wide variety of inorganic and organic analyses. The results of these studies are reported to the EPA, A2LA and the various State regulatory agencies for which we have accreditation. These single blind sample results are monitored as an indicator of comparability of our results with external sources.

North Creek Analytical also periodically acquires performance evaluation samples from commercial sources to be administered as single blind check samples to the analyst at the discretion of the Quality Assurance Manager.

In addition, North Creek Analytical encourages its clients to submit their own Quality Control Check Samples.

8.0 ANALYTICAL QUALITY CONTROL FOR BIOLOGICAL ANALYSES

8.1 Microbiology

The microbiology department adheres to the quality control measures set out in EPA 600/8-78-017, *Microbial Methods for Monitoring the Environment*, (December 1978) and Standard Methods 17th Edition. These measures include but not limited to: 1) Sample Collection and Handling; 2) Laboratory Facilities; 3) Laboratory Personnel; 4) Laboratory Equipment; and 5) General Laboratory Supplies.

The acquisition of valid data begins with collection of a representative sample to be tested. In most cases, North Creek Analytical's clients are responsible for sample planning and collection, however, in some instances, North Creek Analytical provides advice on sampling techniques.

Physical laboratory facilities are adequate to accommodate equipment, ventilation, sterilization and media preparation area, and bench areas for routine work. These areas are maintained, cleaned and well ventilated to prevent cross-contamination.

Sterilized sample collection bottles are purchased from reputable vendors. Containers from every lot # are verified sterile by Tryptic Soy Broth (TSB) and Heterotrophic Plate Count (HPC). All fermentation tubes, pipette tips, media, and dilution water are sterilized according to EPA methodology. Glassware is sterilized by autoclave. Filters are purchased pre-sterilized from the vendor and sterile forceps are used to transfer them. Sterile petri dishes, filters and inoculating loops are purchased and verified sterile by TSB and HPC.

Maintenance and daily monitoring of equipment follow EPA methodology. Daily records are kept for all this equipment.

Thermometers are checked for accuracy on a yearly basis against a NIST registered thermometer. Balances are check monthly with a set of certified class S weights and daily with a set of certified class P weights. Watches, clocks and timers are checked against each other quarterly.

Sterile dilution water is plated with every filtration series and checked for contamination. The results are kept in the analysts' notebook. Laboratory deionized and filtered water (Milli Q) is tested daily for conductivity and pH and yearly for water suitability according to EPA methodology. It is also checked monthly for a heterotrophic plate count and a variety of other water quality parameters. A glassware inhibitory residue test is performed annually according to Standard Methods 17th Edition. The results from these cross-checks are documented in the analysts' notebook.

A media preparation log is kept in the analysts' notebook which includes preparation date, amount prepared. lot # of media. final pH of media. date media received, date media opened and pH buffers used.

As described earlier, North Creek Analytical approaches the AQC program by first defining the analytical quality objectives, by choosing the appropriate methods to accomplish the quality objectives, and estimating within laboratory precision and bias. The same approach is applicable to microbiological procedures.

Analytical Quality Control for the microbiology is further divided into the following main areas:

1. Quality Control on Routine Analyses
2. Quality Control in Compliance Monitoring
3. Comparative Testing of Methodology and Method Characterization

8.1.1 Quality Control on Routine Analyses

With each batch of samples analyzed North Creek Analytical performs a minimum of one pure culture of known positive reaction, one culture of known negative reaction and one sterility control . When sterile controls indicate contamination, data of samples affected are rejected and a request is made for resampling of those samples involved.

At least once per month two or more analysts count the colonies on the same membrane from a polluted source. The counts from both analysts must agree within 5% of each other. In addition, the Washington State Department of Health requires North Creek Analytical to run a minimum of fifteen drinking water samples per quarter that are positive for both total and fecal coliform.

North Creek Analytical performs performance evaluation samples at a minimum frequency of once per year.

8.1.2 Quality Control in Compliance Monitoring

When performing microbiological tests required by NPDES permits involving legal assurance of non-compliance within the permit, North Creek Analytical must assure that positive analytical results exceed the permit limit by a statistically significant amount. This requires allowance of the analytical deviation known to occur at a level equal to the permit limitation.

Many monitoring agencies judge compliance with microbiological permit limitations based upon one analysis each for single grab samples taken at about the same time on 3 consecutive days. The largest of these 3 results is then compared to a maximum discharge limitation, while the arithmetic mean is compared to a daily average limitation. Judgement based upon such sampling program is only valid under the assumptions that there is no relationship between the discharge level at the time of sampling, and that the variability among analytical results for samples taken simultaneously is either inconsequential or can be properly estimated from previous data.

The first assumption is usually invalid because the discharge level is dependent upon production or processing operations which are not uniform.

The second assumption is important in order to make a compliance judgement. This judgement must take into account the estimated analytical standard deviation at a level equal to the permit limit.

8.1.3 Comparative Testing and Method Characterization

Proposed new or modified methods are subject to protocol described in the EPA Microbial Methods for Monitoring the environment.

9.0 CORRECTIVE ACTION

9.1.0 Policy

It is North Creek Analytical's policy to assure continuous acceptable quality levels for all lab services provided. In order to meet this goal a system has been established to assure that conditions adverse to quality are promptly identified and corrected.

This system of Corrective Action functions both at the bench level through recognition and response to isolated events and at the management level through trend analysis.

9.2.0 Bench Level Corrective Action

Isolated events which may have a negative impact on quality are documented at the bench level through use of a Non Conformance Report (Figure 8). Any individual event that may affect quality is recorded on the Non Conformance Report and brought to the immediate attention of the Department Manager. Examples of such events are Quality Control sample results out of control limits, one time variations in the method parameters due to an unusual matrix, evidence of lab contamination and loss or damage to the sample or its extract. When such an event is recognized its impact upon quality is assessed and Corrective Action is decided upon. The action is approved by the Area Supervisor and\or the Quality Assurance Officer. A copy of the Non Conformance Report is filed with the data report for subsequent review by the Project Manager. A second copy of the Non Conformance Report is given to the Quality Assurance Officer to be filed chronologically.

Predetermined limits for data acceptability are given in specific QC Policy SOPs for each analytical area (see Figure 9 "Current SOPs").

Specific guidelines on how analysts are to respond to outliers are documented in Corrective Action SOPs for each analytical area (see Figure 9 "Current SOPs").

9.3.0 Management Level Corrective Action

The Quality Assurance Manager shall initiate investigation and Corrective Action by issuing a formal Corrective Action Request (CAR) in any of the following situations:

- When an audit reveals circumstances that may adversely affect quality as determined by the QA Manager.
- When the results of intercomparison study samples are out of acceptable limits.
- When review of Non Conformance Reports reveals a significant trend which may adversely affect quality.

The progress of such Corrective Actions are documented through the use of the Corrective Action Request and Corrective Action Closing Forms (Figure 8). These forms are designed to monitor the following Corrective Action sequence:

- Identify and define problem.
- Assign responsibility for investigation.
- Investigate and determine cause of the problem.
- Determine a course of Corrective Action.
- Assign responsibility for implementing the Corrective Action.
- Evaluate the effectiveness of the Corrective Action.
- Verify that Corrective Action was successful.

Figure 8
Corrective Action Forms

1. Corrective Action Request Form
2. Corrective Action Closing Form
3. Non Conformance Report Form

CAR# :

North Creek Analytical

CORRECTIVE ACTION REQUEST FORM

Department: ______________________ **Date Requested :** ______________________

Person Requesting CAR: ______________________ **Title:** ______________________

OBSERVATION: ______________________

____

____

____

____

RECOMMENDATION: ______________________

____

____

____

CORRECTIVE ACTION TO BE TAKEN: ______________________

____

____

____

DATE CORRECTIVE ACTION WILL BE COMPLETE: ______________________

Department Representative: ______________________
sign date

QA Officer: ______________________
sign date

cc: Lab Director/Operations Manager, QA Director, Supervisor

caropen.dw

CAR# :

North Creek Analytical

CORRECTIVE ACTION CLOSING FORM

DATE CORRECTIVE ACTION WAS TAKEN : ________________

DESCRIPTION OF CORRECTIVE ACTION: ____

____

____

____

____

EVALUATION OF CORRECTIVE ACTION: Acceptable ________
Not Acceptable ________
Other ________

VERIFICATION OF PROBLEM ELIMINATION: ________________________________

____

____

____

ADDITIONAL CORRECTIVE ACTION TO BE TAKEN: ________________________

____

____

____

DATE ADDITIONAL CORRECTIVE ACTION WILL BE COMPLETE: ________

QA Officer: ____
sign date

cc: Lab Director/Operations Manager, QA Director, Supervisor

carclose.dw

North Creek Analytical

Non Conformance Report

Client:________________________ Sample #'s affected:__________________

Project:________________________ Analyst:________________ Date:______

Matrix:________________________ Method:__________________________

Problem and Probable Cause:____

____

____

____

____

____

Corrective ActionTaken:____

____

____

____

____

Results:____

____

____

Analyst Signature:________________________ Date:________________

Supervisor Signature:______________________ Date:________________

QA/QC Signature:_________________________ Date:________________

Distribution: Original; Project File Copy 1; Department Copy 2; QA Officer

NonCon8/92

10.0 INTERNAL AUDITS

System audits are performed by the Quality Assurance Manager, as a minimum, at one facility every quarter. These audits are designed to verify compliance with Operating Procedures, Standard Methods and requirements established by the Quality Assurance Program. Use of a written checklist ensures that items in compliance are noted as well as those items that may need improvement.

Data accuracy audits are also performed at each location at least once per year.

Formal audit reports are prepared and presented to the Laboratory Director for review.

Formal Corrective Action procedures are taken and documented (Figures 8a and 8b) as a result of significant audit Findings.

11.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

It is the responsibility of the Quality Assurance Manager to maintain consistent and effective lines of communication with Corporate management. To facilitate this communication the following system of reporting has been established:

- The QA Manager shall prepare a Quality Assurance Summary report at least quarterly. This report will summarize results of QA activities such as internal audits, external audits, check sample analyses, performance evaluation analyses, and results of any CARs that may have been issued or resolved during this time period.

- Formal audit reports of all internal audits will be given to the Lab Director upon completion of the audit activity.

- Documentation of all Corrective Actions is presented to the Lab Director as these activities are initiated and closed.

- Any trends that may have a negative impact upon quality in the laboratory are brought to the immediate attention of the Laboratory Director.

12.0 SUBCONTRACTING POLICY

When subcontracting analytical services North Creek Analytical will assure, to the extent necessary, that the subcontract lab has a QA Program consistent with the requirements of this document. The QA Manager is responsible for evaluating and accepting the subcontractor's QA Program. This evaluation may or may not include an on-site audit. At a minimum a copy of the subcontractors' QA manual and related SOPs will be reviewed. Whenever possible subcontract work will be performed only in North Creek Analytical satellite or affiliated laboratories.

13.0 DOCUMENTS AND DOCUMENT CONTROL

The Quality Assurance Program is the governing document and provides overall policy for North Creek Analytical related to quality of services. Other documents are required to provide supplementary information for a group or for project-specific requirements. This Procedure discusses the key types of documents and their preparation and control.

13.1 Types of Documents

Document types are discussed below.

- Quality Assurance Program. North Creek Analytical's QA Program document describes quality assurance procedures and policies for all services. The document discusses both administrative and technical aspects for the overall QA/QC system and basic practices. The manual is not intended to provide in-depth technical discussion. The document has precedence in policy matters over all other North Creek's documents discussed herein. If required by specific project by contractual or regulatory requirements, provision of the QA Program document may be supplemented and/or amended providing the approvals required are obtained.

- Standard Operating Procedures. Procedures are developed to provide in-depth technical discussions of specific topics and methods. Included are procedures for sampling, sample control (accountability and storage) and login, analytical methods, computer usage, and reporting. These procedures are intended for use throughout North Creek Analytical so that uniform technical practices are established.

- Project-Specific Documents. Specific contractual or regulatory demands, or the uniqueness of a project's scope of work, may require the preparation and implementation of project-specific documents. Project demands may include:

    - The revision of existing procedures and/or the development of new methods.

- Project requirements different from those that apply in every day activities such as data reporting, equipment operation, or data processing.

- Specific provisions for the maintenance of records.

- Regulatory agency requirements for specific actions not included in the QA Program Manual.

- Project-specific documents such as sampling and analysis plans, overall work plans, sampling protocols, and Quality Assurance Project Plans.

- Quality Assurance Project Plans (QAPP's) - are a comprehensive statement of the QA/QC practices to be implemented for a specific project when they differ from those established by the Quality Assurance Program Manual.

In preparing QAPP's, the requirements of regulations and/or the contract must be used as a justification for modification of the basic requirements of the Quality Assurance Program Manual. If North Creek Analytical's requirements exceed demands of the project, North Creek's practices shall be used unless requirements of the project contract specifically designate less stringent policies. QAPP's shall be prepared by the assigned project manager (PM) and reviewed and approved by the Corporate QA Officer and the Laboratory Director.

13.2.0 Project Procedures

In addition to the documents previously discussed, project-specific procedures are prepared to describe the means for performing the project, or specific aspects of a project. These procedures are generally referred as test plans, work plans, sampling protocols, analysis plan, etc., and may be used to provide guidance for any quality related activity.

13.3.0 Document Control

This document, Group-Specific Procedures, Corporate Procedures, Standard Operating Procedures, Employee Manuals, and Health and Safety Manuals are controlled documents. Project-Specific documents may be formally controlled. The requirements for approval and mechanism for control follow.

13.3.1 Review and Approval of Controlled Documents

Prior to use, the following documents must be reviewed and approved as follows:

- North Creek Analytical Quality Assurance Program -
  - Corporate QA/QC Manager
  - Director Marketing and Development
  - Laboratory Director
- Group-Specific Procedures
  - Analyst
  - Supervisor of the Group
  - Corporate QA/QC Manager
  - Laboratory Director
- Corporate Procedures
  - Corporate QA/QC Manager
  - Director Marketing and Development
  - Laboratory Director
  - President
- Project-Specific Documents
  - Design Methods, Specifications and Requirements
    - Group Supervisor
    - Health and Safety Officer
    - Project Manager
    - Corporate QA/QC Manager
    - Director Marketing and Development
  - Project Planning
    - Project Manager
    - Corporate QA/QC Manager
    - Director Marketing and Development
    - Laboratory Director

- Project-Specific Procedures, such as sampling and analysis protocols, etc.

  - Project Manager
  - Corporate QA/QC Manager
  - Laboratory Director

Approval of the above documents shall be denoted by a signature and date page in each document which demonstrates the above approvals and the document author. When required by contract, approval signatures required from clients and/or regulatory agencies shall be included. Signatures shall be included on the document title page.

13.3.2 Distribution

In general, documents shall be available to all personnel and will be distributed as needed. A list of all copy-holders will be maintained. When a document is no longer needed or the copy-holder leaves North Creek Analytical, it shall be returned to the issuing group.

Copies of documents will be issued external to North Creek Analytical as required. These documents may be controlled or uncontrolled and will be so marked depending on the reason for issue.

13.3.3 Revision of Documents

Whenever the documents cited above are revised, review and approval of the revision shall be in accordance with the requirements of the original document.

Revisions shall be issued to all copyholders of record.

Revisions to documents shall, as a minimum, be denoted by including the consecutive revision number on the document title page, revised signature page, and each page that has been revised. For the Quality Assurance Program, and all Corporate Procedures the following shall be identified on each page to facilitate revisions. All pages of the revised document shall be reissued to the latest revision numbers and the contents page revised to show the latest issue and date.

Section No.
Revision No.
Revision Date: (of issue)

14.0 CONTROL OF COMPUTER SOFTWARE

14.1.0 Software Documentation

Software developed or modified by North Creek Analytical that affects the quality of analytical data shall be documented. Documentation shall provide identification of the software version used and verification that no authorized changes have been made.

14.2.0 Software Testing

Verification of computer programs affecting the quality of analytical data shall be performed and documented. Test requirements and acceptance criteria shall be estimated prior to testing. Software verification testing shall be performed by individuals who: (1) Do not report to manufacturers of software, and (2) who were not involved in its development. Models, methods, assumptions, and the computer environment which were used in the tests shall be identified and documented.

14.3.0 Software Control

Configuration Management methods shall be established to ensure that changes to computer software which affect the quality of analytical data are properly controlled and approved. Analytical test results shall be traceable to the version (s) of software used in the anlysis, data collection and reporting of test results. The computer environment shall be controlled to allow the computer software to correctly operate.

14.4.0 Security of Software

Policy and procedures shall be established which will ensure the security of the software affecting the quality of analytical test results. This includes the loss and the unauthorized use of computer software.

14.5.0 Error Control

Policy and procedures shall be established to evaluate, control, and correct data entry errors or program problems which affect the quality of

15.0 DATA REDUCTION, VALIDATION AND REPORTING

15.1.0 Data Review

Procedures for verifying data accuracy and completeness are outlined in SOP# NCAB-0008.0 "Technical and Managerial Data Review for Reports". In general, all data undergoes at least three levels of review for both data accuracy and completeness before being transmitted to the client.

The review of data accuracy begins at the bench level with a peer review system. In this level all calculations and entries into data logbooks are checked for error by a second analyst. The second level of review is performed by the area supervisor. Once all of the data is complete for a batch of samples the results are reviewed by the Project Manager before transmittal to the client. This is the third level of data accuracy review.

The review for completeness of the data is begun in the sample login area to ensure that internal worksheets match the request on the client Chain-of-Custody forms. The Project Manager performs a second level of review before datasheets are given to the analytical areas. Once results are complete the Project Manager performs a third level of review to ensure that all analyses initially requested were performed.

15.2.0 Reporting and Documentation

Data travels through several processes before the final data package is released to the client. The path from the analytical bench to the final report begins by documenting all testing parameters in the analyst's notebook. All measurements and calculations for the sample as well as for the quality control measures are documented in the notebook. Once the analyst is satisfied that the analytical batch meets all quality control requirements and has quantitated the sample results, they are transferred to a set of laboratory worksheets specific to the client's requests as stated on the chain-of-custody report.

When completed, the data on the worksheets are entered into an electronic data base. The Project Manager reviews the results from the data base and checks that the analyses performed are appropriate to the client's requests. Related analyses from the same sample are compared for coherence, and the data are compared with previous results (if available) from the same source to observe any deviations from established trends. Any corrections that are necessary are made at this time and a final report is generated.

After the final report is generated it is again reviewed by the Project Manager to ensure accurate transfer of information from the laboratory worksheets to the final report. After the final review the Project Manager signs the final report.

The Laboratory Manager reviews approximately 15% of all PM approved reports.

Hardcopies of final reports are kept in a secure filing area for a minimum of five years. All hardcopy final reports on file at North Creek Analytical include the original laboratory worksheets and chain-of-custody report.

The electronic data base is backed-up to tape and the tapes are stored in a secure area. The tapes are kept for a minimum of five years.

15.3.0 Confidentiality of Information

It is the responsibility of all North Creek Analytical employees to safeguard sensitive client and company information, including (but not limited to) analytical, financial, marketing, and operating information. Analysis information and results will be released only to the client, or to other parties after receipt of written authorization from the client. The nature of our business and the economic well-being of North Creek Analytical is dependent upon protecting and maintaining client confidentiality, as well as proprietary information.

16.0 STANDARD OPERATING PROCEDURES

16.1 Policy

North Creek Analytical uses written and approved procedures for routine activities and for analytical and operational processes. Applicable procedures are available to the analysts in each department and a complete copy of all SOPs are maintained by the QA Officer/Coordinator.

All SOPs are continually evaluated for applicability and are revised as needed. Revisions are documented on the original hard-copy SOP and on the electronic copy.

All SOPs are written and approved according to strict guidelines as outlined in SOP# NCAB-0001.0 "Documentation Protocol" and NCAP-001 "Preparation of SOPs".

An index of all current SOPs is attached as Figure 9.

Figure 9 Standard Operating Procedures

The following are the indices for all SOPs used at the Bothell, Spokane and Portland facilities.

17.0 GLOSSARY

Accuracy: The nearness of a result to the true value. Accuracy is the degree of agreement of a measurement, X, (or an average of measurements of the same thing), X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100 (X-T)/T.

Analytical Batch: The basic unit of quality control defined as similar matrix samples. These samples are extracted and/or analyzed together with the same method sequence and the same lots of reagents and with the manipulation common to each sample within the same time period or in a continuous sequential time period.

Audit: A systematic check to determine the quality of the laboratory operation. Audits may be of three basic types:

1. Performance Audits in which quantitative data are independently obtained for comparison with known true values using Performance Evaluation samples.

2. System Audits of a qualitative nature that consist of an on-site review of the laboratory's Quality Assurance Program and physical facilities for sampling, calibration and measurement.

3. Data Accuracy Audits in which quantitative results are verified for accuracy by comparison to the original logbook entries and calculations.

Bias: The difference between an observed result and the true value. There are several sources for Bias in the analytical laboratory. Some major sources of Bias are blank contamination, standard impurity, matrix effect and random calculation and transcription error.

Blanks: A blank is an artificial sample designed to monitor the introduction of artifacts into the analytical process. For aqueous samples, reagent water is used as a blank matrix. However, a universal blank matrix does not exist for solid samples. The blank is taken through all steps of the analytical process.

Calibration blank: An organic or aqueous solution that is as free of analytes as possible and prepared with the same volume of reagents used in the preparation of calibration standards. The calibration blank is used to give the null reading for the instrument response versus concentration calibration curve.

Equipment blank: An organic-free aqueous solution that is opened in the field, poured appropriately over and through the sample collection device, collected in sample container, and returned to the laboratory as a sample. Equipment blanks are a check of sampling device cleanliness.

Field blank: An organic-free aqueous solution that is transferred from one preserved vessel to another at the sampling site. This solution serves as a check on reagent and environmental contamination.

Method Blank: An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. This is used to document contamination resulting from the analytical process.

Reagent blank: An organic or aqueous solution that is prepared free of analyte as possible and contains all the reagents in the same volume as used in the processing of the environmental samples. The reagent blank is carried though the complete preparation procedure and is used to correct for possible extraction procedure contamination.

Trip Blank: An organic-free aqueous solution that is transported to the sampling site and returned to the laboratory without being opened to serve as a check on contamination originating from sample transport, shipping, and site conditions.

Completeness: A measure of the amount of valid data obtained compared to the amount expected .

Comparability: An expression of confidence with which one data set can be related to another.

Data quality: The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, representativeness, completeness and comparability.

Data validation: A systematic process to review data to identify any outliers, omissions or suspect values to assure the validity of the data to the user. The screening process may be done by manual and or computer methods and utilize any consistent technique such as limits to screen impossible values or to analyze relationships between new and historical data sets.

Laboratory Control Sample (LCS): A known. blank matrix spiked with compounds representative of the target analytes. The LCS is brought through all steps in the analytical process.The LCS is used to document analytical system performance.

MDL: The Method Detection Limit (MDL) is the minimum concentration of an analyte that can be measured under normal standard operating conditions and reported with 99% confidence that the value is greater than zero.

Matrix spike/matrix spike duplicate: A technique used to provide a measure of accuracy for the method in a given matrix by adding predetermined quantities of analytes prior to sample extraction/digestion and analysis. The spike concentration should be at the regulatory level or near the PQL for the method. When performed in duplicate, the relative percent difference between the MS and MSD is calculated and used to assess analytical precision.

PQL: The Practical Quantitation Limit is the lowest level to be reliably detected within specified limits of precision and accuracy during routine laboratory operating conditions on environmental samples.

Performance audit: The planned independent check of the operation of a measurement system to obtain a quantitative measure of the quality of the data generated by utilizing certified reference standards.

Precision: The measure of mutual agreement between a set of replicate analyses for an analyte without assumption or knowledge of the true value. Precision can be expressed as standard deviation from a set of values or as relative percent difference from a duplicate sample.

Quality Assurance: The total integrated program for assuring the reliability of laboratory data including quality planning, quality assessment and quality improvement efforts to economically meet user requirements. Quality Assurance incorporates procedures for field sampling, sample handling and storage, analytical quality control, document preparation, and review.

Quality Assurance Project Plan: The orderly assembly of detailed and specific procedures by which the laboratory defines how it produces quality data for a specific project or method.

Quality Control: The routine application of procedures such as blanks, spikes and spike duplicates for obtaining prescribed standards of performance in the measurement process.

Reagent grade: Analytical Reagent (AR) Grade, ACS Reagent Grade and Reagent Grade are synonymous terms for reagents which conform to the current specifications of the Committee on Analytical Reagents of the of the American Chemical Society.

Representativeness: The degree to which data accurately and precisely represents a characteristic population, parameter variations of a sampling point, or an environmental condition.

Sample: A discreet representative part or a single item from a larger group presented to the laboratory for analysis.

Duplicate sample: Two replicate aliquots taken from the same source for which determination of composition or contamination is requested or required.

Standard Reference Material: A material of known purity or traceability to a National Standard such as NIST or EPA repository.

Standards: A known reference concentration of analyte to which environmental samples are compared.

Calibration standards: The graduated dilutions of stock analyte solutions prepared to establish the standard curve or calibration curve for a particular analyte.

Calibration check standard: The verification of instrument response by analyzing a standard prepared from a calibration standard. It is an evaluation of calibration performed concurrently with sample analysis.

Standard curve: A graph of the calibration standard concentration versus instrument response for an analyte. The standard curve describes the usable quantitation range for an analyte. The concentration of analyte in an environmental sample can then be determined from the standard curve of the sample.

Standard operating procedure (SOP): An operation, analysis or action whose mechanics are thoroughly prescribed and documented and which is commonly accepted as the usual or normal method for performing certain routine or repetitive tasks.

Surrogate: Organic compounds which are similar to analytes of interest in chemical composition, extraction and chromatography, but which are not normally found in environmental samples. These compounds are spiked into all blanks, standards and samples before analysis and percent recoveries are calculated.

SW-846: The EPA document, *Test Methods for Evaluating Solid Waste—Physical and Chemical Methods*.

Water: A reference to *reagent*, *analyte-free*, or *Laboratory Pure of ASTM Type II water* means any distilled or deionized water which is free of contaminants that may interfere with the analytical test.

Appendix A:

North Creek Analytical - Bothell Laboratory

Scopes of Accreditation and Certificates

1. A2LA
2. Washington DOE
3. Washington DOH
4. Oregon DOH
5. Montana DOH
6. Idaho DOH
7. U.S. ARMY Corps of Engineers

STANDARD OPERATING PROCEDURES

BOTHELL AND SPOKANE

STANDARD OPERATING PROCEDURE INDEX

Code
AM-Administrative
SC-Sample Control
GL-General Laboratory
AT-Aquatic Toxicity
IN-Inorganics
MT-Metals
MS-Mass Spectroscopy
GC-Gas Chromatography
EX-Extractions
HC-Hydrocarbons

SCP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	SOP Assigned to the Following Areas:												
				AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAB-0001.0	Documentation Protocol	4/24/92	00010.SOP	X												
NCAB-0002.0	Data Archival and Storage	6/24/92	00020.SOP	X												
NCAB-0003.0	Corrective Action Procedure	8/16/91	00030.SOP	X												
NCAB-0003.1	CAP Organic Analyses (GC,LC,GC/MS)	1/12/93	00031.SOP	X												
NCAB-0003.2	CAP Inorganic Analyses (Metals/Wet Chem)	1/28/93	00032.SOP	X												
NCAB-0004.0	Dry Weight Conversion	3/22/93	00040.SOP	X												
NCAB-0005.0	Rules for Resolving Technical Complaints	8/26/92	00050.SOP	X												
NCAB-0006.0	Chain of Custody Control and Routing	10/19/92	00060.SOP	X												
NCAB-0007.0	Handling Confidentiality of Data	10/19/92	00070.SOP	X												
NCAB-0008.0	Technical Data Review for Reports	12/22/92	00080.SOP	X												
NCAB-0009.0	Project Manager; Client Procedures	3/30/94	00090.SOP	X												
NCAB-0010.0	Subcontrading Analytical Services	1/5/92	00100.SOP	X												
NCAB-0011.0	Relogging Samples	10/28/92	00110.SOP	X												
NCAB-0012.0	Conducting Data Accuracy Audits	2/11/93	00120.SOP	X												
NCAB-0012.1	Conducting Internal and External Audits	9/27/93	00121.SOP	X												
NCAB-0013.0	Copying and Mailing of Reports	4/1/93	00130.SOP	X												
NCAB-0014.0	Changing Report Tempates	4/29/93	00140.SOP	X												
NCAB-0015.0	Subcontractor Invoice Procedure	3/4/94	00150.SOP	X												
NCAB-1001.0	Sample Handling	6/23/92	10010.SOP		X											

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAB-1001.1	Sample Handling for BATTELLE Samples	2/1093	10011.SOP		X											
NCAB-1001.2	Sample Handling for US NAVY Samples	11/393	10012.SOP		X											
NCAB-1001.3	Sample Handling for ARMY Corps Samples	2/2195	10013.SOP		X											
NCAB-1001.4	Sample Handling for AK101 Samples	3/2996	10014.SOP		X											
NCAB-1002.0	Disposal of Foreign Soil	6/2492	10020.SOP		X											
NCAB-1003.0	Acknowledgement of Sample Receipt Cond.	6/2692	10030.SOP		X											
NCAB-1004.0	Documentation of Drinking Water Samples	12/492	10040.SOP		X											
NCAB-2001.0	Glassware Cleaning	8/1192	20010.SOP			X										
NCAB-2002.0	Establishing Method Detection Limits	1/1090	20020.SOP			X										
NCAB-2003.0	Calibration of Measurement Equipment	4/2093	20030.SOP			X										
NCAB-2004.0	Significant Figures and Rounding Off	6/2392	20040.SOP			X										
NCAB-2005.0	Water Quality Assurance	10/1992	20050.SOP			X										
NCAB-2006.0	QC Policy for TPH by WA-DOE	10/1992	20060.SOP			X										
NCAP-2006.6	TPH QC Policy by OR-DEQ (Portland)	3/2693	20066.SOP			X										
NCAB-2007.0	General Training	7/2792	20070.SOP			X										
NCAB-2008.0	Corrective Action Reports	2/1993	20080.SOP			X										
NCAB-2010.0	QC Policy for Inorganic Analyses	2/2/93	20100.SOP			X										
NCAP-2010.6	QC Policy for Inorganic Analyses	12/1294	20106.SOP			X										
NCAB-2020.0	QC Policy for Metals Analyses	9/9/92	20200.SOP			X										
NCAP-2020.6	QC Policy for Metals Analyses	12/1294	20206.SOP			X										
NCAB-2030.0	QC Policy for Organic Analyses	1/29/93	20300.SOP			X										
NCAP-2030.6	QC Policy for Organic Analyses	12/1194	20306.SOP			X										
NCAB-2040.0	Handling & Prep. of Standards for Organics	2/10/93	20400.SOP			X										
NCAB-2050.0	Handling & Prep. of Standards for Inorganics	2/12/93	20500.SOP			X										
NCAB-2060.0	Proper Use of Respirators	5/21/93	20600.SOP			X										
NCAB-2070.0	Document Changes	9/28/93	20700.SOP			X										
NCAB-2080.0	Sample Container Preparation	2/3/95	20800.SOP			X										
NCAB-2090.0	Storage and Security of Computer Programs	2/3/95	20900.SOP			X										
NCAB-3001.0	Microbiological Glassware Procedures	6/24/91	30010.SOP				X									
NCAB-3002.0	Sterilization Procedures	6/23/92	30020.SOP				X									
NCAB-3003.0	Total Coliform Membrane Filtration	3/16/93	30030.SOP				X									
NCAB-3004.0	Fecal Coliform Membrane Filtration	3/16/93	30040.SOP				X									
NCAB-3005.0	Colilert P/A	3/16/93	30050.SOP				X									

The column heads AM through HC appear under the printed heading "SOP Assigned to the Following Areas:".

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	SOP Assigned to the Following Areas: AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAB-3006.0	Presence/Absence Coliform Analysis	10/4/91	30060.SOP				X									
NCAB-3007.0	Total Coliform MPN	3/16/93	30070.SOP				X									
NCAB-3008.0	Fecal Coliform MPN	3/16/93	30080.SOP				X									
NCAB-3009.0	Fecal Streptococcus MPN	3/16/93	30090.SOP				X									
NCAB-3010.0	Heterotrophic Plate Count- Pour Plate	9/21/92	30100.SOP				X									
NCAB-3011.0	Bioassay- DO Meter Cal.	11/25/92	30110.SOP				X									
NCAB-3012.0	Bioassay- pH Meter Cal.	1/29/93	30120.SOP				X									
NCAB-3013.0	Bioassay- Rainbow Trout Culturing	3/9/93	30130.SOP				X									
NCAB-3014.0	Bioassay- DOE Haz Waste Characterizaton	3/9/93	30140.SOP				X									
NCAB-3015.0	Bioassay- EPA Static Acute Testing (4th Ed)	6/3/93	30150.SOP				X									
NCAB-3015.1	Bioassay- EPA Static Acute Testing (3rd Ed)	6/3/93	30151.SOP				X									
NCAB-3016.0	Bioassay- Reference Toxicant Testing	3/31/93	30160.SOP				X									
NCAB-3018.0	Bioassay- California Haz Waste Char.	6/3/93	30180.SOP				X									
NCAB-3020.0	Compost and Other Solid Samples	6/1/95	30200.SOP				X									
NCAB-3021.0	Monthly Colilert Quality Checks	6/1/95	30210.SOP				X									
NCAB-3022.0	Salmonella	11/29/95	30220.SOP				X									
NCAB-4001.0	Particle Size Distribution	6/24/92	40010.SOP					X								
NCAB-4002.0	Total Sulfides: Spectrophotometric	11/4/92	40020.SOP					X								
NCAB-4002.1	Total Sulfides: Titrimetric	11/4/92	40021.SOP					X								
NCAB-4003.0	Total Solids	12/21/92	40030.SOP					X								
NCAB-4004.0	Acidity (as CaCO3)	10/19/92	40040.SOP					X								
NCAB-4005.0	Total Alkalinity (as CaCO3)	10/19/92	40050.SOP					X								
NCAB-4005.1	Alkalinity- Bicarbonate	10/19/92	40051.SOP					X								
NCAB-4005.2	Alkalinity-Carbonate	10/19/92	40052.SOP					X								
NCAB-4005.3	Alkalinity-Hydroxide	10/19/92	40053.SOP					X								
NCAB-4006.0	Ion Chromatograph	10/19/92	40060.SOP					X								
NCAB-4007.0	Biochemical Oxygen Demand- 5 Day	1/27/93	40070.SOP					X								
NCAB-4008.0	CaCO3- Langlier Index -Total Alkalinity	10/19/92	40080.SOP					X								
NCAB-4008.1	CaCO3- Langlier Index- pH	10/19/92	40081.SOP					X								
NCAB-4008.2	CaCO3- Langlier Index- Temperature	10/19/92	40082.SOP					X								
NCAB-4008.3	CaCO3- Langlier Index- TDS	10/19/92	40083.SOP					X								
NCAB-4009.0	Chemical Oxygen Demand	1/27/93	40090.SOP					X								
NCAB-4010.0	Chloride- by IC	1/4/93	40100.SOP					X								

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	SOP Assigned to the Following Areas: AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAB-4010.1	Chloride- Titrinetric	1/4/93	40101.SOP					X								
NCAB-4011.0	Demand Chlorine	10/15/92	40110.SOP					X								
NCAB-4012.0	Residual Chlorine	10/19/92	40120.SOP					X								
NCAB-4015.0	Color	10/19/92	40150.SOP					X								
NCAB-4016.0	Conductivity/Resistivity	10/19/92	40160.SOP					X								
NCAB-4017.0	Cyanide-Total	10/22/92	40170.SOP					X								
NCAB-4017.1	Cyanide- Amenable	10/19/92	40171.SOP					X								
NCAB-4017.2	Cyanide- Total + Amenable	3/11/93	40172.SOP					X								
NCAB-4018.0	Cyanide- Reactivity	3/11/93	40180.SOP					X								
NCAB-4019.0	Cyanide- Weak and Dissociable	10/19/92	40190.SOP					X								
NCAB-4022.0	Flashpoint Pensky-Marten Closed Cup	3/11/93	40220.SOP					X								
NCAB-4023.0	Fluoride- ByIC	1/4/93	40230.SOP					X								
NCAB-4023.1	Fluoride- by Probe	3/11/93	40231.SOP					X								
NCAB-4024.0	Hardness- Titrinetric	10/19/92	40240.SOP					X								
NCAB-4025.0	Iodide	10/15/92	40250.SOP					X								
NCAB-4026.0	Iodine	10/19/92	40260.SOP					X								
NCAB-4027.0	Total Kjeldahl Nirogen	7/17/92	40270.SOP					X								
NCAB-4028.0	Nitrogen- Ammonia	3/11/93	40280.SOP					X								
NCAB-4029.0	Nitrogen- Nitrate by IC	1/4/93	40290.SOP					X								
NCAB-4029.1	Nitrogen-Nitrate by Probe	1/4/93	40291.SOP					X								
NCAB-4030.0	Nitrogen- Nitrite by IC	1/4/93	40300.SOP					X								
NCAB-4030.1	Nitrogen-Nitrite by Spectrophotometric	1/4/93	40301.SOP					X								
NCAB-4031.0	Nitrogen- Nitrate-Nitrite by IC	1/4/93	40310.SOP					X								
NCAB-4031.1	Nitrogen- Nitrate-Nitrite	1/4/93	40311.SOP					X								
NCAB-4032.0	Odor	10/19/92	40320.SOP					X								
NCAB-4033.0	Dissolved Oxygen	10/19/92	40330.SOP					X								
NCAB-4034.0	pH- Electrode (Water)	10/19/92	40340.SOP					X								
NCAB-4035.0	Total Phenols- Colormetric	3/11/93	40350.SOP					X								
NCAB-4036.0	Orthophosphate	10/19/92	40360.SOP					X								
NCAB-4036.1	Phosphorous Bioavailable (BAP)	10/10/95	40361.SOP					X								
NCAB-4037.0	Total Phosphorus	10/19/92	40370.SOP					X								
NCAB-4037.1	Total Phos. by Perstorp Enviroflow 3000	10/24/94	40371.SOP					X								
NCAB-4038.0	Salinity	3/11/93	40380.SOP					X								

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	SOP Assigned to the Following Areas: AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAB-4039.0	Silica (SiO2)	10/19/92	40390.SOP					X								
NCAB-4040.0	Total Dissolved/Filterable Solids	1/27/93	40400.SOP					X								
NCAB-4041.0	Total Suspend/Non-Filterable Solids	1/27/93	40410.SOP					X								
NCAB-4042.0	Total Settleable Solids	1/4/93	40420.SOP					X								
NCAB-4043.0	Total Volatile Solids and Ash	3/11/93	40430.SOP					X								
NCAB-4044.0	Specific Gravity	10/19/92	40440.SOP					X								
NCAB-4045.0	Sulfate- Gravimetric	3/11/93	40450.SOP					X								
NCAB-4048.0	Reactivity Sulfide	3/11/93	40480.SOP					X								
NCAB-4050.0	Sulfite	10/19/92	40500.SOP					X								
NCAB-4051.0	Surfactants- Methylene Blue Active Sub.	10/19/92	40510.SOP					X								
NCAB-4052.0	Temperature	10/19/92	40520.SOP					X								
NCAB-4053.0	Turbidity	1/27/93	40530.SOP					X								
NCAB-4054.0	Phosphate by IC	1/4/93	40540.SOP					X								
NCAB-4055.0	Chlorophyll-a	10/19/92	40550.SOP					X								
NCAB-4056.0	pH- Electrode (Soil)	10/19/92	40560.SOP					X								
NCAB-4057.0	Total Organic Halides	10/19/92	40570.SOP					X								
NCAB-4058.0	Method Exceptions Total Organic Carbon	6/5/92	40580.SOP					X								
NCAB-4058.1	TOC in Soil and Sediment EPA 9060	6/25/93	40581.SOP					X								
NCAB-4059.0	Total & Inorganic Phosphates by ICP-OES	6/17/92	40590.SOP					X								
NCAB-4060.0	Method SM 5520 A,B,C,D,E,F	8/20/93	40600.SOP					X								
NCAB-4061.0	AOX-Adsorbable Organic Halide	9/2/93	40610.SOP					X								
NCAB-5001.0	ICP Instrument Training	3/3/93	50010.SOP						X							
NCAB-5002.0	Acid Sample Digestion	6/24/92	50020.SOP						X							
NCAB-5003.0	Format and Frequency SOP-Metals Analysis	6/24/92	50030.SOP						X							
NCAS-5003.5	Format and Frequency-Metals Analysis	7/19/95	50035.SOP						X							
NCAB-5004.0	AAS: Mercury Cold Vapor Analysis	9/23/92	50040.SOP						X							
NCAS-5004.5	AAS: Metal Hydride Analysis	7/19/95	50045.SOP						X							
NCAB-5005.0	AAS: Graphite Furnace Atomization	6/24/92	50050.SOP						X							
NCAB-5006.0	AAS: N2O/Acetylene Flame (Reducing)	6/24/92	50060.SOP						X							
NCAB-5007.0	AAS: N2O/Acetylene Flame (Oxidizing)	6/23/92	50070.SOP						X							
NCAB-5008.0	AAS: Air/Acetylene Flame	6/24/92	50080.SOP						X							
NCAB-5009.0	Organic Lead in Soil	6/23/92	50090.SOP						X							
NCAB-5010.0	Organic Lead in Water	6/23/92	50100.SOP						X							

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
				SOP Assigned to the Following Areas:												
NCAB-5011.0	ICP-AES Method 6010	10/19/92	50110.SOP						X							
NCAB-5012.0	Flame Instrument Training-Basic Operation	10/20/92	50120.SOP						X							
NCAB-5013.0	Naming Metal QC	10/20/92	50130.SOP						X							
NCAB-5014.0	Routine Maintenance - Metals & Wet Chem.	1/29/93	50140.SOP						X							
NCAS-5015.5	AAS: Arsenic and Selenium	7/19/95	50155.SOP						X							
NCAB-5016.0	Graphite Furnace Analysis	4/15/95	50160.SOP						X							
NCAB-5017.0	ICP/MS Analysis	1/13/95	50170.SOP						X							
NCAB-6001.0	GC/MS Department Requirements	6/23/92	60010.SOP							X						
NCAB-6002.0	Method Exceptions: 8240 VOA	3/12/93	60020.SOP							X						
NCAB-6003.0	Method Exceptions: EPA 624 (Purgeables)	3/12/93	60030.SOP							X						
NCAB-6004.0	Method Exceptions: EPA 8270 Semivol.	9/24/93	60040.SOP							X						
NCAB-6005.0	Method Exceptions: EPA 524.2	8/24/93	60050.SOP							X						
NCAB-6006.0	Modified EPA 8240/8260 for Air Samples	1/20/94	60060.SOP							X						
NCAB-6007.0	EPA 8240/8260 Heated Sparge Sediments	1/21/94	60070.SOP							X						
NCAB-6008.0	EPA 8240/8260 PSDDA and PSEP Program	1/24/94	60080.SOP							X						
NCAB-6009.0	Method Exceptions: EPA 525 Semivol.	10/24/94	60090.SOP							X						
NCAB-6010.0	Routine Maintenance - GC/MS	1/29/93	60100.SOP							X						
NCAB-6011.0	EPA Method 3580 - Waste Dilution	10/24/94	60110.SOP							X						
NCAB-7001.0	Method Exceptions 8010	10/27/92	70010.SOP								X					
NCAB-7002.0	Method Exceptions: 8020-BTEX Only	6/24/92	70020.SOP								X					
NCAB-7003.0	Method Exceptions: 8080	8/27/92	70030.SOP								X					
NCAB-7004.0	Meth. Ex. 508: Chlor. Pest in H20 by ECD	11/12/92	70040.SOP								X					
NCAB-7005.0	Meth Ex. 515.1 Chlor. Acids in H20- ECD	11/18/92	70050.SOP								X					
NCAB-7006.0	Method Exceptions 601,602	10/27/92	70060.SOP								X					
NCAB-7007.0	Alcohols and Acetone	6/23/92	70070.SOP								X					
NCAB-7008.0	EPA 504-Halogenated VOA	6/23/92	70080.SOP								X					
NCAB-7008.1	Modified EPA 504-EDB,DBCP in Soil	2/8/95	70081.SOP								X					
NCAB-7009.0	502.2 Volatile Organics Analysis	6/23/92	70090.SOP								X					
NCAB-7010.0	Purge and Trap Method Exceptions	6/23/92	70100.SOP								X					
NCAB-7013.0	Ethylene Glycol	6/23/92	70130.SOP								X					
NCAB-7014.0	Meth. Excep. EPA 600 PCBs in T Fluid & Oil	1/19/93	70140.SOP								X					
NCAB-7015.0	Meth. Ex. EPA 608 GC Org. Pest. & PCBs	1/20/93	70150.SOP								X					
NCAB-7016.0	Meth. Excep. EPA 604 GC/FID Phenols	1/20/93	70160.SOP								X					

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	SOP Assigned to the Following Areas: AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAB-7017.0	Meth. Excep. HPLC Analysis of PNAs 8310	6/23/92	70170.SOP								X					
NCAB-7018.0	Method Exceptions 8150	8/27/92	70180.SOP								X					
NCAB-7020.0	Routine Maintenance- HPLC	1/9/93	70200.SOP								X					
NCAB-7020.1	Routine Maintenance- Semivolatile GC	1/9/93	70201.SOP								X					
NCAB-7020.2	Routine Maintenance - Volatile GC	1/29/93	70202.SOP								X					
NCAB-7021.0	Fuel Hydrocarbon Waste ID, GC/FID	12/20/93	70210.SOP								X					
NCAB-7022.0	NCA Analysis of Wipes for PCBs	1/31/95	70220.SOP								X					
NCAB-8001.0	TCLP Extraction	8/27/92	80010.SOP									X				
NCAB-8002.0	Sonication Extraction	5/1/89	80020.SOP									X				
NCAB-8003.0	EPA 3520-Continuous Liquid/Liquid Ext. #1	3/5/93	80030.SOP									X				
NCAB-8003.1	EPA 3520-Continuous Liq/Liq Apparatus #2	1/18/93	80031.SOP									X				
NCAB-8004.0	Separatory Funnel Liquid/Liquid Ext.	6/23/92	80040.SOP									X				
NCAB-8005.0	Meth. Excep. 413.1 Grav. Sep. Fun. Ext	3/2/93	80050.SOP									X				
NCAB-8006.0	Contract Req.-Organic Sample Prep.	10/19/92	80060.SOP									X				
NCAB-8007.0	Sample prep for BNA's in Water (on disk)	5/1/89	80070.SOP									X				
NCAB-8008.0	Low level prep for BNA's in Soil (on disk)	5/1/89	80080.SOP									X				
NCAB-8009.0	Extractions- 8150 water	10/26/92	80090.SOP									X				
NCAB-8010.0	Extractions- 8150 soil	10/26/92	80100.SOP									X				
NCAB-8011.0	Extractions- HCID Soil	10/26/92	80110.SOP									X				
NCAB-8012.0	Extractions- 3620: Florisil Cleanup	10/26/92	80120.SOP									X				
NCAB-8013.0	Method Exceptions: 5520 B	3/17/93	80130.SOP									X				
NCAB-8014.0	Extractions - EPA 3580 Waste Dilution	2/8/95	80140.SOP									X				
NCAB-8015.0	Extractions - EPA 3660 Sulfur Cleanup	2/8/95	80150.SOP									X				
NCAB-8016.0	Extractions - EPA 3665 Sulfuric Acid Cleanup	2/8/95	80160.SOP									X				
NCAB-9001.0	Method Exceptions-WTPH-D in Soil	1/29/93	90010.SOP										X			
NCAS-9001.5	Method Exceptions-WTPH-D in Soil	5/23/95	90015.SOP										X			
NCAB-9002.0	Method Exceptions-WTPH-G in Soil	7/20/92	90020.SOP										X			
NCAB-9003.0	Method Exceptions- WTPH G in Water	7/20/92	90030.SOP										X			
NCAB-9004.0	Method Exceptions-WTPH-D in water	1/29/93	90040.SOP										X			
NCAS-9004.5	Method Exceptions-WTPH-D in water	5/23/95	90045.SOP										X			
NCAB-9005.0	Method Exceptions-ADEC-G water and soil	5/20/92	90050.SOP										X			
NCAB-9006.0	Method Exceptions-ADEC-D water and soil	8/27/92	90060.SOP										X			
NCAB-9007.0	Method Exceptions Oregon TPH-G for soil	12/21/92	90070.SOP										X			

SOP #	SOP NAME	DATE OF LAST REVISION	FILE NAME	SOP Assigned to the Following Areas: AM	SC	GL	AT	IN	MT	MS	GC	EX	HC			
NCAP-9007.6	Meth. Excep. OR TPH-G for soil (Portland)	3/26/93	90076.SOP										X			
NCAB-9008.0	Modification of WTPH-HCID for Water	8/31/93	90080.SOP										X			
NCAB-9009.0	Method Exceptions WTPH-HCID in Soil	6/23/92	90090.SOP										X			
NCAB-9010.0	Method Exceptions- 413.2 (IR) for Waters	3/2/93	90100.SOP										X			
NCAB-9011.0	Method Exceptions- Oregon 418.1 soil	3/3/93	90110.SOP										X			
NCAP-9011.6	Meth. Excep. OR 418.1 soil (Portland)	3/26/93	90116.SOP										X			
NCAB-9012.0	Method Exception-WTPH-418.1 for soil	3/2/93	90120.SOP										X			
NCAB-9012.1	TRPH in Soil for ARMY Corps 9071/418.1	2/7/95	90121.SOP										X			
NCAB-9013.0	Method Exception-WTPH-418.1 for water	3/2/93	90130.SOP										X			
NCAB-9014.0	Method Excep. Oregon TPH-HCID, TPHD	8/25/92	90140.SOP										X			
NCAP-9014.6	Meth. Ex. OR TPH-HCID soils (Portland)	3/26/93	90146.SOP										X			
NCAB-9015.0	Method Excep. Oregon TPH-D	12/21/92	90150.SOP										X			
NCAP-9015.6	Meth Excep. Oregon TPH-D (Portland)	3/26/93	90156.SOP										X			
NCAB-9016.0	Meth. Excep. 604 GC/FID Phenols	1/20/93	90160.SOP										X			
NCAB-9017.0	Meth. Excep. 610 HPLC Analysis of PAHs	1/20/93	90170.SOP										X			
NCAB-9018.0	Meth. Excep. PAHs by NIOSH 5506	2/19/93	90180.SOP										X			
NCAB-9019.0	WTPH-G/BTEX in Air Samples	1/13/94	90190.SOP										X			
NCAB-9020.0	Macro Revisions and Maintenance	10/10/94	90200.SOP										X			
NCAB-9021.0	Meth. Excep. Alaska AK 103	3/13/95	90210.SOP										X			
NCAB-9022.0	NCA Silica Gel/Acid Cleanup for TPH-D	3/13/95	90210.SOP										X			
	INDEX LAST REVISED: 4/9/96															

STANDARD OPERATING PROCEDURES

PORTLAND

DOCUMENT CONTROL				
SOP LOG				
SOP ID	DESCRIPTION	Assigned by/ Date	Recent Revision	Code
SOP-001	Preparation of SOPs	8/18/92 lmo	0	A
SOP-002	TCAR	8/7/92 lmo	1	A
SOP-003	Handling of Standards, Solvents, Acids and Reagen	9/1/92 lmo	0	A
SOP-004	Data Handling and Management	9/1/92 lmo	1	A
SOP-005	Sample Receiving	1/12/93 lmo	1	A
SOP-006	Subsampling	1/13/93 hb	0	A
SOP-007	Document Control	1/13/93 lmo	0	A
SOP-008	Facilities	1/13/93 lmo	0	A
SOP-009	Glassware Cleaning	1/13/93 lmo	1	A
SOP-010	GC/MS Analysis of Semivolatile Compounds	8/4/92 lmo	1	O
SOP-011	PAH Analysis by GC/MS in SIM mode	8/4/92 lmo	1	O
SOP-012	Chlorinated Phenols (EPA 8150 Mod)	8/4/92 lmo	0	O
SOP-013	Halogenated Volatiles (EPA 8010)	8/5/92 lmo	1	V
SOP-014	8015M-D Analysis	8/6/92 lmo	0	F
SOP-015	Cancel	8/18/92 lmo		
SOP-016	Cancel	8/18/92 lmo		
SOP-017	Cancel	8/18/92 lmo		
SOP-018	Cancel	8/18/92 lmo		
SOP-019	Cancel	8/18/92 lmo		
SOP-020	Cancel	8/18/92 lmo		
SOP-021	Cancel	8/18/92 lmo		
SOP-022	Cancel	8/18/92 lmo		
SOP-023	GFAA Analysis	8/18/92 lmo	1	I
SOP-024	TCLP Prep - Inorganic and Nonvolatile Organic	8/18/92 lmo	0	I
SOP-025	ICP	8/18/92 lmo	1	I
SOP-026	7470 Digestion	10/1/92 lmo	0	I
SOP-027	7470 Wipe Digestion	10/1/92 lmo	0	I
SOP-028	7471 Digestion	10/1/92 lmo	0	I
SOP-029	Mercury Analysis	10/1/92 lmo	2	I
SOP-030	Alkalinity	10/1/92 lmo	0	I
SOP-031	BOD	10/1/92 lmo	2	I
SOP-032	Cyanide EPA 9010	10/1/92 lmo	0	I
SOP-033	Cyanide prep	10/1/92 lmo	0	I
SOP-034	COD	10/1/92 lmo	1	I
SOP-035	Conductivity	10/1/92 lmo	0	I
SOP-036	Hardness	10/1/92 lmo	0	I
SOP-037	Formaldehyde	10/1/92 lmo	0	I
SOP-038	Hexavalent Chromium	10/1/92 lmo		I
SOP-039	IC	10/1/92 lmo	0	I
SOP-040	KF Water Content	10/1/92 lmo	0	I
SOP-041	Cancel	10/1/92 lmo		
SOP-042	pH EPA 9041	10/1/92 lmo	0	I
SOP-043	pH EPA 9040	10/1/92 lmo	0	I
SOP-044	pH EPA 9045	10/1/92 lmo	0	I
SOP-045	Phenolics (colorimetric)	10/1/92 lmo	1	I
SOP-046	Total Solids	10/1/92 lmo	0	I

SOP-047	Cancel	10/1/92 lmo		
SOP-048	Total Dissolved Solids	10/1/92 lmo	1	I
SOP-049	Total Suspended Solids	10/1/92 lmo	2	I
SOP-050	Fixed and Volatile Solids	10/1/92 lmo	0	I
SOP-051	Tannin & Lignin	10/1/92 lmo	1	I
SOP-052	Total Phosphate	10/1/92 lmo		I
SOP-053	TOX	10/1/92 lmo	0	I
SOP-054	EPA 8080 Pesticide Analysis	10/1/92 lmo	1	O
SOP-055	EPA 8080 PCB Analysis	10/1/92 lmo	1	O
SOP-056	EPA 8020 Aromatic Volatiles	10/1/92 lmo	0	V
SOP-057	8015M-G	10/1/92 lmo	0	F
SOP-058	TPH-G	10/1/92 lmo	0	F
SOP-059	WTPH-G	10/1/92 lmo	0	F
SOP-060	EPA 3540 Soxhlet	10/1/92 lmo		P
SOP-061	EPA 3510 Sep funnel	10/1/92 lmo	0	P
SOP-062	EPA 3550 Sonication	10/1/92 lmo	1	P
SOP-063	EPA 3520 Liquid/Liquid	10/12/92 jjs	0	P
SOP-064	Digestion of Oils/Sludges - Metals	1/26/93 lmo	0	I
SOP-065	Water Digestion - Metals	1/26/93 lmo	0	I
SOP-066	Soil Digestion - Metals	1/26/93 lmo	0	I
SOP-067	PCB Wipe Extraction	10/1/92 lmo		P
SOP-068	Waste Dilution EPA 3580	10/1/92 lmo	0	P
SOP-069	Amines Analysis	10/1/92 lmo		O
SOP-070	Headspace	10/1/92 lmo		V
SOP-071	TPH-HCID Analysis	10/1/92 lmo		F
SOP-072	TPH-D Analysis	10/1/92 lmo	0	F
SOP-073	WTPH-HCID Analysis	10/1/92 lmo	1	F
SOP-074	WTPH-D Analysis	10/1/92 lmo	0	F
SOP-075	Percent Solids	10/1/92 lmo	1	I
SOP-076	WTPH-HCID Preparation	10/1/92 lmo	1	F
SOP-077	WTPH-D Preparation - soil	10/1/92 lmo	1	F
SOP-078	WTPH-418.1M Preparation soil	10/1/92 lmo	0	F
SOP-079	Volatiles 8240	10/9/92 jjs	1	V
SOP-080	Holding Blanks - Volatiles	10/12/92 jjs	0	V
SOP-081	413.2/418.1 soil prep	10/27/92 jjs	0	P
SOP-082	413.2/418.1 water prep	10/27/92 jjs	1	P
SOP-083	IR Analysis	12/14/92 jjs	0	O
SOP-084	Cancel	12/14/92 jjs		
SOP-085	TPH-HCID Prep	12/14/92 jjs	0	F
SOP-086	TPH-D Prep	12/14/92 jjs		F
SOP-087	TPH-418.1M Prep	12/14/92 jjs		F
SOP-088	8015M-D soil prep	12/14/92 jjs		F
SOP-089	8015M-D water prep	12/14/92 jjs		F
SOP-090	Methamphetamine prep	10/28/92 jjs	0	P
SOP-091	Flashpoint	11/3/92 jjs	0	O
SOP-092	Cancel	11/20/92 jjs		
SOP-093	Herbicide Prep - water	11/23/92 jjs		P
SOP-094	TCLP ZHE	11/23/92 jjs	0	V
SOP-095	WTPH-D prep water	11/23/92 jjs	1	F
SOP-096	Turbidity	2/5/93 lmo	0	I
SOP-097	WTPH-418.1 M Prep - water	11/30/92 lmo		F

SOP-098	Ammonia-N (electrode)	12/9/92 lmo	0	I
SOP-099	Free Liquid	12/9/92 lmo	0	I
SOP-100	Flame Atomic Absorption	12/9/92 lmo	0	I
SOP-101	Herbicide Prep - soil	12/10/92 jjs		P
SOP-102	Solvent Scan	12/30/92 jjs	0	V
SOP-103	F-list	12/30/92 jjs	0	V
SOP-104	8260	12/30/92 jjs	0	V
SOP-105	Methamphetamine/Drug Test Analysis	12/30/92 jjs	0	O
SOP-106	524.2	12/30/92 jjs	0	V
SOP-107	Cyanide-electrode	1/4/93 lmo	0	I
SOP-108	Fluoride-electrode	1/4/93 lmo	0	I
SOP-109	Nitrate/Nitrite - Cd Reduction	1/4/93 lmo		I
SOP-110	Cancel	1/4/93 lmo		
SOP-111	Sulfate - Turbidimetric	1/4/93 lmo		I
SOP-112	Sulfide - Lead Acetate	1/4/93 lmo		I
SOP-113	Residual Chlorine	1/4/93 lmo	O	I
SOP-114	Nitrate-N (electrode)	1/4/93 lmo		I
SOP-115	Color	1/7/93 lmo	0	I
SOP-116	Hardness (EPA 130.2)	1/7/93 lmo	0	I
SOP-117	8010/8020	1/18/93 lmo	0	V
SOP-118	Calibration of Electronic Balances	2/1/93 hlb	1	A
SOP-119	Cancel	2/1/93 lmo		
SOP-120	GPC	2/1/93 lmo	1	P
SOP-121	8040 analysis	2/8/93 lmo		O
SOP-122	Logbook Maintenance	2/22/93 lmo	0	A
SOP-123	Document Control Procedures - QA/QC	2/22/93 lmo	0	A
SOP-124	8310 Analysis	2/26/93 lmo		O
SOP-125	8140 Organo-Phos Pesticides	3/4/93 hlb	O	O
SOP-126	8150/8151 Herbicides Analysis	3/4/93 hlb		O
SOP-127	Glycols (GC/FID)	3/8/93 lmo		O
SOP-128	MBAS	3/8/93 lmo	0	I
SOP-129	Settlable Solids	3/17/93 lmo	0	I
SOP-130	Dissolved Silica	5/11/93 lmo	0	I
SOP-131	Cr(VI) coprecipitation	5/11/93 lmo	0	I
SOP-132	Pipetman Maintenance and Calibration	5/20/93 lmo		A
SOP-133	Office Procedures for Document Preparation	6/7/93 lmo		A
SOP-134	Determination of MDL and MRL	6/15/93 lmo	0	A
SOP-135	Sample Disposal	6/29/93 lmo		A
SOP-136	QC Calculations & Reporting	9/15/93 lmo	0	A
SOP-137	Methanol by Headspace	9/27/93 lmo		V

American Association for Laboratory Accreditation

A2LA

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

NORTH CREEK ANALYTICAL, INC.
Bothell, WA

for technical competence in the field of

Environmental Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC guide 25-1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards) and any additional program requirements in the identified field of testing.

Presented this 30th day of May, 1995.

John W. Locke
President
For the Accreditation Council

Certificate Number 301.01

Valid to August 31, 1996

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION

NORTH CREEK ANALYTICAL, INC.
18939 120th Avenue NE, Suite 101
Bothell, WA 98011-2569
Scot Cocanour Phone: 206 481 9200

ENVIRONMENTAL

Valid To: August 31, 1996 Certificate Number: 0301-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

Atomic Absorption/ICP-AES, Atomic Absorption Spectroscopy - Flame and Furnace, Gas Chromatography, Gravimetry, Gas Chromatography/Mass Spectrometry, High Performance Liquid Chromatography, Ion Chromatography, Methylene Blue Active Substances, Microbiology, Misc.- Electronic Probes (pH, F^-, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, Total Organic Carbon, Total Organic Halide, Turbidity

Nonpotable Water: metals, nutrients, demands, classical (wet) chemistry, microbiology, purgeable organics, extractable organics, pesticides-herbicides-PCBs

Solid/Hazardous Waste: metals, nutrients, demands, classical (wet) chemistry, purgeable organics, extractable organics, pesticides-herbicides-PCB's, and hazardous waste characteristics (ignitability, corrosivity, reactivity, and TCLP)

A supplemental scope, identifying the full range of tests and types of tests, is available from A2LA or the laboratory.

John W Locke

American Association for Laboratory Accreditation

SUPPLEMENT TO SCOPE OF ACCREDITATION

NORTH CREEK ANALYTICAL, INC.
18939 12th Avenue NE, Suite 101
Bothell, WA 98011-2569
Scot Cocanour Phone: 206 481 9200

ENVIRONMENTAL

Valid as of: May 30, 1995 Certificate Number: 0301-01
Valid until: August 31, 1996

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform recognized EPA methods for the following determinations:

Nonpotable Water

Metals: Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, Sn, V, Zn

per EPA test methods 200.7, 202.1, 202.2, 204.2, 206.2, 210.2, 213.2, 218.2, 219.2, 220.2, 236, 239.2, 242.1, 243.1, 245.1, 245.5, 249.2, 258.1, 270.2, 272.2, 273.1, 279.2, 282.1, 286.2, 289.2

Nutrients: Ammonia (as N), Kjeldahl nitrogen, Nitrate (as N), Nitrate-nitrite (as N), Nitrite (as N), Orthophosphate (as P), Total phosphorus

per EPA test methods 300.0, 350.3, 351.3, 353.2, 353.3, 354.1, 365.1, 365.2
per Standard Methods 18th edition: 4110A

Demands: BOD, COD, TOC, TOX, AOX

per EPA test methods 405.1, 410.4, 415.2, 1650A, 9020

Classical Chemistry: Acidity, Alkalinity, Bromide, Ca, Chloride, Cl (residual), Color, Cu, Cyanide, Cyanide amenable to chlorination, Fluoride, Hardness, pH, Fe, Mg, Mn, MBAS, Oil and grease, Dissolved oxygen, Phenols, Phosphorus (elemental), Total residue, Filterable residue, Nonfilterable residue, Settleable residue, Specific conductance, Sulfate, Sulfide, Sulfite, Surfactants, Temperature, Turbidity, Zn, Salinity, Silica

per EPA test methods 110.2, 120.1, 150.1, 160.1, 160.2, 160.3, 160.5, 170.1, 180.1, 200.7, 215.1, 220.2, 236.1, 242.1, 243.1, 289.2, 300.0, 305.2, 310.1, 320.1, 330.1, 335.1, 335.2, 340.2, 360.1, 365.2, 376.1, 413.1, 413.2, 418.1, 420.1, 425.1

Standard Methods 2120C, 4500, 4500D, 4500G

05/30/95

656 Quince Orchard Road, #620 • Gaithersburg,MD 20878-1409 • Phone: 301 670 1377 • FAX: 869 1495

Microbiology: Fecal coliform. Total coliform

per EPA test methods SOP 600/8-78/017

Purgeable Organics: Acetone, Benzene, Bis(2-chloroisopropyl)ether, Bromobenzene, Bromodichloromethane, Bromoform, Bromomethane, 2-Butanone, Carbon disulfide, Carbon tetrachloride, Chlorobenzene, Chloroethane, 2-Chloroethylvinyl ether, Chloroform, Chloromethane, Chlorotoluene, Dibromochloromethane, 1,2-Dibromo-3-chloropropane (DBCP), Dibromomethane, 1,2-Dibromoethane (EDB), 1,4-Dichloro-2-butane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Dichlorodifluoromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2-Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Diethyl ether, Ethylbenzene, 2-Hexanone, Hexachlorobutadiene, Methylene Chloride, Methyl ethyl ketone, Methyl isobutyl ketone, 4-Methyl-2-pentanone, Naphthalene, Styrene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Trichlorofluoromethane, Trichloropropane, 1,2,3-Trichloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Trihalomethanes, Vinyl chloride, Xylene total, 1,2-Xylene, 1,3-Xylene, 1,4-Xylene

per EPA test methods 601, 602, 624

Extractable Organics: Acenaphthene, Acenaphthylene, Anthracene, Benzoic acid, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Benzo(a)pyrene, Benzyl alcohol, Biphenyl, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate, 4-Bromophenylphenyl ether, Butyl benzyl phthalate, 2-sec-Butyl-4,6-dinitrophenol (DNBP), 4-Chloroaniline, Chloroethane, 4-Chloro-3-methylphenol, 1-Chloronaphthalene, 2-Chloronaphthalene, 2-Chlorophenol, 4-Chlorophenylphenyl ether, Chrysene, Cresols (methyl phenols), Dibenzo(a,h)anthracene, Dibenzofuran, Dibenzo(a,e)pyrene, Dibenzo(a,h)pyrene, Dibenzo(a,i)pyrene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 3,3'-Dichlorobenzidine, 2,4-Dichlorophenol, 2,6-Dichlorophenol, Diethylphthalate, alpha-,alpha-Dimethylphenethylamine, 2,4-Dimethylphenol, Dimethylphthalate, Di-n-butylphthalate, Di-n-octylphthalate, Dinitrobenzene, 2,4-Dinitrophenol, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Diphenylamine, Diphenyl ether, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclohexane, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, 2-Methyl-4,6-Dinitrophenol, 2-Methylnaphthalene, 2-Methylphenol, 4-Methylphenol, Naphthalene, 1-Naphthylamine, 2-Naphthylamine, 2-Nitroaniline, 3-Nitroaniline, 4-Nitroaniline, Nitrobenzene, 2-Nitrophenol, 4-Nitrophenol, N-Nitroso-di-n-butylamine, N-Nitrosodimethylamine, N-Nitrosodi-n-propylamine, N-Nitrosodiphenylamine, Pentachlorophenol, Phenanthrene, Phenol, Pyrene, Trichlorophenols, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol

per EPA test methods 625, 8310

Pesticides-herbicides-PCBs: Aldrin, Atrazine, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC (Lindane), Chlordane (technical), 2,4-D, Dalapon, 2,4-DB, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dicamba, Dieldrin, Dinoseb, Endosulfan I (alpha), Endosulfan II (beta), Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide, Methoxychlor, PCB-1016 (arochlor), PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, PCB-1260, Simazine, 2,4,5-T, 2,4,5-TP (Silvex), Toxaphene, Trifluralin

per EPA test methods 608, 8151

Solid Waste/Hazardous Waste

Metals: Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Si, Na, Tl, Sn, V, Zn

per EPA test methods SW 6010, 7020, 7041, 7060, 7091, 7131, 7191, 7201, 7211, 7380, 7421, 7460, 7470, 7520, 7740, 7760, 7841, 7911, 7951

Nutrients: Nitrate (as N)

per EPA test method SW 9200

Demands: TOC, TOX, AOX

per EPA test methods 9020, 9060, 1650A

Classical Chemistry: Ca, Cu, Cyanide, pH, Fe, Mg, Mn, Oil and grease, Phenols, Sulfate, Zn

per EPA test methods 418.1, 6010, 7380, 7460, 7951, 9010, 9038, 9045, 9065

Purgeable Organics: Acetone, Benzene, Bis(2-chloroisopropyl)ether, Bromobenzene, Bromodichloromethane, Bromoform, Bromomethane, 2-Butanone, Carbon disulfide, Carbon tetrachloride, Chlorobenzene, Chloroethane, 2-Chloroethylvinyl ether, Chloroform, Chloromethane, Chlorotoluene, Dibromochloromethane, 1,2-Dibromo-3-chloropropane (DBCP), Dibromomethane, 1,2-Dibromoethane (EDB), 1,4-Dichloro-2-butane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Dichlorodifluoromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2-Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Diethyl ether, Ethylbenzene, 2-Hexanone, Hexachlorobutadiene, Methylene Chloride, Methyl ethyl ketone, Methyl isobutyl ketone, 4-Methyl-2-pentanone, Naphthalene, Styrene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Trichlorofluoromethane, Trichloropropane, 1,2,3-Trichloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Trihalomethanes, Vinyl chloride, Xylene total, 1,2-Xylene, 1,3-Xylene, 1,4-Xylene, Gasoline Range Organics

per EPA test methods 8010, 8020, 8240, 8015M, WTPH-G

Extractable Organics: Acenaphthene, Acenaphthylene, Anthracene, Benzoic acid, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Benzo(a)pyrene, Benzyl alcohol, Biphenyl, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bis(2-ethylhexyl)phthalate, 4-Bromophenylphenyl ether, Butyl benzyl phthalate, 2-sec-Butyl-4,6-dinitrophenol (DNBP), 4-Chloroaniline, Chloroethane, 4-Chloro-3-methylphenol, 1-Chloronaphthalene, 2-Chloronaphthalene, 2-Chlorophenol, 4-Chlorophenylphenyl ether, Chrysene, Cresols (methyl phenols), Dibenzo(a,h)anthracene, Dibenzofuran, Dibenzo(a,e)pyrene, Dibenzo(a,h)pyrene, Dibenzo(a,i)pyrene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 3,3'-Dichlorobenzidine, 2,4-Dichlorophenol, 2,6-Dichlorophenol, Diethylphthalate, alpha-,alpha-Dimethylphenethylamine, 2,4-Dimethylphenol, Dimethylphthalate, Di-n-butylphthalate, Di-n-octylphthalate, Dinitrobenzene, 2,4-Dinitrophenol, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Diphenylamine, Diphenyl ether, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclohexane, Hexachlorocyclopentadiene, Hexachloroethane, Indeno(1,2,3-cd)pyrene, 2-Methyl-4,6-Dinitrophenol, 2-Methylnaphthalene, 2-Methylphenol, 4-Methylphenol, Naphthalene, 1-Naphthylamine, 2-Naphthylamine, 2-Nitroaniline, 3-Nitroaniline, 4-Nitroaniline, Nitrobenzene, 2-Nitrophenol, 4-Nitrophenol, N-Nitroso-di-n-butylamine, N-Nitrosodimethylamine, N-Nitrosodi-n-propylamine, N-Nitrosodiphenylamine, Pentachlorophenol, Phenanthrene, Phenol, Pyrene, Trichlorophenols, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol, Diesel Range Organics

per EPA test methods 8150, 8240, 8270, 8310, 8015M, WTPH-D

Pesticides-herbicides-PCBs: Aldrin, Atrazine, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC (Lindane), Chlordane (technical), 2,4-D, Dalapon, 2,4-DB, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dicamba, Dieldrin, Dinoseb, Endosulfan I (alpha), Endosulfan II (beta), Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Heptachlor, Heptachlor epoxide, Methoxychlor, PCB-1016 (arochlor), PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, PCB-1260, Simazine, 2,4,5-T, 2,4,5-TP (Silvex), Toxaphene, Trifluralin

per EPA test methods SW 8080, 8150

Hazardous Waste Characteristics: Corrosivity, Ignitability, Reactivity, TCLP

per EPA test methods SW846 (7.1, 7.2, 7.3): 1311

State of Washington
Department of Ecology

The State of Washington

Department of Ecology

This is to certify that

North Creek Analytical

Bothell, Washington

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an **ACCREDITED LABORATORY** for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective on the **1st day of July, 1997**, and shall expire on the **30th day of June 1998**.

Witnessed under my hand this **30th day of June 1997**.

Cliff J. Kirchmer

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

LAB ACCREDITATION NUMBER
C008

SCOPE OF ACCREDITATION

North Creek Analytical
Bothell, Washington

is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation applies to non-potable water analyses only. Accreditation for all parameters is final unless indicated otherwise in a note. EPA refers to the U.S. Environmental Protection Agency. "SM" refers to APHA *Standard Methods for the Examination of Water and Wastewater*, 18th Edition.

PARAMETER	METHOD	NOTES
Acidity	EPA 305.2	1,2
Alkalinity, Total	EPA 310.1	1
Ammonia	EPA 350.3	1
Anionic Surfactants	EPA 425.1	1,2
Biochemical Oxygen Demand BOD/CBOD	EPA 405.1	1
Calcium	EPA 215.1/7140	1
Calcium	EPA 200.7/6010A	1
Chemical Oxygen Demand	EPA 410.4(7.3)	1
Chloride	EPA 300.0 A	1
Chlorine Total Residual	EPA 330.1	1
Color	EPA 110.2	1,2
Color	SM 2120 C	1,2
Cyanide Total	EPA 335.2(8.10)	1
Dissolved Oxygen	EPA 360.1	1,2
Fluoride	EPA 340.2	1
Hardness, Total (as $CaCO3$)	EPA 215.1+242.1	1
Magnesium	EPA 242.1/7450	1
Magnesium	EPA 200.7/6010A	1
Nitrate	EPA 353.2	1
Nitrate + Nitrite	EPA 353.3	1
Nitrite	EPA 354.1	1,2
Nitrogen Total Kjeldahl	EPA 351.3	1
Oil & Grease	EPA 413.1	1
Oil & Grease	EPA 413.2	1
Orthophosphate	EPA 365.1	1
pH	EPA 150.1	1

North Creek Analytical, Bothell, Washington
Scope of Accreditation (Continued)

PARAMETER	METHOD	NOTES
Phenolics Total Recoverable	EPA 420.1(8.2)	1
Phosphorus Total	EPA 365.2	1
Potassium	EPA 258.1/7610	1
Potassium	EPA 200.7/6010A	1
Silica	EPA 200.7	1,2
Sodium	EPA 273.1/7770	1
Sodium	EPA 200.7/6010A	1
Solids, Total Dissolved	EPA 160.1	1
Solids, Total Suspended	EPA 160.2	1
Solids, Total Volatile	EPA 160.4	1,2
Specific Conductance	EPA 120.1	1
Sulfate	EPA 300.0 A	1
Sulfide	EPA 376.1	1,2
Sulfite	EPA 377.1	1,2
Total Organic Carbon	EPA 415.2	1,2
Adsorbable Organic Halides (AOX)	EPA 1650 A	1
Total Organic Halides	EPA 9020B	1,2
Total Pet Hydrocarbons	EPA 418.1	1,2
Turbidity	EPA 180.1	1,2
Aluminum	EPA 202.1/7020	1
Aluminum	EPA 202.2/7021	1
Aluminum	EPA 200.7/6010A	1
Antimony	EPA 204.2/7041	1
Antimony	EPA 200.7/6010A	1
Arsenic	EPA 206.2/7060A	1
Arsenic	EPA 200.7/6010A	1
Barium	EPA 208.2/7081	1,2
Barium	EPA 200.7/6010A	1,2
Beryllium	EPA 210.2/7091	1
Beryllium	EPA 200.7/6010A	1
Cadmium	EPA 213.2/7131A	1
Cadmium	EPA 200.7/6010A	1
Chromium	EPA 218.2/7191	1
Chromium	EPA 200.7/6010A	1
Cobalt	EPA 219.2/7201	1
Cobalt	EPA 200.7/6010A	1
Copper	EPA 220.2/7211	1
Copper	EPA 200.7/6010A	1
Iron	EPA 236.1/7380	1
Iron	EPA 200.7/6010A	1

North Creek Analytical, Bothell, Washington
Scope of Accreditation (Continued)

PARAMETER	METHOD	NOTES
Lead	EPA 239.2/7421	1
Lead	EPA 200.7/6010A	1
Manganese	EPA 243.1/7460	1
Manganese	EPA 200.7/6010A	1
Mercury	EPA 245.1/7470A	1
Nickel	EPA. 249.2/7521	1
Nickel	EPA 200.7/6010A	1
Selenium	EPA 270.2/7740	1
Selenium	EPA 200.7/6010A	1
Silver	EPA 272.2/7761	1
Silver	EPA 200.7/6010A	1
Thallium	EPA 279.2/7841	1
Thallium	EPA 200.7/6010A	1
Tin	EPA 282.1/7870	1,2
Tin	EPA 200.7	1,2
Vanadium	EPA 286.2/7911	1
Vanadium	EPA 200.7/6010A	1
Zinc	EPA 289.2/7951	1
Zinc	EPA 200.7/6010A	1
Chlorinated Herbicides	EPA 8151	1,2
Organochlorine Pesticides	EPA 608/8080A	1
Polychlorinated Biphenyls	EPA 608/8080A	1
Purgeable Aromatics	EPA 602/8020A	1
Purgeable Halocarbons	EPA 601/8010B	1
Purgeable (Volatile) Organics	EPA 624/8240B	1
Fecal Coliforms	EPA 600/8-78-017	1
Total Coliforms	EPA 600/8-78-017	1
Arsenic (Sed)	EPA 3050A+7060A	3
Cadmium (Sed)	EPA 3050A+7131A	3
Copper (Sed)	EPA 3050A+7211	3
Lead (Sed)	EPA 3050A+7421	3
Mercury (Sed)	EPA 7471	
Nickel (Sed)	EPA 3050A+6010A	3
Zinc (Sed)	EPA 3050A+7951	3
Organochlorine Pesticides (Sed)	EPA 3550A+8080A	
PCB (Sed)	EPA 3550A+8080A	2
Purgeable Organics (Sed)	EPA 8260	2

NOTES:

1. Accreditation is based in part upon recognition of accreditation by the American Association for Laboratory Accreditation (A2LA).
2. Interim accreditation due to the inability of the Department of Ecology to identify a readily available performance evaluation (PE) sample (WAC 173-50-100).
3. Provisional accreditation pending the receipt of acceptable SRM sample results (WAC 173-50-110).

AUTHENTICATION: Cliff J. Kirchmer

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

June 30, 1998
Expiration Date

PARAMETERS DENIED ACCREDITATION

PARAMETER	METHOD		NOTES
Beryllium	EPA 210.1/7090		1
Cadmium	EPA 213.1/7130		1
Chromium	EPA 218.1/7190		1
Chromium Hexavalent	EPA 218.4/7197		1
Chromium Hexavalent	EPA 7196A		1
Cobalt	EPA 219.1/7200		1
Copper	EPA 220.1/7210		1
Lead	EPA 239.1/7420		1
Nickel	EPA 249.1/7520		1
Silver	EPA 272.1/7760A		1
Zinc	EPA 289.1/7950		1
Total Pet Hydrocarbons - Gasoline	WDOE WTPH-G		4
Total Pet Hydrocarbons - Diesel	WDOE WTPH-D		4
BNA Extr (Semivolatile) Organics	EPA 625/8270B		4
Antimony (Sed)	EPA 3050A+7041		2
Silver (Sed)	EPA 3050A+7761		2
BNA Extr (Semivol) Organics (Sed)	EPA 3550A+8270B		4
Polycyclic Aromatic HC (Sed)	EPA 3550+8270	Mod	3

NOTES:

1. Withheld because not included in A2LA accreditation.
2. Withheld pending receipt of acceptable SRM results.
3. Withheld pending receipt of data pkg and SOP that demonstrates the use of at least two ions for identification of each compound.
4. Withheld pending receipt of acceptable PE sample results.

State of Washington
Department of Health

STATE OF WASHINGTON
DEPARTMENT OF HEALTH

DRINKING WATER TESTING LABORATORY CERTIFICATION PROGRAM

NORTH CREEK ANALYTICAL
18939 120TH AVENUE NE, SUITE 101
BOTHELL, WASHINGTON 98011
WASHINGTON CODE #104

having met the requirements of the Regulations Governing Laboratory Certification and Standard of Performance for WAC 246-390 et. seq.

is hereby approved as a

STATE CERTIFIED DRINKING WATER LABORATORY

to perform drinking water analyses as indicated on the Annual Certifie Parameter list which must accompany this contract to be valid

ISSUED AT SEATTLE on April 15, 1996

BY ____________
GEORGE HILTON, OFFICE DIRECTOR
DRINKING WATER LABORATORY CERTIFICATION PROGRAM

EXPIRATION DATE April 30, 1997

Washington State Department of Health

THIS CONTRACT IS ACCEPTED FOR LABORATORY BY

____

DATE 5/1/96

TO BE CONSPICUOUSLY DISPLAYED AT THE LABORATORY WITH THE ANNUAL CERTIFIED PARAMETER LIST

STATE OF WASHINGTON
DEPARTMENT OF HEALTH

DRINKING WATER TESTING LABORATORY CERTIFICATION PROGRAM

ANNUAL CERTIFIED PARAMETER LIST

FOR

NORTH CREEK ANALYTICAL
18939 120TH AVENUE NE, SUITE 101
BOTHELL, WASHINGTON 98011
(206) 481-9200

CHEMISTRY Parameters as per WAC 246-290-300 & 310 See attached list for individual contaminants	CHEMISTRY ADDITIONAL ANALYTES
ALL INORGANICS INSECTICIDES EXCEPT DIQUAT, ENDOTHALL, AND GLYPHOSATE HERBICIDES VOCs EDB DBCP TRIHALOMETHANES PAHs ADIPATES/PHTHALATES NOT CERTIFIED: CARBAMATES, PCBs, ASBESTOS, & DIOXIN	pH UNITS ALKALINITY CALCIUM MOLYBDENUM RESIDUAL FREE CHLORINE ALUMINUM BORON
MICROBIOLOGY **Parameters as per WAC 246-290-300 & 310**	**MICROBIOLOGY** **ADDITIONAL ANALYTES**
TOTAL & FECAL COLIFORMS & *E.COLI*	

Effective Date April 15, 1996

Expiration Date April 30, 1997

THIS FORM MUST ACCOMPANY DRINKING WATER TESTING LABORATORY PROGRAM CERTIFICATION CONTRACT

State of Montana
Department of Health

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

CHEMISTRY LABORATORY BUREAU

Recognizes that

NORTH CREEK ANALYTICAL
18939 120TH AVENUE N.E., SUITE 101
BOTHELL, WA 98011-2569

Has completed the requirements of ARM 16.38.101-126 and is licensed to analyze Montana's Public Water Supplies for the following parameters:

Alkalinity	Nickel	Carbon Tetrachloride	1,2,4-Trichlorobenzene
Antimony	Nitrate	Chlorobenzene	1,1,1-Trichloroethane
Arsenic	Nitrite	p-Dichlorobenzene	1,1,2-Trichloroethane
Barium	pH	o-Dichlorobenzene	Trichloroethylene
Beryllium	Selenium	1,2-Dichloroethane	Vinyl Chloride
Cadmium	Sodium	1,1-Dichloroethylene	Total Xylenes
Calcium	Thallium	c-1,2-Dichloroethylene	Total Trihalomethanes
Chromium	2,4-D	t-1,2-Dichloroethylene	Iron
Conductivity	Endrin	Dichloromethane	Magnesium
Copper	Lindane	1,2-Dichloropropane	Sulfate
Cyanide	Methoxychlor	Ethylbenzene	TDS
Fluoride	Toxaphene	Styrene	Total Hardness
Lead	2,4,5-TP	Tetrachloroethylene	
Mercury	Benzene	Toluene	

John D Hawthorne
JOHN D. HAWTHORNE
Laboratory Evaluation Officer

Robert J Robinson
ROBERT J. ROBINSON, Director
Montana Department of Health and
Environmental Sciences

Expires 4/29/94

State of Idaho
Department of Health

State of Idaho
DEPARTMENT OF HEALTH AND WELFARE
Division of Health

BUREAU OF LABORATORIES

2220 Old Penitentiary Rd.
Boise, Idaho 83712
(208) 334-2235

PHILIP E. BATT
Governor
LINDA L. CABALLERO
Director
RICHARD H. SCHULTZ
Administrator

July 24, 1995

Dennis Wells
North Creek Analytical
18939 120 Ave. N.E. Suite 101
Bothell, WA 98011-908

Dear Mr. Wells:

I reviewed the information that your laboratory submitted in support of reciprocity for testing drinking water samples from the State of Idaho. Reciprocity is granted until July 31, 1996 for the analytes listed on the attached page.

For continuation of reciprocity send on or before July 31, 1996, a copy of your most recent Washington certification plus copies of your laboratory's two most recent participation in the EPA WS series.

Reporting formats are acceptable if your laboratories letterhead is substituted. See attached information about SOC format.

If you have questions please call.

Sincerely,

Jim Dodds

Jim Dodds
Laboratory Certification Officer

cc: Leigh Woodruff

JD/cj

State of Idaho
DEPARTMENT OF HEALTH AND WELFARE
Division of Health

BUREAU OF LABORATORIES

2220 Old Penitentiary Rd.
Boise, Idaho 83712
(208) 334-2235

PHILIP E. BATT
Governor
LINDA L. CABALLERO
Director

RICHARD H. SCHULTZ
Administrator

North Creek Analytical, Bothell, Washington is granted reciprocity to test Idaho drinking water samples until July 31, 1996 for:

Inorganics

Antimony	Chromium	Nickel
Arsenic	Copper	Nitrate
Barium	Cyanide	Nitrite
Beryllium	Fluoride	Selenium
Cadmium	Lead	Sodium
	Mercury	Thallium

Organics

Total trihalomethanes

VOCs

Benzene	1,2-Dichloropropane
Carbon tetrachloride	Ethylbenzene
Chlorobenzene	Styrene
1,4-Dichlorobenzene	Tetrachloroethylene
1,2-Dichlorobenzene	Toluene
1,2-Dichloroethane	1,2,4-Trichlorobenzene
1,1-Dichloroethylene	1,1,1-Trichloroethane
c-1,2-Dichloroethylene	1,1,2-Trichloroethane
t-1,2-Dichloroethylene	Trichloroethylene
Dichloromethane	Vinyl chloride
	Xylenes (total)

SOCs

Adipates	Heptachlorepoxide
Alachlor	Hexachlorobenzene
Atrazine	Hexachlorocyclopentadiene
Chlordane	Lindane
Dalapon	Methoxychlor
1,2-Dibromo-3-chloropropane	Pentachlorophenol
2,4-D	Phthalates
Dinoseb	Picloram
Endrin	Polynuclear hydrocarbons
Ethylene Dibromide	Simazine
Heptachlor	Toxaphene
	2,4,5-TP

U.S. ARMY Corps of Engineers

USACE

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS — MRD
HTRW MANDATORY CENTER OF EXPERTISE
12565 WEST CENTER ROAD
OMAHA, NEBRASKA 68144-3869

REPLY TO
ATTENTION OF

April 6, 1995

Environmental, Hazardous, Toxic
and Radioactive Waste Division

North Creek Analytical
18939 120th Avenue N.E., Suite 101
Bothell, Washington 98011-9508

Gentlemen:

This correspondence corrects the PAH analysis method as stated in the March 31, 1995, letter which addresses the evaluation of your laboratory by the U.S. Army Corps of Engineers (USACE).

North Creek Analytical, Bothell, Washington, has successfully analyzed the project required performance evaluation samples as listed below:

METHOD	PARAMETERS	MATRIX
8020	Aromatic Volatile Organics	Water
8260A	Volatile Organics	Water
8270	Semivolatile Organics	Water
8270	Semivolatile Organics	Sediment
8080	Organochlorine Pesticides	Water
8080	PCBs	Water
8080	PCBs	Sediment
8310	PAH	Water
SW-846	Metals[1]	Water
SW-846	Metals[1]	Sediment
418.1	Total Recoverable Petroleum Hydrocarbons	Water
418.1/9071	Total Recoverable Petroleum Hydrocarbons	Soil
8015M	Total Petroleum Hydrocarbons	Water
8015M	Total Petroleum Hydrocarbons	Sediment

Remarks: 1 The metals are aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Based on the successful analysis of the project specific audit samples indicated in the table in paragraph two above and the results of the laboratory inspection, North Creek Analytical, Bothell, Washington, is validated for sample analysis by the methods listed above. The period of validation is eighteen (18) months. The eighteen months expires on August 27, 1996. The Hazardous, Toxic and Radioactive Waste (HTRW) Mandatory Center of Expertise (MCX) may schedule and conduct an on-site audit at any time during the 18-month validation period to evaluate laboratory performance if deemed necessary.

It should be noted that your laboratory may not subcontract USACE analytical work to any other laboratory location without the approval of this office. This laboratory validation does not guarantee the delivery of any analytical samples from a USACE Contracting Officer Representative.

If you have any questions or comments, please contact Ms. Elena Webster at (402) 697-2574.

Sincerely,

Marcia C. Davies

Marcia C. Davies, Ph.D.
Director, USACE Hazardous,
Toxic and Radioactive Waste
Mandatory Center of Expertise

Appendix B:

North Creek Analytical - Portland Laboratory

Scopes of Accreditation and Certificates

1. A2LA
2. Washington DOE
3. Oregon DOH
4. U.S. ARMY Corps of Engineers

American Association for Laboratory Accreditation

A2LA

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION

NORTH CREEK ANALYTICAL, INC.
9405 SW Nimbus Avenue
Beaverton, OR 97005
Philip Nerenberg Phone: 503 643 9200

ENVIRONMENTAL

Valid To: August 31, 1996 Certificate Number: 0301-02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

Atomic Absorption/ICP-AES Spectrometry, Gas Chromatography, Gas Chromatography/ Mass Spectrometry, Misc.- Electronic Probes (pH, F^-, O_2), Hazardous Waste Characteristics Tests

Nonpotable Water: metals, classical (wet) chemistry, purgeable organics.

Solid/Hazardous Waste: metals, classical (wet) chemistry, purgeable organics, petroleum hydrocarbons, hazardous waste characteristics (corrosivity, and TCLP)

A supplemental scope, identifying the full range of tests and types of tests, is available from A2LA or the laboratory.

Roxanne M. Robinson
for Peter S. Unger

American Association for Laboratory Accreditation

SUPPLEMENT TO SCOPE OF ACCREDITATION

NORTH CREEK ANALYTICAL, INC.
9405 SW Nimbus Avenue
Beaverton, OR 97005
Philip Nerenberg Phone: 503 643 9200

ENVIRONMENTAL

Valid as of: June 23, 1994
Valid until: August 31, 1996

Certificate Number: 0301-02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform recognized EPA methods for the following determinations:

Nonpotable Water

Metals: Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn

per EPA test methods: 202.1, 204.1, 204.2, 206.2, 208.1, 210.1, 213.1, 213.2, 215.1, 218.1, 218.2, 219.1, 220.1, 236.1, 239.1, 239.2, 242.1, 243.1, 245.1, 249.1 258.1, 270.2, 272.1, 272.2, 273.1, 279.1, 286.1, 289.1

Classical Chemistry: pH, Oil and grease, Specific conductance, Total petroleum hydrocarbons

per EPA test methods: 120.1, 150.1, 418.1

Purgeable Organics: Acetone, Benzene, Bromodichloromethane, Bromoform, Bromomethane, 2-Butanone, Carbon disulfide, Carbon tetrachloride, Chlorobenzene, Chloroethane, 2-Chloroethyl vinyl ether, Chloroform, Chloromethane, Dibromochloromethane, 1,2-Dibromoethane (EDB), 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Dichlorodifluoromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, 2-Hexanone, Methylene Chloride, Methyl ethyl ketone, Methyl isobutyl ketone, 4-Methyl-2-pentanone, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,1,2-Tetrachloroethane, Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Trichlorofluoromethane, Vinyl chloride, Xylene total

per EPA test methods: 601, 602, 624

Roxanne M. Robinson
for Peter S. Unger

656 Quince Orchard Road • Gaithersburg, MD 20878-1409 • Phone: 301 670 1377 • FAX: 869 1495

Solid Waste/Hazardous Waste

Metals: Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn

per EPA test methods: 7020, 7040, 7041, 7060, 7080, 7090, 7130, 7131, 7140, 7190, 7191, 7200, 7210, 7380, 7420, 7421, 7450, 7460, 7470, 7471, 7520, 7610, 7740, 7760, 7761, 7770, 7840, 7910, 7950

Classical Chemistry: pH, Oil and grease, Specific conductance, Total petroleum hydrocarbons

per EPA/State test methods: 9040, 9045, 9050, and 418.1 mod (OR-TPH)

Purgeable Organics: Acetone, Benzene, Bromodichloromethane, Bromoform, Bromomethane, 2-Butanone, Carbon disulfide, Carbon tetrachloride, Chlorobenzene, Chloroethane, 2-Chloroethyl vinyl ether, Chloroform, Chloromethane, Dibromochloromethane, 1,2-Dibromoethane (EDB), 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Dichlorodifluoromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, Ethylbenzene, 2-Hexanone, Methylene Chloride, Methyl ethyl ketone, Methyl isobutyl ketone, 4-Methyl-2-pentanone, Styrene, 1,1,2,2-Tetrachloroethane, 1,1,1,2-Tetrachloroethane,Tetrachloroethene, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Trichlorofluoromethane, Vinyl chloride, Xylene total

per EPA test methods: 8010, 8020, 8240

Hazardous Waste Characteristics: Corrosivity, TCLP

per EPA test methods: 1311, 9040, 9041, 9045

Rosanne M. Robinson
for Peter S. Tenger

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

NORTH CREEK ANALYTICAL, INC.
Beaverton, OR

for technical competence in the field of

Environmental Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC guide 25-1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards) and any additional program requirements in the identified field of testing.

Presented this 23rd day of June, 1994.

President
For the Accreditation Council

Certificate Number 301.02

Valid to August 31, 1996

State of Washington Department of Ecology

The State of Washington

Department of Ecology

This is to certify that

NCA - Portland

Beaverton, Oregon

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an **ACCREDITED LABORATORY** for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective on the **1st day of June 1995** and shall expire on the **31st day of May, 1996.**

Witnessed under my hand this **23rd day of May 1995.**

Cliff J. Kirchmer by PFB

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

LAB ACCREDITATION NUMBER
C097

SCOPE OF ACCREDITATION

NCA - Portland, Beaverton, Oregon, is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. "SM" refers to APHA "Standard Methods for the Examination of Water and Wastewater," 18th Edition. Accreditation for all parameters is interim pending an on-site evaluation of analytical capabilities. This scope of accreditation applies to water analyses and water-related analyses only.

PARAMETER	METHOD		NOTE
Cyanide Total	EPA	335.2(8.7)	
Total Pet Hydrocarbons	WDOE	WTPH-418.1	2
Aluminum	EPA	202.1/7020	
Aluminum	EPA	202.2/7021	
Antimony	EPA	204.1/7040	5
Antimony	EPA	200.7/6010	5
Arsenic	EPA	206.2/7060	
Barium	EPA	208.2/7081	1
Barium	EPA	200.7/6010	1
Beryllium	EPA	210.1/7090	
Beryllium	EPA	200.7/6010	
Cadmium	EPA	213.2/7131	
Cadmium	EPA	200.7/6010	
Chromium	EPA	218.2/7191	5
Chromium	EPA	200.7/6010	5
Cobalt	EPA	219.2/7201	
Cobalt	EPA	200.7/6010	
Copper	EPA	220.2/7211	5
Copper	EPA	200.7/6010	5
Iron	EPA	236.1/7380	5
Iron	EPA	200.7/6010	5
Lead	EPA	239.2/7421	
Lead	EPA	200.7/6010	
Manganese	EPA	243.1/7460	
Manganese	EPA	200.7/6010	
Mercury	EPA	245.2	
Molybdenum	EPA	246.1/7480	
Molybdenum	EPA	200.7/6010	
Nickel	EPA	249.2/7521	
Nickel	EPA	200.7/6010	
Selenium	EPA	270.2/7740	
Silver	EPA	272.1/7760	
Silver	EPA	272.2/7761	

Thallium	EPA	279.2/7841	
Thallium	EPA	200.7/6010	
Tin	EPA	282.1/7870	
Tin	EPA	200.7	1
Tin	EPA	6010MOD	3
Vanadium	EPA	286.2/7911	
Vanadium	EPA	200.7/6010	
Zinc	EPA	289.2/7951	
Zinc	EPA	200.7/6010	
Organochlorine Pesticides	EPA	608	
Organochlorine Pesticides	EPA	8080	
Organophosphorus Pesticides	EPA	8140	4
PCB	EPA	8080	
Purgeable Aromatics	EPA	602/8020	4
Purgeable Halocarbons	EPA	601/8010	4,6
Total Pet Hydrocarbons - Gasoline	WDOE	WTPH-G	2
Total Pet Hydrocarbons - Diesel	WDOE	WTPH-D	2
BNA Extr (Semivolatile) Organics	EPA	625/8270	
Purgeable (Volatile) Organics	EPA	624/8260	

NOTES:
(1) Interim pending ability of Department of Ecology to identify readily available performance evaluation sample (WAC 173-50-100).
(2) Washington State Department of Ecology "Total Petroleum Hydrocarbon Methods," April 1992.
(3) Method modified to ensure digestion and quantification of metal which is not included in EPA method.
(4) Interim pending completion of on-site evaluation of laboratory capability (WAC 173-50-100).
(5) Provisional pending submission of acceptable performance evaluation samples analysis results (WAC 173-50-110).
(6) Provisional pending submission of current performance evaluation sample analysis results. Provisional status will be reviewed on August 31 to determine if continued accreditation is warranted based on receipt of current and acceptable PE results (WAC 173-50-110).

AUTHENTICATION: Cliff J. Kirchmer by PFB
Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

May 31, 1996
Expiration date

PARAMETERS DENIED ACCREDITATION

Parameter	Method	Notes
Total Organic Carbon	EPA 415.1	7

NOTES: (7) Withheld pending receipt of sample analysis results and associated data package.

State of Oregon
Department of Health

OREGON

HEALTH DIVISION

CERTIFICATE OF APPROVAL FOR DRINKING WATER

NORTH CREEK ANALYTICAL-PORTLAND
State Lab. No. OR040
9405 SW Nimbus Ave
Beaverton OR 97008

IS GRANTED OREGON HEALTH DIVISION APPROVAL TO PERFORM ANALYSIS ON PUBLIC DRINKING WATER BY THE METHOD(S) SPECIFIED UNDER OAR CHAPTER 333-61-005 THROUGH 61 140 FOR:

INORGANIC CHEMISTRY

ORGANIC CHEMISTRY

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES AND METHODS ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

Michael R. Skeels

Michael R. Skeels, PhD, MPH
Administrator
Oregon Health Division

Irene E. Ronning

Irene E. Ronning, PhD
Drinking Water Laboratory
Certification Coordinator

Center for Public Health Laboratories
PO Box 275
Portland OR 97207-0275

ISSUE DATE : July 1, 1995
EXPIRATION DATE : June 30, 1996

OREGON HEALTH DIVISION
DRINKING WATER LABORATORY CERTIFICATION

06/06/1995 List of Approved Analytes and Methods 08:59:42

LAB NAME: NORTH CREEK ANALYTICAL-PORTLAND LAB #: OR040
ADDRESS: 9405 SW NIMBUS AVE
BEAVERTON, OR 97008

ISSUE DATE : 06/06/1995
EXPIRATION DATE : 06/30/1995
(or until List is reissued)

PHONE #: (503)644-9200 FAX # : (503)644-2202

		Status	Method	Alt Method
1.	**Inorganic Chemistry**			
1.01	Antimony	APPROVED	204.2	
1.02	Arsenic	APPROVED	206.2	
1.03	Asbestos	NOT APPROVED		
1.04	Barium	APPROVED	200.7	
1.05	Beryllium	NOT APPROVED	210.2	
1.06	Cadmium	APPROVED	213.2	200.7 not approved
1.07	Chromium	APPROVED	218.2	200.7 not approved
1.08	Copper	APPROVED	200.7	
1.09	Cyanide	APPROVED	4500CN-F	
1.10	Fluoride	APPROVED	340.2	
1.11	Lead	APPROVED	239.2	
1.12	Mercury	APPROVED	245.2	
1.13	Nickel	APPROVED	200.7	
1.14	Nitrate	APPROVED	300.0	
1.15	Nitrite	APPROVED	300.0	
1.16	Selenium	APPROVED	270.2	
1.17	Thallium	APPROVED	279.2	
2.	**Microbiology**			
2.01	Fecal Coliforms by EC	NOT APPROVED		
2.02	E. coli by EC + MUG	NOT APPROVED		
2.03	Heterotrophic Plate Count	NOT APPROVED		
2.04	Total Coliforms by Membrane Filter Method	NOT APPROVED		
2.05	Total Coliforms/E. coli by MMO-MUG	NOT APPROVED		
2.06	Total Coliforms by Multiple Tube Fermentation	NOT APPROVED		
2.07	N Agar + MUG	NOT APPROVED		
2.08	Total Coliforms by Presence/Absence Medium Method	NOT APPROVED		
3.	**Organic Chemistry - Part I**			
3.01	Adipates as di(ethylhexyl)adipate	NOT APPROVED		
3.02	Dibromochloropropane (DBCP)	NOT APPROVED		
3.03	TCDD (Dioxin)	NOT APPROVED		
3.04	Ethylene Dibromide (EDB)	NOT APPROVED		
3.05	PAHs as benzo(a)pyrene	NOT APPROVED		
3.06	Total Polychlorinated Biphenyls (PCBs)	NOT APPROVED		
3.07	Phthalates as di(ethylhexyl)phthalate	NOT APPROVED		
3.08	Total Trihalomethanes (TTHMs)	APPROVED	524.2	
3.09	Vinyl Chloride (VCs)	APPROVED	524.2	
3.10	Volatile Organic Compounds (VOCs)	APPROVED	524.2	

OREGON HEALTH DIVISION
DRINKING WATER LABORATORY CERTIFICATION
List of Approved Analytes and Methods

06/06/1995 08:59:43

LAB NAME: NORTH CREEK ANALYTICAL-PORTLAND LAB #: OR040
ADDRESS: 9405 SW NIMBUS AVE
BEAVERTON, OR 97008

ISSUE DATE : 06/06/1995
EXPIRATION DATE : 06/30/1995
(or until List is reissued)

PHONE #: (503)644-9200 FAX # : (503)644-2202

4. Organic Chemistry - Part II

		Method	Alt Method
4.01	2,4,5-TP (Silvex)	NOT APPROVED	
4.02	2,4-D	NOT APPROVED	
4.03	Alachlor	NOT APPROVED	
4.04	Atrazine	NOT APPROVED	
4.05	Carbofuran	NOT APPROVED	
4.06	Chlordane	NOT APPROVED	
4.07	Dalapon	NOT APPROVED	
4.08	Dinoseb	NOT APPROVED	
4.09	Diquat	NOT APPROVED	
4.10	Endothall	NOT APPROVED	
4.11	Endrin	NOT APPROVED	
4.12	Glyphosate	NOT APPROVED	
4.13	Heptachlor	NOT APPROVED	
4.14	Heptachlor epoxide	NOT APPROVED	
4.15	Hexachlorobenzene	NOT APPROVED	
4.16	Hexachlorocyclopentadiene	NOT APPROVED	
4.17	Lindane	NOT APPROVED	
4.18	Methoxychlor	NOT APPROVED	
4.19	Oxamyl (Vydate)	NOT APPROVED	
4.20	Pentachlorophenol	NOT APPROVED	
4.21	Picloram	NOT APPROVED	
4.22	Simazine	NOT APPROVED	
4.23	Toxaphene	NOT APPROVED	

5. Radiochemistry

5.01	Gross alpha	NOT APPROVED	
5.02	Gross beta	NOT APPROVED	
5.03	Iodine-131	NOT APPROVED	
5.04	Radium-226	NOT APPROVED	
5.05	Radium-228	NOT APPROVED	
5.06	Strontium-90	NOT APPROVED	
5.07	Tritium	NOT APPROVED	

Appendix C:

North Creek Analytical - Spokane Laboratory

Scopes of Accreditation and Certificates

1. Washington DOE

State of Washington
Department of Ecology

The State of Washington

Department of Ecology

This is to certify that

North Creek Analytical

Spokane, Washington

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an **ACCREDITED LABORATORY** for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective on the **16th day of May 1995** and shall expire on the **15th day of December 1996.**

Witnessed under my hand this **31st day of May 1995.**

Cliff J. Kirchmer

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

LAB ACCREDITATION NUMBER
C147

SCOPE OF ACCREDITATION

North Creek Analytical, Spokane, Washington, is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation applies to non-potable water analyses only. Accreditations for all parameters are final unless noted otherwise. EPA refers to methods of the U.S. Environmental Protection Agency. WTPH refers to Washington Department of Ecology "Total Petroleum Hydrocarbon Methods", April 1992.

PARAMETER	METHOD	NOTES
pH	EPA 150.1/9040	
Oil/grease	EPA 413.2	
Total Petroleum Hydrocarbons	EPA 418.1	
Total Petroleum Hydrocarbons	WTPH-418.1	
Arsenic	EPA 206.3/7061	
Antimony	EPA 204.1/7040	
Barium	EPA 208.1/7080	(1)
Beryllium	EPA 210.1/7090	
Cadmium	EPA 213.1/7130	
Chromium	EPA 218.1/7190	
Copper	EPA 220.1/7210	
Lead	EPA 239.1/7420	
Mercury	EPA 245.1/7470	
Nickel	EPA 249.1/7520	
Silver	EPA 272.1/7760	
Selenium	EPA 270.3/7741	
Thallium	EPA 279.1/7840	
Purgeable Aromatics	EPA 602/8020	
Organochlorine Pesticides	EPA 608/8080	
Polychlorinated Biphenyls (PCBs)	EPA 608/8080	

North Creek Analytical, Spokane, WA - (Cont'd)

PARAMETER	METHOD	NOTE
TPH - Diesel	WTPH-D	
TPH - Gas	WTPH-G	

NOTES: (1) Interim accreditation due to the inability of the Department of Ecology to identify an acceptable performance evaluation sample (WAC 173-50-100).

AUTHENTICATION: Cliff J. Kirchmer

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

December 15, 1995
Expiration date

Appendix D:

North Creek Analytical

Equipment and Facilities

Gas Chromatographs:

1. Hewlett-Packard 5890 Series II Gas Chromatographs (GCs) equipped with dual Electron Capture Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signals are acquired via the Hewlett-Packard ChemStation™ data system. Acquired 1992. The primary analysis is pesticides, PCB's and herbicides.

2. Hewlett-Packard 5890 Series II Gas Chromatographs (GCs) equipped with dual Electron Capture Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signals are acquired via the Hewlett-Packard ChemStation™ data system. Acquired 1992. The primary analysis is pesticides, PCB's and herbicides.

3. Hewlett-Packard 5890 Series II GC equipped with dual Flame Ionization Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. Acquired 1990. The primary analysis is extractable, diesel range hydrocarbons.

4. Hewlett-Packard 5890 Series II GC equipped with dual Flame Ionization Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. Acquired 1994. The primary analysis is phenols, polynuclear aromatic hydrocarbons (PAHs), and phthalates.

5. Hewlett-Packard 5890 Series II GC equipped with dual Flame Ionization Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. Acquired 1992. The primary analysis is extractable, diesel range hydrocarbons.

6. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in a series with a Flame Ionization Detector. This GC includes an OI 16-port Purge and Trap Automatic Sampler. The system uses fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. Acquired 1990. The primary analysis is volatile, gasoline range hydrocarbons with BTEX distinction.

7. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in a series with a Flame Ionization Detector. It includes an OI 16-port Purge and Trap Automatic Sampler. The system uses fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. Acquired 1990. The primary analysis is volatile, gasoline range hydrocarbons with BTEX distinction.

8. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in a series with a Flame Ionization Detector. It includes an OI 16-port Purge and Trap Automatic Sampler. The system uses fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. Acquired 1994. The primary analysis is volatile, gasoline range hydrocarbons with BTEX distinction.

9. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in a series with a Flame Ionization Detector. It includes an OI 16-port Purge and Trap Automatic Sampler. The system uses fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. Acquired 1994. The primary analysis is volatile, gasoline range hydrocarbons with BTEX distinction.

10. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in series with an Electrolytic Conductivity (ELCD)/"Hall" Detector™ and includes an OI 16-port Purge and Trap Automatic Sampler. The system is equipped with fused silica capillary columns and a Hewlett-Packard ChemStation™ data system.Acquired 1992. The primary analysis is halogenated and aromatic volatile organics.

Gas Chromatographs/Mass Spectrometers:

1. Hewlett-Packard 5970 B Mass Spectrometer (MS) on a 5890 Series II GC with a 1000 RTE-A Aquarius™ Data System, 16-port OI Purge and Trap Autosampler, a Mass Spectral Library and data tape back-up. Acquired 1991. The primary analysis is volatile organics by GC/MS.

2. Hewlett-Packard 5971 Mass Spectrometer (MS) on a 5890 Series II GC with Automated Sample Injection Towers. The primary analysis is semivolatile organics by GC/MS. Data acquisition is via HP Unix ChemSystem™ with a multi-tasking, multi-operator control system that includes Mass Spectrometer library, 640 mb hard drive and data tape backup. Acquired 1991.

3. Hewlett-Packard 5971 Mass Spectrometer (MS) on a 5890 Series II GC with Automated Sample Injection Towers. The primary analysis is semivolatile organics by GC/MS. Data acquisition is via HP Unix ChemSystem™ with a multi-tasking, multi-operator control system that includes Mass Spectrometer library, 640 mb hard drive and data tape backup. Acquired 1991.

Liquid Chromatographs:

1. Hewlett Packard 1050 HPLC equipped with variable wavelength UV/Vis and Fluorescence Detectors, autosampler and Liquid Chromatograph (LC) ChemStation™ data system. Acquired 1990. The primary application is HPLC analysis of PAHS.

Atomic Absorption Spectrometers:

1. Varian SpectrAA-400Z AAS (atomic absorption spectrometer) with dedicated graphite furnace, Zeeman Correction, Autosampler and Report Manager™ software. Acquired 1991. The primary application is low detection level analysis of many different metals.

2. Perkin Elmer 5100 ZL (atomic absorption spectrometer) with dedicated graphite furnace, Zeeman Correction and Autosampler. Acquired 1995. The primary application is low detection level analysis of many different metals.

3. Varian SpectrAA-20 AAS with Flame and Hydride Accessories, multiple burner heads and Report Manager™ software. Acquired 1991. The primary analysis is medium detection level analysis of many different metals plus hydride generation analysis of Mercury.

4. Varian SpectrAA-20 AAS with Flame and Hydride Accessories, multiple burner heads and Report Manager™ software. Acquired 1991. The primary analysis is medium detection level analysis of many different metals plus hydride generation analysis of Mercury.

Inductively Coupled Argon Plasma Optical Emission Spectrometer:

1. Varian Liberty 200 Vacuum Path Sequential ICP with multiple torches, SPS-5 Autosampler and Autodiluter, multi-tasking computer controller and data handling. Acquired 1992. The primary application is rapid analysis of many different metals in any matrix.

2. CETAC U 5000AT+, ultrasonic nebulizer, acquired 1995 for use with the Varian ICP.

Additional Equipment:

1. Dohrman DC 80 Total Organic Carbon Analyzer equipped with a Dohrman 183 boat sampler. Acquired 1990.

2. Dohrman DX 20 Total Halogen Analyzer equipped with AD3 absorption module Acquired 1990.

3. Dionex DX 100 Ion Chromatograph with Electrical Conductivity Detector, anion and cation columns, micro-membrane suppressor and Hewlett Packard 3396 data integrator. Acquired 1990.

4. Dionex 4000i Ion Chromatograph with Electrical Conductivity Detector, autosampler, anion and cation columns, micro-membrane suppressor and spectra physics data integrator. Acquired 1994.

5. Shimadzu UV 160U, UV-Vis dual-beam spectrophotometer used for a variety of classical wet chemistry determinations. Acquired 1994.

6. Milton Roy 21 UV Spectrophotometer used for a variety of classical wet chemistry determinations. Acquired 1990.

7. Foxboro Miran 1 FF Infrared Spectrophotometer for oil and grease analysis. Acquired 1990.

8. Other laboratory equipment includes centrifuges, ovens, furnaces, analytical balances, TCLP Extraction Apparatus, extraction/distillation equipment, refrigerated vaults, Parr Bomb™, microscope, and other general chemistry equipment.

Facility Summary

Space

The laboratory has 14,000 sq. ft. of interior area. There is approximately 1,000 sq. ft. of bench space for 24 analysts equaling 42 sq. ft. of bench space per analyst.

Ventilation

The laboratory uses 10 six-foot exhaust hoods for a total of 13,500 CFM of exhaust potential. The exhausted air is resupplied in the extraction areas with 16,000 CFM of fresh make-up air from roof mounted units.

Deionized Water

The laboratory uses two DI water supply systems. A large volume resin exchange cartridge system and a smaller Milli Q ultrapure system.

Refrigerated Sample Storage

There is one 400 cu. ft. walk-in refrigerator, three 140 cu. ft. reach-in coolers and five standard 15 cu. ft. refrigerators for use as cold sample storage. There are also a variety of small freezers used for storage of organic standards.

Gas Chromatographs

1. Hewlett-Packard 5890 Series II Gas Chromatograph (GC) equipped dual Electron Capture Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is pesticides, PCBs and herbicides.

2. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in a series with a Flame Ionization Detector. This GC includes an OI 16-port Purge and Trap Automatic Sampler. The system uses fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. The primary analysis is volatile, gasoline range hydrocarbons with BTEX distinction.

3. Hewlett Packard 5890 Series II GC equipped with dual Flame Ionization Detectors and HP 7673 Autosamplers. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is extractable diesel range hydrocarbons and other extractable non-halogenated organics.

Atomic Absorption Spectrometers

1. Varian SpectrAA-20 AAS with Flame and Hydride Accessories, multiple burner heads and Report Manager™ software. The primary analysis is medium detection level analysis of many different metals plus hydride generation analysis of Mercury.

Additional Equipment

1. Foxboro Miran 1 FF Infrared Spectrophotometer for oil and grease analysis.

2. Other laboratory equipment includes centrifuges, ovens, furnaces, analytical balances extraction/distillation equipment, refrigerated vaults, and other general chemistry equipment.

Facility Summary

Space

The laboratory has 3,000 sq. ft. of interior area. There is approximately 288 sq. ft. of bench space for 4 analysts equaling 72 sq. ft. of bench space per analyst.

Ventilation

The laboratory uses 2 six-foot exhaust hoods for a total of 2,700 CFM of exhaust potential.

Deionized Water

The laboratory uses resin exchange cartridge system.

Refrigerated Sample Storage

There are four 15 cu. ft. refrigerators available for sample storage. There are also a variety of small freezers used for storage of organic standards.

Gas Chromatography/Mass Spectrometry

1. Hewlett-Packard 5971 Mass Spectrometer (MS) on a 5890 Series II GC with an MS-DOS Chemstation™ Data System, 16-port OI Purge and Trap Autosampler, Tekmar Headspace unit, a Mass Spectral Library and data tape back-up. The primary analysis is volatile organics by GC/MS.

2. Hewlett-Packard 5971 B Mass Spectrometer (MS) on a 5890 Series II GC with an MS-DOS Chemstation™ Data System, 16-port Tekmar 2000/2016 Purge and Trap Autosampler, a Mass Spectral Library and data tape back-up. The primary analysis is volatile organics by GC/MS.

3. A Hewlett-Packard 5970 Mass Spectrometer (MS) on a 5890 Series II GC with an HP 7673 Automated Sample Injection Tower. The primary analysis is semivolatile organics by GC/MS. Data acquisition is via an HP RTE-A data system.

Gas Chromatography

1. Hewlett Packard Series II Gas Chromatograph (GC) equipped with Photoionization Detector in series with an Electrolytic Conductivity Detector, 16 port purge and trap automatic sampler.. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is volatile gas range organics by Oregon Methods and halogenated and aromatic Volatile Organics.

2. Hewlett Packard 5890 Series II GC equipped with dual Flame Ionization Detectors and HP 7673 Autosampler. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is extractable diesel range hydrocarbons and other extractable non-halogenated organics.

3. Hewlett-Packard 5890 Series II Gas Chromatograph (GC) equipped with dual Electron Capture Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is pesticides, PCB's and herbicides.

4. Two (2) Hewlett-Packard 5890 Series II GCs equipped with dual Flame Ionization Detectors, dual Automatic Sample Injection Towers and split/splitless capillary injectors. The detector signals are acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is extractable, diesel range hydrocarbons.

5. Two (2) Hewlett-Packard 5890 Series II GCs equipped with Photoionization Detectors in series with Flame Ionization Detectors. Both GCs are equipped with Tekmar LSC 2000/2016, 16-port, Purge and Trap Automatic Samplers. The systems use fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. The primary analysis is volatile, gasoline range hydrocarbons with BTEX distinction.

6. Hewlett-Packard 5890 Series II GC equipped with a Photoionization Detector in series with an Electrolytic Conductivity (ELCD)/"Hall" Detector™. The GC is equipped with a Tekmar LSC 2000/2016, 16-port, Purge and Trap Automatic Sampler. The system uses fused silica capillary columns and a Hewlett-Packard ChemStation™ data system. The primary analysis is halogenated and aromatic volatile organics.

7. A Hewlett-Packard 5890 Series II Gas Chromatograph (GC) equipped with a Flame Photometric and a Flame Ionization Detector connected in series, Hewlett Packard 7673 Automatic Sample Injection Tower and split/splitless capillary injectors. The detector signal is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is Organophosphorous pesticides.

8. A Hewlett-Packard 5890 Series II GC equipped with a Flame Ionization Detector, a Hewlett Packard 7673 Automatic Sample Injection Tower and a split/splitless capillary injector. The detector signals is acquired via the Hewlett-Packard ChemStation™ data system. The primary analysis is miscellaneous solvents and alcohols.

Liquid Chromatographs:

1. Hewlett Packard 1090 HPLC equipped with diode array UV and Fluorescence Detectors, autosampler and Liquid Chromatograph (LC) ChemStation™ data system. The primary application is HPLC analysis of PAHS.

Organic Prep

1. An ABC Laboratories Autoprep 1000 Gel Permeation Chromatograph (GPC) with a UV detector. The primary application is GPC cleanup of organic extracts.

Atomic Absorption Spectrometers:

1. Perkin Elmer 5100ZL (atomic absorption spectrometer) with dedicated graphite furnace and Autosampler.

2. Perkin Elmer 2380 AAS.

3. Leeman PS 1000 ICP/Echelle Spectrophotometer with Auto sampler.

4. Leeman PS-2000 Automated Mercury Analyzer.

Infrared Analyzers

1. Perkin Elmer 1600 Fourier Transform Infrared (FTIR) Analyzer. The primary application is for Hydrocarbon analysis.

Additional Equipment:

1. Dohrman DC 190 Total Organic Carbon Analyzer.

2. Dionex Series 4500 Ion Chromatograph.

3. Milton Roy 21 DV Spectrophotometer used for a variety of classical wet chemistry determinations.

4. Foxboro Miran 1 FF Infrared Spectrophotometer for oil and grease analysis.

6. Other laboratory equipment includes centrifuges, ovens, furnaces, analytical balances, TCLP Extraction Apparatus, extraction/distillation equipment, refrigerated vaults and other general chemistry equipment.

Facility Summary

Space
The laboratory has 9,800 sq. ft. of interior area. There is approximately 1,300 sq. ft. of bench space for 20 analysts equaling 65 sq. ft. of bench space per analyst.

Ventilation
The laboratory uses 2 eight-foot and 6 six-foot exhaust hoods for a total of 10,500 CFM of exhaust potential. Make-up air is provided for all hoods.

Deionized Water
The laboratory uses two DI water supply systems. A large volume resin exchange cartridge system and a smaller Barnstead Nanopure system.

Refrigerated Sample Storage
There are two 140 cu. ft. reach-in coolers, one 45 cu. ft. reach-in cooler and six standard 22 cu. ft. refrigerators for use as cold sample storage and four 22 cu. ft. refrigerators for extract storage. There are also a variety of small freezers used for storage of organic standards.

ATTACHMENT D
HEALTH AND SAFETY PLAN

Work Plan, Remedial Investigation
Yakima Railroad Area
Yakima, Washington
SECOR PN: 00378-001-01
August 25, 1997

HEALTH AND SAFETY PLAN

SITE
Cameron-Yakima Working Group
Yakima Railroad Area
Yakima, Washington

CLIENT
Cameron-Yakima Working Group
Yakima Railroad Area
Yakima, Washington

Submitted by:
SECOR International Incorporated
15400 SE 30th Place, Suite 100
Bellevue, WA 98007

August 25, 1997

SECOR Project No. 00378-001-01

HASP No. 96 -

SECOR

HEALTH AND SAFETY PLAN
REVIEW AND APPROVAL

CLIENT: Cameron-Yakima Working Group SITE NAME: Yakima Railroad Area

PROJECT NAME: Cameron-Yakima PROJECT NO. ____________

START DATE: 6/26/97 END DATE: ____________

PLAN EXPIRATION DATE: 12/31/97
(Last day of expected field work or no longer than 6 months).

Cliff Schmitt Plan Completed By	Signature: ____________	Date: ____________
Cliff Schmitt Project Manager	Signature: ____________	Date: ____________
Dan Dell'agnese Health & Safety Coordinator	Signature: ____________	Date: ____________
Curt Goddard Site Health and Safety Officer	Signature: ____________	Date: ____________
Joe Hunt Corporate Health and Safety	Signature: ____________	Date: ____________
____________ Subcontractor Field Supervisor	Signature: ____________	Date: ____________

This Health and Safety Plan has been written for the use of *SECOR* and its employees. It may also be used as a guidance document by properly trained and experienced *SECOR* subcontractors. However, *SECOR* does not guarantee the health or safety of any person entering this site.

Due to the potential hazardous nature of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The health and safety guidelines in this Plan were prepared specifically for this site and should not be used on any other site without prior research by trained health and safety specialists.

SECOR claims no responsibility for its use by others. The Plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

TABLE OF CONTENTS

LIST OF ATTACHMENTS

ATTACHMENT 12 - Excavation Inspection Log

ATTACHMENT 13 - Confined Space Permit

SECOR
LOCAL EMERGENCY AND PROJECT TELEPHONE NUMBERS
(POST)

LOCAL EMERGENCY NUMBERS:

	NAME	TELEPHONE NO.
Hospital	Yakima Valley Memorial Hospital	509-575-8255
Ambulance	Yakima Medic 1	509-453-6561
Police/Sheriff	Yakima Police Department	509-248-1010
Fire	Yakima Fire Department	509-575-6060
Utilities		
Other:		

*Include numbers other than "911".

PROJECT PERSONNEL NUMBERS:

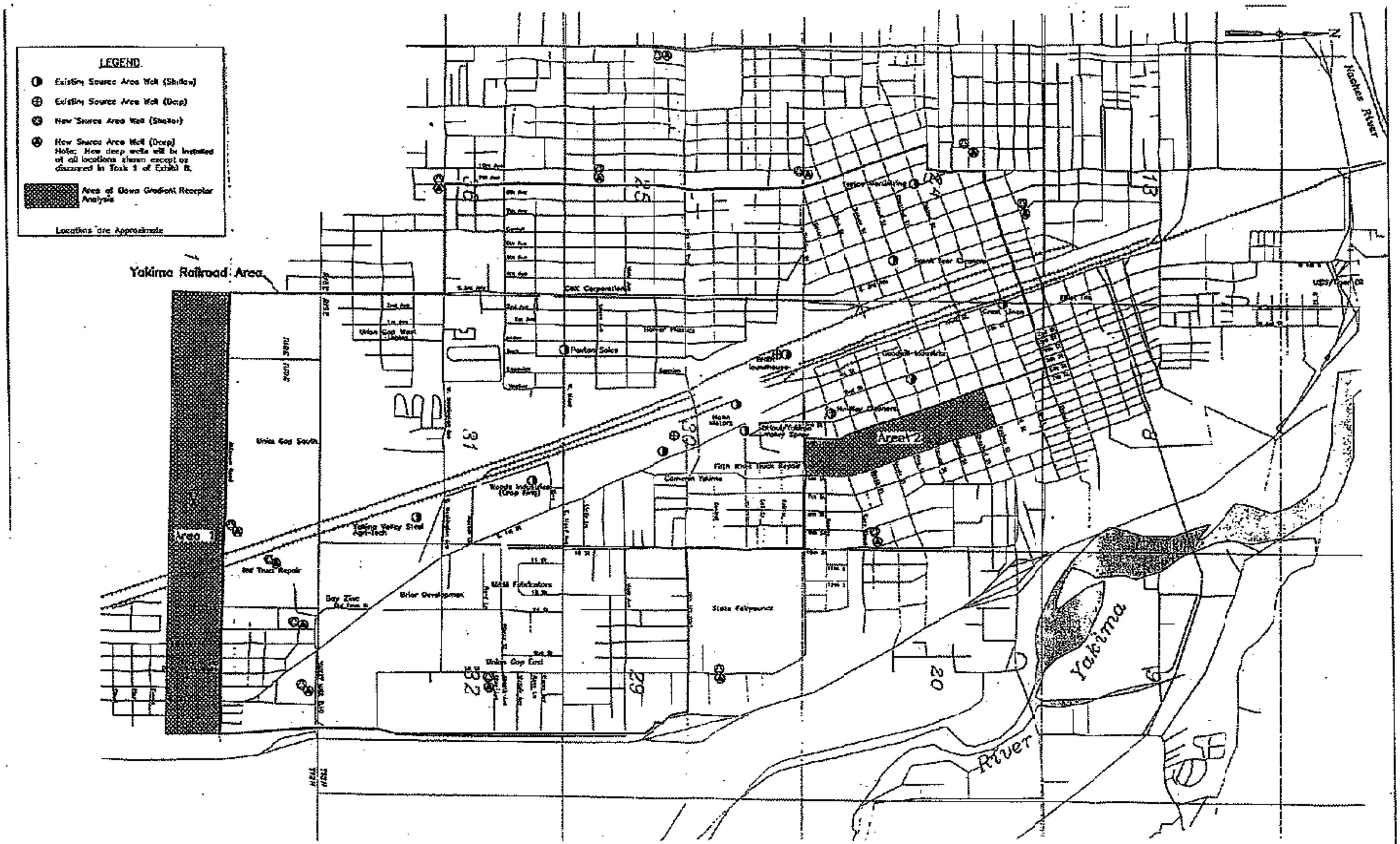
	NAME	TELEPHONE NO.
Site Health and Safety Officer	Curt Goddard	(ON-SITE PHONE)
Project Manager	Cliff Schmitt	(425) 641-9900
Principal-in-Charge	Peter Jewett	(425) 641-9900
Site Contact	Curt Goddard	(425) 641-9900
Client Contact	Mark Valentine	(206) 682-1966
Health and Safety Supervisor	Dan Dell'agnese	(425) 641-9900
Corporate Health and Safety	Joe Hunt	(503) 691-2030
Human Resources Director	Marguerite Shuffelton	(619) 296-6195
Other:		

GOVERNMENTAL CONTACT NUMBERS:

	NAME	TELEPHONE NO.
N/A		
Other:		

Yakima
Fruitvale
Wide Hollow
Ahtanum
Cowiche Canyon
Naches
Not all roads may be shown or named on maps or listed in street guide. Some roads may be private, proposed, or under construction.
Scale in miles
Points of Interest and Parks are keyed under Yakima street guide.
HOSPITAL LOCATION
YAKIMA MUNICIPAL AIRPORT
Washington Ave
Nob Hill Blvd
Ahtanum Rd

HOSPITAL LOCATION MAP (attach or draw):
(POST)



12/4/96
YAK-22.DWG

Project No. 954032NA	Yakima Railroad Area	Yakima Railroad Area Well Location Map and Receptor Areas	Figure B-1
Woodward-Clyde			

SITE MAP (attach or draw):
(POST)

I. TASK SPECIFIC HEALTH AND SAFETY RISK ANALYSIS

A. Predominant Potential Site Chemical Hazards*

CHEMICAL (OR CLASS)	PEL-TWA / TLV-TWA	OTHER PERTINENT LIMITS	WARNING PROPERTIES	ROUTES OF EXPOSURE OR IRRITATION	ACUTE HEALTH EFFECTS	CHRONIC HEALTH EFFECTS/ TARGET ORGANS
Tetrachloroethylene	200 ppm /	IDLH=50 ppm	Colorless liquid with a mild, chloroform-like	Inhalation, Absorption, Ingestion, Contact	Irritant eyes, nose, throat, nausea, dizziness, headache	Eyes, skin, respiratory system, liver, kidneys, CNS

*The Site Health and Safety Officer must notify the Health & Safety Coordinator at the end of work that day if a PEL, TLV, etc. is exceeded.

PEL-TWA = Permissible Exposure Limit-Time Weighted Average (8 hours).
TLV-TWA = Threshold Limit Value-Time Weighted Average (8 hours)
STEL = Short Term Exposure Limit (15 minutes).
IDLH = Immediately Dangerous to Life or Health.
C = Ceiling Limit (not to be exceeded, even instantaneously).
SKIN = Skin absorption can be a significant part of exposure.

E. Action Level Table for Chemical Monitoring*

CHEMICAL (OR CLASS)	MONITORING EQUIPMENT	TASK NO.	MONITORING FREQUENCY/ LOCATION (source, area or breathing zone).	LEVEL FOR RESPIRATOR USE	LEVEL FOR WORK STOPPAGE
Volatile Organic	Thermo Environmental 580 B Photoionization Detector: lamp set for maximal response to tetrachloroethylene	1,2,3	Continuous. Sample at source.	50 ppm above background in breathing zone for a maximum of 2 minutes.	50 ppm in breathing zone.

- Record peak readings every __30__ minutes, or more frequently as necessary.
- Set alarm on instrument at __50 ppm__.
- Calibrate equipment using isobutylene gas every day(s).
- Leak check colorimetric tube pump daily.

***Complete Attachment 5 (Air Monitoring Equipment Calibration/Check Log) and Attachment 6 (Air Monitoring Log).**

C. Personal Protective Equipment Requirements:

Level 'D': Safety glasses, hard hat, disposable ear plugs, long-sleeved shirt and pants, steel-toe boots. For contact with moist soil or liquid:

Gloves Inner: .008-inch Nitrile Outer: Leather

Chemical resistant boots or boot covers Neoprene

Chemical resistant suit Tyvek

Other

Level 'C'*: Level 'D' plus:

Air-purifying Respirator (Half- or Full-Face) Full-Face

Cartridges Organic vapor/HEPA

Gloves Inner: 0.008-inch gauge Nitrile Outer: 0.011-inch gauge Nitrile

Chemical resistant boots Neoprene

Chemical resistant suit PE Tyvek

Other

*The Site Health and Safety Officer must notify the Health & Safety Coordinator at the end of work that day if Level 'C' is used.

II. GENERAL SITE REQUIREMENTS AND BACKGROUND INFORMATION

A. Health and Safety Plan Responsibilities

- Prior to beginning on-site work, the Project Manager will ensure Attachments 1-4 are completed.
- The Site Health and Safety Officer (SHSO) will ensure Attachments 5-8 are completed the first day of on-site work. Within 24 hours of the end of field work, the SHSO will submit the completed HASP to the Health & Safety Coordinator (HSC).
- The Site Health and Safety Officer will oversee the overall Plan. He/she has the authority to stop work or prohibit any personnel from working on the site at any time for not complying with any aspect of the Plan.
- The Subcontractor Field Supervisor is responsible for implementing the Plan for his/her own employees.
- Each person on the site has responsibility for their own health and safety, as well as assisting others in carrying out the Plan. Any person observed to be in violation of the Plan should be assisted in complying with the Plan, or reported to the Site Health and Safety Officer or the Subcontractor Field Supervisor.
- Any site personnel may shut down field activities if there is a real or perceived immediate danger to life or health.

B. Minimum Training, Respirator Fit-Testing, and Medical Surveillance Requirements for Site Personnel

- 40 hr. Hazardous Waste Operations Training (HAZWOPER)
- 8 hr. Annual HAZWOPER Refresher Training
- 8 hr. Supervisor HAZWOPER Training for Site Health and Safety Officer
- First Aid and CPR Training for Site Health and Safety Officer
- Annual Respirator Fit Testing
- Annual Medical Clearance

C. Purpose of Field Work:

Perform remedial investigation of the facility and perform quarterly groundwater monitoring and sampling.

D. Detailed Description of Specific Tasks Planned

Detailed Description of Specific Tasks Planned (Number each separate task in order of progression. The task numbers assigned here will be referred to throughout the Plan):

1. Well installation and development - Twenty-eight ground water monitoring wells will be installed to perform quarterly groundwater monitoring and sampling.
2. Surveying of monitoring wells - Monitor new wells and three wells on the Paxton Sales facility.
3. Aquifer pumping test - Perform pumping tests in two identified wells.

4. Perform quarterly monitoring and sampling of new and existing ground water wells.

5. Submit data to Department of Ecology

6. Receptor analysis - Business within the YRRA will be surveyed to evaluate whether groundwater is used consumptively or for process water.

7. Submit progress reports and remedial investigation report.

E. Initial Site Entry Has this been performed by *SECOR*? (YES/NO): NO If YES, describe:

F. Interior Work & Confined Spaces

Will any work be done inside an enclosure, building, or confined space? (YES/NO): NO . If YES, describe:

Attachment 13 will be completed for permit-required confined spaces.

G. Excavation and Trenching

Excavation and/or trenching will be done on this site? (YES/NO): NO . If YES, describe including proposed dimensions and if entry may be required (including mounting tanks for vacuuming, purging, sampling, etc.):

Attachment 12 will be completed for excavations of any depth and requiring entry.

H. Landfills and Other Areas Potentially Containing Explosive Gas or Vapor
Site is in an area containing a current/former landfill, or the geology contains known/suspected pockets of explosive gas/vapor? (YES/NO) NO . If YES, describe:

I. Time of On-Site Work

Work will be done during daylight hours? (YES/NO): YES . If NO, describe:

J. Hazardous Materials

Will any hazardous materials (chemicals) be used on-site? (If so, include MSDS's under Attachment 11.) (YES/NO): NO . If YES, describe:

K. Background Information (e.g., historical operations and environmental investigations):

Consists of 6 square miles of predominantly industrial and commercial property that parallels the railroad corridor on the east side of Yakima, Washington. The four mile long tract runs diagonally from Lincoln Avenue in the northwest to Ahtanum Road in the southeast. The area consists of a broad, gently sloping plain located west of the Yakima River.

III. SITE CHARACTERISTICS

A. **Facility Description:** (Identify structures, buildings, pits, impoundments, and work area.):

Residential areas, schools, hospitals, office buildings

B. **Site Status:** Occupied (Yes/No): YES (If Yes, describe current activities and relationship to field work):

The PCE contamination is spread across 6 square miles of predominantly industrial and commercial property that parallels the railroad corridor.

C. **Unusual Site Features:** (water supply, telephone, radio, powerlines, traffic patterns, gas lines, water mains, terrain, vacant lots, debris, other physical hazards, etc.):

Telephone and radio lines, powerlines, traffice, gas lines

D. **Site Map:** [see p. iii - include adjacent buildings, encumbrances, site facility, previous project location (if any), proposed project location, and location of nearest phone].

E. **Contaminant Description** (Maximum concentrations from most recent investigation.):

	Substance	Source of Contamination	Source of Sample (soil, water, etc.)	Sample Concentration	Environmental Regulatory Action Level*
1.					
2.					
3.					
4.					

Reference:

Samples have not been obtained at site.

*For HASP reference purposes only.

IV. WASTE CHARACTERISTICS

A. Waste Generation [Type(s)/Quantities Expected]:

Anticipated: Yes __X__ No ______

Types: Liquid _X__ Solid __X_ Sludge ___ Other (describe) ________

Quantity (Expected Volume): To be determined.

B. Expected Health Characteristics:

Corrosive ___ Flammable/Ignitable ____ Radioactive ___ Toxic __X_

Reactive ____ Unknown ____

Other (specify) ____________________

C. Packaging requirements for waste material (Expected):

- open head 55-gallon drum PPE
- closed head 55-gallon drum To be determined for liquid storage
- overpack drum __________
- baker tanks __________
- lined waste bins To be determined for solid waste storage
- other __________

D. Disposal and/or Treatment Methods Proposed:

Disposal to an appropriate treatment facility.

__________________ will be responsible for characterizing, packaging, labeling, storing, and disposing of suspected or known waste.

E. Potential Non-chemical Hazards

	YES	NO
Overhead/underground hazards		
• Overhead (describe) Powerlines	X	
• Underground (describe) Sewer lines	X	
Equipment hazards		
• Geoprobe		X
• Drilling	X	
• Excavation	X	
• Machinery	X	
Heat exposure	X	
Cold exposure		X
Oxygen deficiency		X
Confined space		X
Noise	X	
Ionizing radiation		X
Non-ionizing radiation		X
Fire/Explosion	X	
Electrical	X	
Biological		X
Work Surfaces		
• Holes/ditches	X	
• Steep grades		X
• Slippery surfaces		X
• Uneven terrain	X	
• Unstable surfaces	X	
• Elevated work surfaces		X
Shoring		X
Other: ______		

F. Task Specific Hazards:

	TASK	HAZARD RATING	IDENTIFIED/ ANTICIPATED HAZARDS
1.	Drilling	Moderate	Machinery, utilities, noise, contact with soil contaminated with PCE.
2.	Monitoring and Sampling	Moderate	Contact with soil contaminated with detectable PCE.
3.	Soil Disposal	Moderate	Machinery, noise
4.			
5.			
6.			
7.			

G. Overall Hazard Rating: (Unknown, low, moderate, serious, or extreme):

Moderate

V. GENERAL SITE HEALTH AND SAFETY PROCEDURES

A. **MAPS - Site Map and Hospital Location Map (p. iii and p. ii):** Hospital route must be clearly marked. POST SITE AND HOSPITAL LOCATION MAPS.

B. **Post "Local Emergency and Project Telephone Numbers": p. i**

C. **Site Security:** Site Health and Safety Officer is responsible for preventing unauthorized entry onto the site and for knowing who is on-site at all times.

1. Work will be done around heavy equipment (e.g. drill rig, backhoe, etc.):
(YES/NO): YES

If YES, describe: Drilling equipment

2. Work will be done in or adjacent to a road, street or highway:
YES/NO YES

If YES, describe: Drilling wells near residential streets and business roads

3. Reflective vests will be worn around heavy equipment or when working in or around traffic.

4. Prior to working on-site, a general inspection for hazards will be made by the Site Health and Safety Officer.

5. Access to the work site will be controlled in the following manner:

- Work site area perimeter identification method (describe equipment and procedures to be used):

  Caution tape, cones and barricades will mark perimeter of work zone in all work locations.

- Work area security (on- and off-hours):

  Barricades and caution tape, and removal of all equipment after work is completed.

6. If an on-site command post is necessary, ensure that it is located upwind from sources, give prevailing winds, and locate/identify on Site Map (p. iii).

7. On-site personnel must be able to call off-site via a telephone within 150 feet of work.

8. Designate at least one vehicle for emergency use.

D. Work Limitations and Restrictions:

- No eating, drinking, or smoking on-site, except in the support zone.
- No rings, watches, bracelets, necklaces, or other jewelry that could trap chemical contamination or get caught in moving equipment.
- No contact lenses on-site.
- No facial hair that would interfere with respirator fit.
- Buddy system at all times in Level 'C' or 'B', or when working around heavy equipment like backhoes or drill rigs.

E. Heat and Cold Stress

The Site Health and Safety Officer will monitor weather broadcasts before the start of outdoor work each day, and more frequently as necessary. No work will be done outdoors during hazardous weather conditions.

- Heat Stress
  - For temperatures above 75°F, each person will take their pulse at rest. At breaks, the pulse should be less than 110 beats per minute after one minute. Before returning to work, the pulse should be no more than 10 beats greater than the resting pulse.
  - If the air temperature is greater than 95°F, work should be done for 30 minutes with a rest break of 10 minutes for Level D. For Level C, work should be done for 20 minutes, with a rest break of 10 minutes. At least 8 ounces (1 cup) of cool water, Gatorade-type drink, or dilute fruit juice should be consumed at each rest break or at least one cup every 20 minutes.
  - Work should stop if any of the following symptoms occur: muscle spasm and/or pain in the limbs or abdomen (heat cramps); weak pulse, heavy sweating, dizziness, and/or fatigue (heat exhaustion); or rapid pulse, no sweating, nausea, dizziness, and/or confusion (heat stroke). Provide First Aid immediately.
  - Use sunscreen on unprotected skin to protect against ultraviolet exposure as necessary.
- Cold Stress
  - For temperatures below 40°F, adequate insulating clothing must be worn. If the temperature is below 20°F, workers will be allowed to enter a heated shelter at regular intervals. Warm sweet drinks should be available. Coffee intake should be limited.
  - No one should begin work or return to work from a heated shelter with wet clothes. Workers should be aware of signs of cold stress such as heavy shivering, pain in the fingers or toes, drowsiness, or irritability. Onset of any of these signs are indications for immediate return to a heated shelter.

F. Decontamination Procedures:

1. Personnel:

   Remove and dispose Tyvek coveralls and boot covers, remove gloves and dispose, wash hands and face with soap and water.

2. Sampling Apparatus:

   Liquid wash and water rinse.

3. Heavy Equipment:

4. Level 'C' Decontamination Stations (in order from exclusion zone to support zone):

   a) Equipment drop
   b) Wash and rinse outer garment, boots, and gloves
   c) Remove outer boots and gloves
   d) Change respirator cartridges (if returning to exclusion zone)
   e) Remove inner gloves and outer garment
   f) Remove respirator
   g) Clean hands and face

5. The following equipment will be made available, or equivalent.

   - emergency eyewash,
   - soap/detergent solution and H_2O rinse (via Hudson-type sprayers),
   - soap gel or disposable wipes,
   - disposable towels,
   - plastic sheeting,
   - cleaning brushes and tubs.

G. General Procedures:

- The Utility Clearance Log and Map (Attachments 3 & 4) will be completed prior to beginning any subsurface work.
- Daily Health and Safety Briefings will be held by the Site Health and Safety Officer (Attachment 7).
- Determine wind direction, establish exclusion zone, and set up decontamination reduction zone and support zone upwind when upgrading to Level 'C' or 'B'.
- Try to remain upwind when collecting samples, venting wells, etc.
- Potable water must always be available at the work site.
- If toilet facilities are not located within a 5-minute walk from the decontamination facilities, either provide a chemical toilet and hand washing facilities or have a vehicle available (not the emergency vehicle) for transport to nearby facilities.
- Provide dust control by spraying soils with water or a surfactant/water solution.
- Use ground fault circuit interrupters for plug-in electrical devices and extension cords.
- Hearing protection in the form of disposable ear plugs will be worn around heavy equipment, machinery, or when two individuals five feet or less apart need to shout to be heard.
- Be aware of tripping hazards with extension cords, tools, hoses, augers, etc.
- Other: ____

H. Emergency Equipment:

- At least one ABC-type dry chemical fire extinguisher, and
- First Aid Kit.

I. Perimeter Identification and Personal Protective Equipment (PPE):

Complete the table below indicating the type of zone boundaries required for this job. Mark zone boundaries on Site Map, p. iii.

TASK NO.[1]	LEVEL OF PROTECTION REQUIRED (B, C, D; N/A)[2]		ZONE BOUNDARIES REQUIRED (a, b, c, d; N/A)[3]	
	PPE START	PPE UPGRADE	ZONE START	ZONE UPGRADE
1	D	NA	D	NA
2	D	C	D	A-C
3	D	C	D	A-C
4	D	C	D	A-C

1 As identified in Section II, Subpart D.

2 Level B - Self-contained breathing apparatus (SCBA) or supplied-air respirator with an escape bottle, chemically resistant suit.

Level C - Full- or half-face air-purifying respirator, chemically resistant PPE.

Level D - No respiratory protection. Safety glasses, hard hat, steel-toe boots, long-sleeved shirt and pants. Hearing protection, gloves, and other PPE as required.

3 This job will require one or all of the following "zones" or "boundaries" to be established during work.

a. Exclusion Zone - Required when workers within that zone must wear personal protective equipment. (Usually Level B or C.)

b. Contamination Reduction Zone - Required when decontamination of people and equipment leaving the Exclusion Zone is required. (Usually Level B or C.)

c. Support Zone - the location where administrative and other support activities are conducted. (Usually Level B or C.)

d. Work Area Boundary - Excludes non-workers from entering a potentially hazardous environment. (Usually Level B, C, or D.)

VI. CONTINGENCY PLAN

A. Injury or Illness:

If an injury or illness occurs, take the following action:

- Get First Aid for the person immediately.
- Notify the Site Health and Safety Officer. The Site Health and Safety Officer is responsible for immediately notifying the Project Manager, and preparing and submitting an Injury/Illness Incident Report (Attachment 9) to the Health and Safety Coordinator (HSC) within 24 hours, as well as notifying the employee's supervisor and Principal-in-Charge. If a subcontractor employee is injured, the Subcontractor Field Supervisor will also complete their own injury/illness investigation and submit a copy of their report to the *SECOR* HSC as well.
- The Site Health and Safety Officer will assume charge during a medical emergency.

B. Site Incident:

If an incident occurs, take the following action:

- Notify the SHSO immediately. The SHSO is responsible for immediately notifying the Project Manager, and preparing and submitting a Site Incident Report (Attachment 10) to the HSC within 24 hours.

C. Local Emergency and Project Telephone Numbers (See p. ii)

D. Emergency Routes (Also see Hospital Location Map - p. i):

1. Route from on-site work area to off-site property: NA

2. Route from off-site property to hospital: West on Yakima Avenue, South on 28th Avenue until Tieton Drive.
   Yakima Valley Memorial Hospital
   2811 Tieton Drive
   Yakima, WA 98902

(ATTACHMENT 1)

SECOR

EMPLOYEE TRAINING AND MEDICAL CLEARANCE

		Certification Dates					
Responsibility	**Name**	40-Hour HAZWOPER	8-Hour HAZWOPER Refresher	8-Hour HAZWOPER Supervisor*	First Aid/ CPR*	Medical Clearance	Other
Site Health and Safety Officer	Curt Goddard					2/97	
Other Field Staff							

*Health and Safety Officer at a minimum must have this training.

(ATTACHMENT 2)

SECOR

SUBCONTRACTOR TRAINING AND MEDICAL CLEARANCE RECORD

Subcontractor: Custom Backhoe and Dumptruck Services

Address: 13032 S.E. 45th Court, Bellevue Washington 98006

Employees Assigned to Project:____

I certify the above employees assigned to this project have received training, medical clearance, and respirator fit-testing according to the Health and Safety Plan and the Occupational Safety and Health Administration Standard on Hazardous Waste Operations and Emergency Response (29 CFR 1910.120). If any of these employees are injured, I will submit an injury report to the *SECOR* Health and Safety Director within 24 hours.

Name	Signature
Title*	Date

*Subcontractor Supervisor or Manager only.

(ATTACHMENT 3)

SECOR

UTILITY CLEARANCE LOG

Date: ______________________

"One-call" confirmation number and date contacted: ______________________

"One-call" expiration date: ______________________

Subcontractor locating firm and invoice number: APS Locating Inc.

Facility contact person & telephone number: Jack 425-392-6412

Facility drawings reviewed: ______________________

Verbal/written sign-off of clearance by facility contact: ______________________

Pressurized lines/shut-off valves identified:* ______________________

Underground utilities/lines identified:* ______________________

Underground utilities/lines marked on-site by: ______________________

Overhead utilities/lines identified:* ______________________

Overhead utilities/marked on-site by: ______________________

*Mark on copy of facility drawing or include in site sketch (Attachment 5).

Clearance contact:

Namrata Shrivastava		
Name (SECOR employee only)	Signature	Date

Clearance Reviewed by:

Riley Conkin		
Name (SECOR Project Manager)	Signature	Date

(ATTACHMENT 4)

SECOR

UTILITY CLEARANCE MAP

(ATTACHMENT 5)

SECOR

AIR MONITORING EQUIPMENT CALIBRATION/CHECK LOG

DATE	INSTRUMENT/ MODEL NO.	SERIAL NO.	BATTERY CHECK OK?	ZERO ADJUST OK?	CALIBRATION GAS (PPM)	READING (PPM)	LEAK CHECK (Colorimetric Tube Pump)	PERFORMED BY	COMMENTS

CAMERON-YAKIMA WORKING GROUP SECOR Project No. 00378-001-01

(ATTACHMENT 6)

SECOR

AIR MONITORING LOG*

DATE	TIME	LOCATION	SOURCE/AREA/ BREATHING ZONE	INSTRUMENT	CONCENTRATION/UNITS	SAMPLED BY

***Notify the Health & Safety Coordinator or Corporate Health and Safety immediately if a PEL, TLV, or other limit is exceeded.**

(ATTACHMENT 7)

SECOR

DAILY HEALTH AND SAFETY BRIEFING LOG

Date:______________________________

Start Time:__________________________

Subjects Discussed:____

Attendees:

Print Name	Signature

Meeting Conducted by:______________________________ ________________

Name (Site Health and Safety Officer) Signature

(ATTACHMENT 8)

SECOR

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT AND AGREEMENT FORM

(All *SECOR* and subcontractor personnel must sign.)

I acknowledge I have reviewed a copy of the Health and Safety Plan for this project, understand it, and agree to comply with all of its provisions. I also understand I could be prohibited by the Site Health and Safety Officer or other *SECOR* personnel from working on this project for not complying with any aspect of this Health and Safety Plan:

Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date

(ATTACHMENT 9)

SECOR INJURY/ILLNESS REPORT

(Use additional space as necessary)

DATE OF INCIDENT__________ CASE NO.______ TIME OF DAY__________

EMPLOYEE NAME__________ DATE OF BIRTH__________

HOME ADDRESS__________ PHONE NO.__________

SEX: MALE___ FEMALE___ AGE___ JOB TITLE__________ SOCIAL SECURITY NO.__________

OFFICE LOCATION__________ DATE OF HIRE__________

WHERE DID INCIDENT OCCUR? (INCLUDE ADDRESS)__________

ON EMPLOYER'S PREMISES? YES___ NO___ PROJECT NAME/NO.__________

WHAT WAS EMPLOYEE DOING WHEN INCIDENT OCCURRED? (BE SPECIFIC)__________

HOW DID THE INCIDENT OCCUR? (DESCRIBE FULLY)__________

WHAT STEPS COULD BE TAKEN TO PREVENT SUCH AN INCIDENT?__________

OBJECT OR SUBSTANCE THAT DIRECTLY CAUSED INCIDENT?__________

DESCRIBE THE INJURY OR ILLNESS__________ PART OF BODY AFFECTED__________

NAME AND ADDRESS OF PHYSICIAN__________

IF HOSPITALIZED, NAME AND ADDRESS OF HOSPITAL__________

LOSS OF ONE OR MORE DAYS OF WORK? YES/NO______ IF YES-DATE LAST WORKED__________

HAS EMPLOYEE RETURNED TO WORK? YES/NO______ IF YES-DATE RETURNED__________

DID EMPLOYEE DIE? YES/NO______ IF YES, DATE__________

Field Person	Signature	Date
Project Manager	Signature	Date
Health & Safety Coordinator	Signature	Date
Group Leader	Signature	Date
Managing Principal	Signature	Date

This report must be completed by the employee's supervisor or Health and Safety Coordinator immediately upon learning of the incident. The completed report must be reviewed and signed by the Principal-in-Charge and transmitted to Corporate Health and Safety and the Health & Safety Officer within 24 hours of the incident, even if employee is not available to review and sign. Employee or employee's doctor must submit a copy of the doctor's report to Corporate Health and Safety within 24 hours of the initial exam and any subsequent exams. For field injuries, submit a copy of the Health and Safety Plan. A detailed synopsis of events including corrective action to be taken must be submitted by the PIC to Corporate Health & Safety within 1 week of the injury.

(ATTACHMENT 10)

SECOR
SITE INCIDENT REPORT
(Attach additional documentation as necessary)

Date of Incident: ____________ **Time of Incident:** __________

Location of Incident: _________ **Project Name:** ____________

Project Number: ____________

Type of Incident* (check those that apply):

_____ "Near Miss" _________ Vehicle Accident

_____ Underground Property Damage _________ Fire

_____ Above-ground Property Damage _________ Evacuation

_____ Chemical Exposure _________ Regulatory Agency Inspection or Violation

_____ Other (describe)____

*Submit copy of Health & Safety Plan and Attachments for field-related incidents.

Description of Incident:____

____

Cause of Incident:____

____

Action Taken:____

____

Future Corrective Action:____

____

Estimated Amount of Damage:____

Field Person	Signature	Date
Project Manager	Signature	Date
Health & Safety Coordinator	Signature	Date
Group Leader	Signature	Date
Managing Principal	Signature	Date

cc: Corporate Health & Safety, Vice-president of Operations, Corporate Contracts/Administration (property damage), & Health & Safety Coordinator within 24 hours of incident.

NOTE: A detailed synopsis of events including corrective action to be taken must be submitted by the PIC to Corporate Health & Safety within 1 week of the site incident. REV: 7-17-96

(ATTACHMENT 11)

SECOR

MATERIAL SAFETY DATA SHEETS

(ATTACHMENT 12)

SECOR

EXCAVATION INSPECTION LOG*

DATE	TIME	EXCAVATION OK/NOT OK FOR ENTRY	COMMENTS	COMPETENT PERSON	SIGNATURE

*Excavation will be inspected before the start of work each day, after each rainfall, or more often if soil/work conditions change.

(ATTACHMENT 13)

SECOR

CONFINED SPACE ENTRY PERMIT
(POST OUTSIDE SPACE)

TO BE COMPLETED BY PROJECT MANAGER

DATE:________________________

PROJECT NAME:______________ PROJECT NO:________________

LOCATION OF WORK:____

HAZARDS IN THIS CONFINED SPACE:________________________________

DESCRIPTION OF WORK:____

HAZARDS CREATED BY WORK TO BE DONE:_____________________________

OBSERVER:____________________ ENTRY LEADER:____________________

EMPLOYEES ASSIGNED:____

ENTRY DATE:_________ ENTRY TIME:_______ EXIT TIME:_____________

OUTSIDE CONTRACTORS WORKING IN AREA:_____________________________

(CIRCLE ONE)

1. Have all employees who will enter this space or act as standby received the following approvals and training:

Yes No a. Medical clearance within the past year.

Yes No b. Training in confined space entry.

Yes No c. Job emergency procedures have been reviewed with all employees involved.

Yes No d. Completed rescue drill for this type confined space.

2. Equipment identified by checks (√) in boxes will be available at entrance for emergencies. Equipment identified by (X) in boxes will be used by personnel in space.

☐ ☐ 1. 30-min SCBA
☐ ☐ 2. 15-min SCBA
☐ ☐ 3. Other Respirator ________________
☐ ☐ 4. 2-way Radios
☐ ☐ 5. Tether - Life lines
☐ ☐ 6. Harness - Safety belt
☐ ☐ 7. Wristlets
☐ ☐ 8. Fall device for tether
☐ ☐ 9. Rolling body board (creeper)
☐ ☐ 10. Ladder
☐ ☐ 11. Ladder extensions
☐ ☐ 12. Barricades for all openings
☐ ☐ 13. Tripod or other lifting device
☐ ☐ 14. Opening device for covers
☐ ☐ 15. Device to lock covers open
☐ ☐ 16. Fresh air blower and hose
☐ ☐ 17. LEL-0_2 monitor-alarm
☐ ☐ 18. Toxic gas colorimetric tubes
☐ ☐ 19. Toxic gas air monitor
☐ ☐ 20. Hard hats
☐ ☐ 21. Safety shoes
☐ ☐ 22. Safety glasses
☐ ☐ 23. Full face shields
☐ ☐ 24. Chemical protective arm covers
☐ ☐ 25. Full chemical protective suit
☐ ☐ 26. Chemical protective gloves
☐ ☐ 27. Chemical protective boots
☐ ☐ 28. Emergency lights/Flashlights
☐ ☐ 29. Fire extinguisher
☐ ☐ 30. Pre-entry H&S Briefing
☐ ☐ 31. Stand-by employee(s)

(ATTACHMENT 13)

CONFINED SPACE ENTRY PERMIT
(POST OUTSIDE SPACE)

Date: Project Name: Project No.:

3. All lines that could discharge contaminants into the space have been/will be blanked off or line disconnected and pumping means locked out and tagged.
   Yes No N/A

4. Space has been/will be cleaned of any toxic residue or atmosphere by ________________ .
   Yes No N/A

5. Moving machinery has been/will be locked out and immobilized.
   Yes No N/A

6. Entry and exit to the space are provided by ________________________________.
   Yes No N/A

7. Will work to be done in the space introduce contaminants to the space?
   Yes No N/A

8. What is capacity of blowers to be used in cubic feet per minute? ________________.

9. Have all affected departments been notified of service interruption?
   Yes No N/A

10. Atmospheric gas tests will be done by ________________________________.
    Readings:
    Oxygen ______________ (Not <20% or >22%) Flammability % ________________ (LEL <10%) Toxic Gas __________. (<______ppm)

11. Will continuous monitoring device be used? Yes No Type______________.

12. Calibration date of meters used in items 10 and 11.
    a. ________________ b. ____________________ c.________________

13. Emergency communication means: 2-Way ☐ Telephone ☐ Other ☐

I have inspected the space to enter, the safety equipment that will be used, and approve employees' entry into the confined space.

Signed: ________________________________
Project Manager

____
Site Health and Safety Officer

Approved: ________________________________
Corporate Health and Safety

SECOR International Incorporated
Bellevue Office
15400 SE 30th Place, Suite 100
Bellevue, Washington 98007
Phone: (206) 641-9900
FAX: (206) 641-9092

TECHNICAL MEMORANDUM

TO: Mark Valentine
de maximis, inc.

FROM: Cliff Schmitt
Senior Project Manager

RE: FINAL WELL SITES AND OTHER ISSUES
YRRA REMEDIAL INVESTIGATION
SECOR PN: 00378-001-01

DATE: August 22, 1997

SECOR has prepared this Technical Memorandum to summarize the results of SECOR's meetings on August 18, 1997 with Mr. Ken Harris, city of Union Gap, and Mr. John Rutter and others, city of Yakima and Mr. Rick Roeder, Ecology, to discuss the proposed monitoring well pair locations and access issues. The meetings were productive and most concerns regarding the proposed monitoring well locations have been addressed. Mr. Harris and Mr. Rutter recommended the following:

- The local private irrigation districts be contacted during the utility locate process;
- The city utility maps be reviewed during the utility locate process; and
- Residences in the vicinity of the well pair locations be contacted several days prior to drilling to inform them of the planned activities.

Provided below is a summary of issues for each well pair location.

CITY OF UNION GAP

Access to the well pairs located on the city of Union Gap property will be considered during the City Council meeting scheduled for August 25, 1997. Mr. Harris will describe the proposed work and give his recommendation to the Council that access be granted per the conditions described below. There will not be any permits required or fee for inspections by the city of Union Gap.

Wells MW-6s and 6d: The marked well pair location will be moved to the gravel parking strip approximately 4 to 6 feet to the west, which is within the city easement.

Wells MW-7s and 7d: This well pair is on private property and was not discussed during the meeting.

Wells MW-8s and 8d: Mr. Harris indicated that this location was not acceptable because the marked well pair location may be excavated during installation of a new sewer line anticipated to occur within a few months. Parking lots on private property north of Ahtanum Road (Valley Septic Service, 903 Ahtanum Road, 800-522-2664) or south of Ahtanum Road (Northwest Hide Company, 900 Ahtanum Road, 509-248-0520) do not appear to have any physical limitations to access. Valley Septic Service was contacted previously regarding potential access. Approximate alternative locations are presented on the attached sketch.

Wells MW-9s and 9d: This well pair is on private property and was not discussed during the meeting.

Wells MW-10s and 10d: This well pair is on private property and was not discussed during the meeting.

Wells MW-11s and 11d: This well pair is on private property and was not discussed during the meeting.

Wells MW-12s and 12d: This well pair location was acceptable to the city under the condition that the well pair be located within the footprint of the planned sidewalk and that the well heads be finished to the existing sidewalk grade. The existing sidewalk ends just north of the proposed well pair location near a storm drain but the sidewalk will likely be extended in the near future to the south. It should not be difficult to set the well heads to the sidewalk grade.

CITY OF YAKIMA

Issues discussed included:

- The city will charge a nominal fee (total of $50 to $200) for inspecting the work sites after drilling has been completed.
- Mr. Rutter would like a typical well construction diagram mailed to him for review.
- Ecology will maintain the wells. Well heads will be inspected by Ecology more frequently that once per quarter to insure that the well head does not require maintenance.
- Wells will be locked to prevent unauthorized access.
- Ecology will decommission the wells at the end of the project.
- The sewer department should be contacted during the utility clearence process (Doug Mayo, 575-6030).
- Ecology will provide the city with indemnification for the wells.

Wells MW-1s and 1d: This well pair location was acceptable to the city.

Wells MW-2s and 2d: This well pair location was acceptable to the city.

Wells MW-3s and 3d: The proposed well pair was located at a high traffic intersection (Ticton Drive and 10th Avenue). The city highly recommended that an alternative location be selected. Two alternative locations were identified based on field reconnaissance: 1) A parking lot west of 11th Avenue and south of Tieton Drive; 2) A gravel strip west of 8th Avenue and south of Tieton Drive (see attached sketch maps). There did not appear to be any physical limitations to access at either of these alternative locations. City of Yakima maps should be reviewed to determine if these locations are on city property or within city easements.

Wells MW-4s and 4d: This well pair location was acceptable to the city with the recommendation that the Yakima school district be contacted to discuss well installation in the Yakima Valley Vocation Skill Center parking lot.

Wells MW-5s and 5d: This well pair location was acceptable to the city. Mr. Rutter will check the city easement map to insure the proposed location is within the city easement.

Wells MW-13s and 13d: This well pair location was acceptable to the city under the condition that the well pair be located in the grass area and not on the roadway. Mr. Rutter will check the city easement map to insure the proposed location is within the city easement.

Wells MW-14s and 14d: This well pair location was acceptable to the city. A Street Use Permit will be required to block traffic flow during the drilling activities.

OTHER ISSUES

1. SECOR has received verbal approval from Mark Valentine, *de maximis, inc.*, for the following change orders:
   - YRRA #1 - Access Agreement ($1,000);
   - YRRA #4 - Response to Draft Work Plan review ($1,800); and
   - YRRA #5 - Additional Access Agreement (time and materials, not to exceed $4,500).

2. SECOR has been contacted to conduct groundwater sampling at the Frank Wear site within the YRRA. SECOR requests approval from the Working Group to perform the groundwater sampling round with the understanding that SECOR will not be interpreting the groundwater results or providing Frank Wear with other consulting services. SECOR does not believe that this limited scope of work would constituent a potential conflict of interest with the Working Group.

SECOR trusts that this provides sufficient information for your needs. Should you have any questions, feel free to contact Mr. Peter Jewett or Mr. Cliff Schmitt at (425) 641-9900.

/je

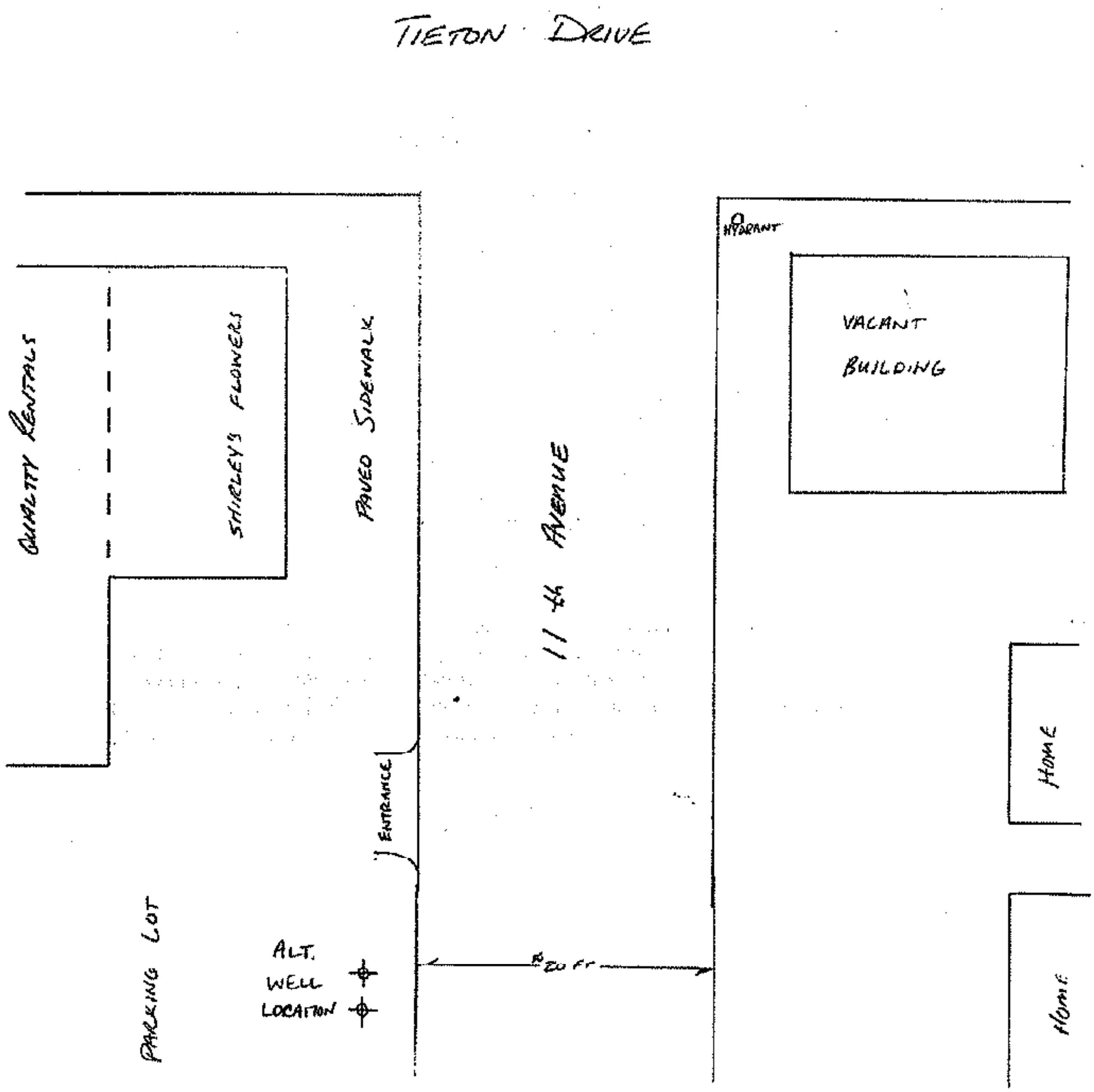
Attachments

SECOR

ALTERNATIVE
RI-3s
RI-3d

N

JOB NAME WORKING GROUP
JOB NO. 00378-001-01
CALCULATED BY OTS DATE 3/18/97
CHECKED BY ______ DATE ______
SHEET 1 OF 1

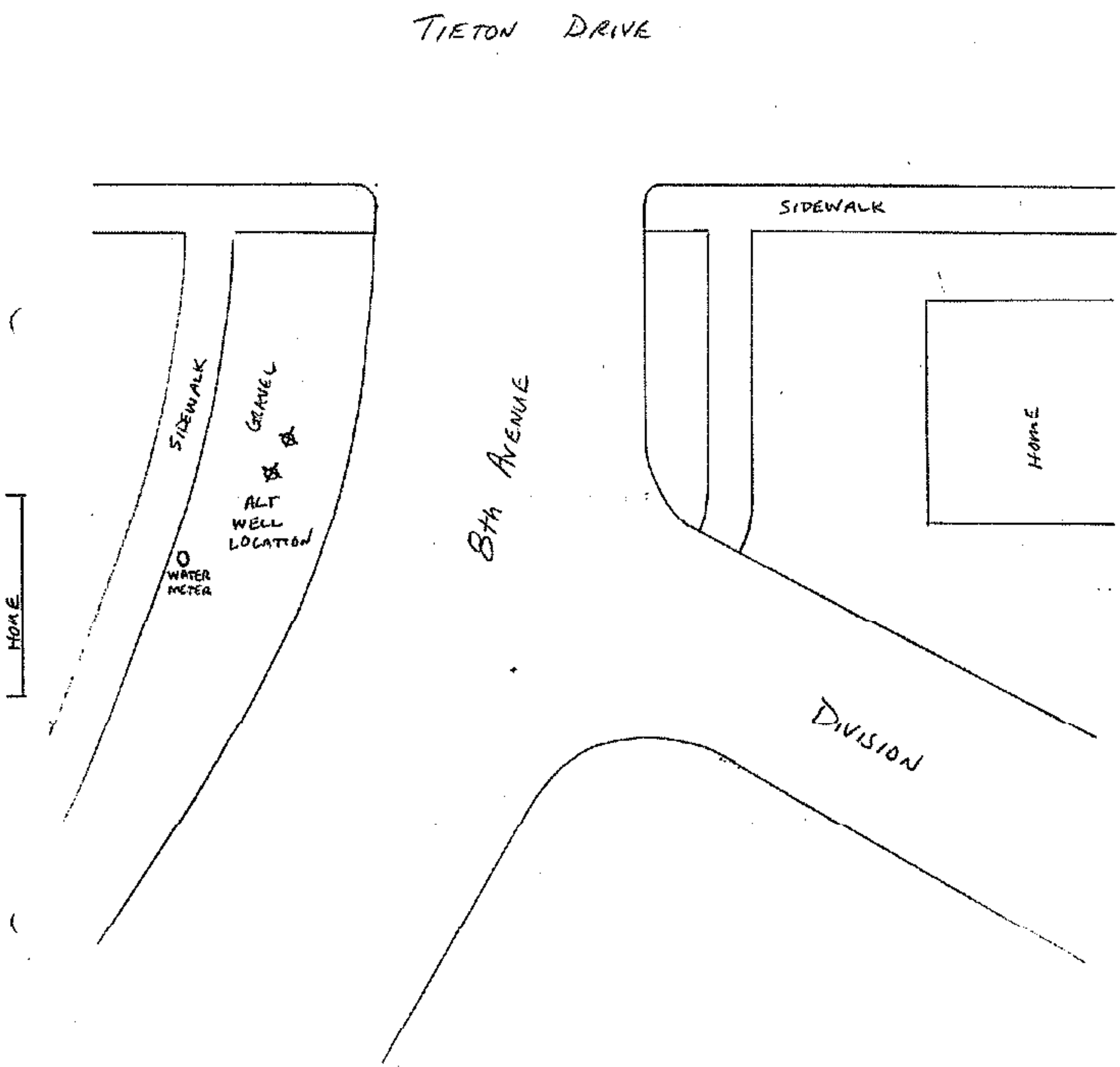


ALTERNATIVE
RI-3S
RI-3D

SECOR

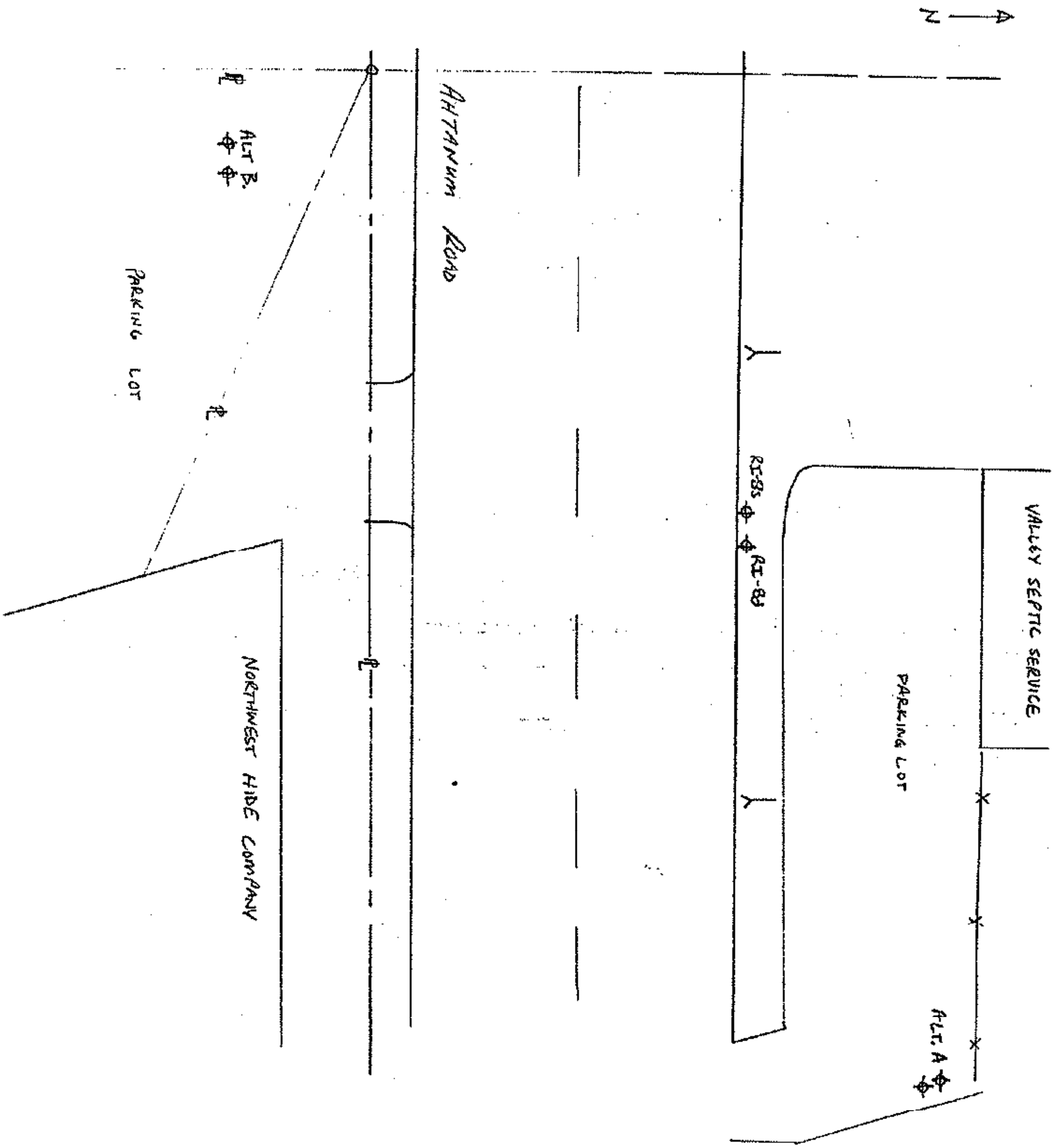
N

JOB NAME Working Group
JOB NO. 00378-001-01
CALCULATED BY CTS DATE 8/19/97
CHECKED BY DATE
SHEET 1 OF 1



SECOR

JOB NAME WORKING GROUP
JOB NO. 00378.001-01
CALCULATED BY CJS DATE 8/16/02
CHECKED BY ______ DATE ______
SHEET 1 OF 1



SECOR International Incorporated
Bellevue Office
15400 SE 30th Place, Suite 100
Bellevue, Washington 98007
Phone: (425) 641-9900
FAX: (425) 641-9092

TECHNICAL MEMORANDUM

TO: Mark Valentine - *de maximis, inc.*
Rick Roeder - Washington State Department of Ecology

FROM: Cliff Schmitt
Senior Project Manager

RE: MODIFICATION TO WELL DESIGN FOR RI-13d
YRRA REMEDIAL INVESTIGATION
SECOR PN: 00378-001-01/Task 3

DATE: October 31, 1997

SECOR International Incorporated (SECOR) has prepared this Technical Memorandum to document the modification to the approved design of extraction well RI-13d. According to the Statement of Work, dated December 4, 1996, the purpose of well pair RI-13s/d is to provide a groundwater extraction point for an aquifer test (pump test) of the Yakima River gravel deposits. Whether the deep (RI-13d) or shallow (RI-13s) well is used for the extraction point will be determined based on the difference in water levels in wells RI-13s and RI-13d. If the water level in wells RI-13s and RI-13d are within 0.5 feet of one another, then well RI-13s will be the extraction well; if the difference in water levels are greater than 0.5 feet from one another, then well RI-13d will be the extraction well.

Drilling at well pair RI-13 commenced on October 30, 1997. The depth to groundwater was approximately 16 feet below ground surface (bgs). Sediments encountered were predominately sandy gravel that became more coarse-grained at depth. Below 60 feet bgs, the formation produced much more water per foot of drilling than at other well pair locations drilled to date. The interval from 70 to 80 feet bgs produced more than 1200 gallons of water and the interval from 80 to 90 feet bgs produced more than 4000 gallons of water. At 90 feet total borehole depth, all of the available capacity for water storage (5800 gallons) was filled and drilling was suspended. SECOR estimates that an additional 12,000 to 16,000 gallons of water would have been generated if drilling progressed to the target depth of 121 feet bgs for the bottom of well RI-13d. This would increase drilling costs to over $300 per foot, including drill rig standby costs until four additional water trucks could be located and transported to the site and water disposal costs.

The coarse-grained sediments logged and rate of water production during drilling indicate that the transmissivity of the aquifer is very high below 60 feet bgs. As discussed in SECOR's Technical Memorandum dated June 25, 1997, the aquifer test may not achieve the test objectives, especially if the transmissivity of the aquifer is as high as indicated by conditions encountered during drilling.

After discussions with Mr. Mark Valentine of *de maximis* and unsuccessful attempts to discuss conditions with Messrs. Rick Roeder and Don Abbott, Washington State Department of Ecology, it was decided to complete well RI-13d at a depth of 90 feet bgs instead of the target depth of 121 feet bgs. SECOR believes that this modification to the proposed well design should not significantly compromise the usefulness of the data to be obtained from the planned aquifer test. SECOR proceeded with completion of well RI-13d at 90 feet bgs based upon verbal approval from *de maximis*.

SECOR trusts that this provides sufficient information for your needs. Should you have any questions, feel free to contact Mr. Cliff Schmitt at (425) 641-9900.

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TECHNICAL MEMORANDUM

TO: Mark Valentine - *de maximis, inc.*
Rick Roeder - Washington State Department of Ecology

FROM: Cliff Schmitt
Senior Project Manager

RE: **RELATIVE GROUNDWATER LEVELS AT RI-13**
YRRA REMEDIAL INVESTIGATION
SECOR PN: 00378-001-01

DATE: November 17, 1997

SECOR International Incorporated (SECOR) has prepared this Technical Memorandum to document the relative groundwater level elevations at the RI-13 location. The screened interval at each well is: Well RI-13s from 26 to 41 feet below ground surface (bgs); Well RI-13i (originally designated RI-13d and renamed RI-13i) from 80 to 90 feet bgs; and well RI-13d from 111 to 121 feet bgs. The wells at this location were surveyed to a datum of 100 feet. Listed below are the relative groundwater levels at each RI-13 well.

Well No.	Relative Casing Elevation	Depth to Water	Groundwater Elevation
13s	95.82	15.92	79.90
13i	95.76	16.21	79.55
13d	95.20	16.19	79.01

The 0.89 foot difference in groundwater levels at the shallow wells (RI-13s) and deep wells (RI-13d) means that deep wells will be installed at the RI-11 and RI-12 locations. SECOR anticipates completion of the well installation portion of the field program by November 21, 1997.

CS/ss

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☐ **Hard Copy To Follow**

To: MARK VALENTINE
From: Cliff
Company: de maximis
Date: 11/17/97
Time:
FAX No: 682-2187
Job No: 00379-001-01
Phone No:
Pages (Including Cover): 2
Comments:

FAXFRM.61

Confidentiality Notice

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TECHNICAL MEMORANDUM

TO: Mark Valentine - *de maximis, inc.*
Rick Roeder - Washington State Department of Ecology

FROM: Cliff Schmitt CS
Senior Project Manager

RE: **MODIFICATION TO WELL DESIGN**
YRRA REMEDIAL INVESTIGATION
SECOR PN: 00378-001-01

DATE: November 17, 1997

SECOR International Incorporated (SECOR) has prepared this Technical Memorandum to document the modification to the proposed design of monitoring well RI-11d. According to the *Work Plan for the Focussed Remedial Investigation* prepared by SECOR and dated August 25, 1997, the deep monitoring wells were to be screened the bottom 10 feet and be set 100 feet below the seasonal low groundwater (assumed to be 5 feet below the water level encountered during drilling).

At the borehole for RI-11d, groundwater was encountered at 12 feet below ground surface (bgs) and the static water level was 13 feet bgs approximately 14 hours later. The planned total borehole was 118 feet (13 feet plus 5 feet plus 100 feet = 118 feet bgs) and the 108 to 118 interval was planned to be screened. However, the drill stem bit was damaged in the interval from 105 to 110 feet bgs, prohibiting advancement of the borehole an additional 8 to 10 feet to the target depth. This morning the total depth of the borehole was measured at between 107 and 108 feet. The aquifer material is comprised of gravel and sand similar to material encountered during drilling of the adjacent well RI-10d. Well RI-10d was screened from 104 to 114 feet.

SECOR discussed the information stated above with Rick Roeder and requested that the well design be modified to a total well depth of between 107 and 108 feet bgs and screened interval from 97 or 98 to 107 or 108 feet bgs. Rick Roeder approved the modification to the well design as discussed. The field crew was notified of the approved design and will complete installation of the well.

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*** TX REPORT ***
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TRANSMISSION OK

TX/RX NO	0844
CONNECTION TEL	2066822187
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CONNECTION ID	
ST. TIME	11/18 11:19
USAGE T	00'54
PGS.	2
RESULT	OK

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☐ **Hard Copy To Follow**

To: Mark Valentine

From: Cliff Schmitt

Company: *de maximus, inc.*

Date: November 18, 1997

Time:

FAX No: (206)682-2187

Job No: 00378-001-01

Phone No:

Pages (Including Cover): 2

Comments: For your information.