Final Draft
Interim Action Work Plan
2011 3-333 Building Soil Excavation
North Boeing Field
Seattle, Washington

June 9, 2011

Prepared for

The Boeing Company
Seattle, WA

LANDAU ASSOCIATES
130 2nd Avenue South
Edmonds, WA 98020
(425) 778-0907

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

Appendix	Title
A	Interim Action Level Development Tables
B	Ecology Draft Preliminary Screening Levels and potential ARARs
C	Soil Analytical Data Table
D	Groundwater Analytical Data Table
E	Health and Safety Plan

ABBREVIATION/ACRONYM LIST

ARARs	Applicable or Relevant and Appropriate Requirements
BGS	Below Ground Surface
CalEPA	California Environmental Protection Agency
City	City of Seattle
COC	Chain-of-Custody
CQA	Construction Quality Assurance
CUL	Cleanup Level
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
Ft	Foot
GTSP	Georgetown Steam Plant
H:V	Horizontal:Vertical
HASP	Health and Safety Plan
IAL	Interim Action Level
KCIA	King County International Airport
LDW	Lower Duwamish Waterway
MDL	Method Detection Limit
µg/L	Micrograms per liter
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
MTCA	Model Toxics Control Act
NBF	North Boeing Field
NPDES	National Pollutant Discharge Elimination System
OEHHA	Office of Environmental Health Hazard Assessment
PCBs	Polychlorinated Biphenyls
pcf	Pounds per cubic foot
PEL	Propulsion Engineering Labs
RL	Reporting Limit
SOPs	Standard Operating Procedures
SVOCs	Semivolatile Organic Compounds
sf	Square foot
TEE	Terrestrial Ecological Evaluation
TEQ	Toxicity Equivalency
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
yd^3	Cubic yard

1.0 INTRODUCTION

This document presents a work plan to conduct an interim action soil excavation on property leased by The Boeing Company (Boeing) at North Boeing Field (NBF) in Seattle, Washington. NBF is located east of East Marginal Way South adjacent to the King County International Airport (KCIA) and the city of Seattle (City) Georgetown Steam Plant (GTSP) (see Figure 1).

The NBF interim action will be conducted by Boeing. It is anticipated that this interim action soil excavation, which will be conducted to the west/southwest of the 3-333 building at NBF, will occur sequentially with the planned interim action soil excavation that will be taking place near the NBF/GTSP boundary (fenceline area) during the 2011 construction season (Landau Associates 2011a). The 3-333 building interim action area is located within the Propulsion Engineering Labs (PEL) area at NBF (Figure 2). While the fenceline area excavation will be conducted as a collaborative effort by Boeing and the City, the 3-333 building interim action excavation will be conducted by Boeing independently of the planned excavation activities with the City near the NBF/GTSP boundary.

The primary objective of the NBF 3-333 building soil excavation interim action is to remove accessible soil that contains concentrations of polychlorinated biphenyls (PCBs) greater than the proposed interim action levels (IALs), as required by the Washington State Department of Ecology. The proposed IALs for PCBs were developed in the Fenceline Area Excavation Interim Action Work Plan and are discussed in Section 2.1.

The planned NBF 3-333 building soil excavation area was identified based on the comprehensive data set for soil samples collected within the 3-333 building interim action area. This includes PCB data collected during the PEL Soil and Groundwater Investigation (Landau Associates 2011b), and historic soil samples in the area of the excavation (summarized in the PEL Soil and Groundwater Investigation Work Plan, Landau Associates 2010). The PCB data set for samples located within the 3-333 building interim action excavation area for soil and groundwater is summarized in Section 2.2. PCB concentrations in soil are presented on Figures 3 through 6.

PCBs are present in soil at concentrations both greater than and less than 50 milligrams per kilogram (mg/kg). Removal of soil with PCB concentrations greater than or equal to 50 mg/kg is regulated by the U.S. Environmental Protection Agency (EPA) under the Toxic Substances Control Act (TSCA), and will be conducted in accordance with TSCA under the requirements of the risk-based procedures for the cleanup and disposal of PCB remediation waste [40 C.F.R. § 761.61(c)]. Soil with PCB concentrations less than 50 mg/kg, but greater than the proposed IALs, will be excavated in accordance with the Model Toxics Control Act (MTCA) as an interim action in accordance with the NBF/GTSP Agreed Order (Ecology 2008). As such, this work plan will be submitted to and requires approval by both the EPA under TSCA and Ecology under MTCA.

2.0 SOIL EXCAVATION PLAN

This section summarizes development of the proposed IALs and identification of the planned NBF 3-333 building soil excavation area, and presents certain interim action construction considerations.

2.1 INTERIM ACTION LEVELS

IALs for PCBs were developed as described in detail in Section 2.1 of the 2011 Fenceline Area Excavation Interim Action Work Plan (Landau Associates 2011a); PCB IALs developed for the fenceline area excavation area will be used for the 3-333 building excavation. The development of the proposed IALs for PCBs is summarized in this section.

PCBs were identified by Ecology as a chemical of concern in the PEL area at NBF. Details of the interim action level development for PCBs in soil, groundwater, and surface water are provided in Tables A-1, A-2, and A-3 in Appendix A for soil, groundwater, and surface water respectively. Screening of applicable or relevant and appropriate requirements (ARARs) applicable to the NBF site for soil, groundwater, and surface water was performed during the development of IALs for the fenceline area excavation. ARAR screening for soil, groundwater, and surface water is provided in Tables A-4, A-5, and A-6 of Appendix A, respectively.

Draft preliminary screening levels were developed by Ecology for Lower Duwamish Waterway (LDW) upland sites and sent to the City for review (Edens 2010). The screening level spreadsheet provides a comprehensive listing of all ARARs that may be relevant for sites along the LDW. Ecology draft preliminary screening levels and potential ARARs for the LDW are provided in Appendix B. ARARs included in the Ecology screening level spreadsheet were evaluated according to their relevance to the NBF site. ARARs that were determined not relevant for the NBF site were eliminated from consideration.

Development of IALs for soil and groundwater are detailed in Sections 2.1.1 and 2.1.2 of the 2011 Fenceline Area Excavation Interim Action Work Plan (Landau Associates 2011a); those IALs are summarized below:

- **PCBs in Soil:** Separate IALs for PCBs were developed for soil in areas where PCBs are not present in groundwater (based on the lowest direct contact ARAR, the TSCA cleanup level for bulk PCB remediation waste in high occupancy areas) and for soil in areas where PCBs are present in groundwater (based on the lowest direct contact ARAR and the site-specific soil concentration threshold protective of groundwater). The IALs for soil are:
  - 1.0 mg/kg for PCBs in soil in areas where PCBs are not detected in groundwater.
  - 0.5 mg/kg for PCBs in soil in areas where PCBs are detected in groundwater.

- **PCBs in Groundwater:** The groundwater IAL for PCBs was developed from the groundwater and surface water ARARs as shown in Table A-2 of Appendix A. The groundwater IAL for PCBs is less than the reporting limit (RL). The final groundwater IAL for PCBs was adjusted upward to the RL in accordance with MTCA [WAC 173-340-720(7)(c)]. The IAL for groundwater is:

  – 0.01 µg/L for PCBs in groundwater.

2.2 PLANNED EXCAVATION AREAS

The planned interim action excavation area in the area west/southwest of the 3-333 building was identified based on comparison of the comprehensive collection of soil and groundwater results collected in the NBF 3-333 building area with the IALs. In addition to historical soil data collected in the area, more recent soil and groundwater data collected during the PEL Soil and Groundwater Investigation (Landau Associates 2011b) aided in the determination of the excavation areas. .

Historical PCB soil data in the 3-333 building area and PCB data from the PEL Soil and Groundwater Investigation (Landau Associates 2011b) are provided in Appendices C and D. These data are summarized on Figures 3 through 6. PCB concentrations and associated detected depths vary throughout the excavation area; however, based on historical data, the majority of contamination was present at the 4 to 6 ft depth interval.

The NBF 3-333 building interim action soil excavation areas are shown on Figure 7 and include both: 1) soil with total PCB concentrations greater than or equal to 50 mg/kg that will be excavated in accordance with TSCA requirements, and 2) soil with total PCB concentrations less than 50 mg/kg that will be excavated in accordance with MTCA requirements and the NBF/GTSP Agreed Order.

Procedures for soil excavation activities, field documentation, confirmation sample collection and designation, chemical analysis, equipment decontamination, and waste disposal for this material are described in Section 3.0.

2.3 UTILITIES AND OTHER EXCAVATION CONSTRAINTS

The planned soil excavation extent and depth will be limited in certain areas at NBF by the presence of buildings, utilities, and other infrastructure. The planned interim action excavation in the 3-333 building excavation area at NBF will not be expanded or deepened where doing so could endanger the integrity of existing building foundations, critical utilities, or other infrastructure adjacent to the planned excavation areas. The excavation depths and extents provided in this work plan are subject to change based on the presence of critical utilities identified during pre-excavation utility locates. A public and private utility locate will be conducted prior to excavation activities. No buildings or equipment will be demolished or

removed as part of the excavation activities described in this work plan. Appropriate sidewall slopes will need to be maintained to avoid compromising adjacent building and equipment structural foundations.

2.4 GROUNDWATER MANAGEMENT AND DEWATERING

The 3-333 building excavation may extend below the groundwater level in certain areas. Excavation dewatering will be conducted to the extent practicable to facilitate soil removal and excavation backfilling activities; however, it is not anticipated that all excavations will be conducted "in the dry." The potential use of temporary excavation shoring and sheeting systems may be implemented as a means to help protect adjacent facilities. Extracted groundwater and construction water will be contained and pre-treated at the temporary onsite water treatment facility prior to discharge to the King County sanitary sewer system. Groundwater monitoring well NGW517 located within this area was found to contain 20.8 µg/L of PCBs. Therefore, water removed from the excavation will not be treated as TSCA waste. However, all water removed from this excavation will be processed through the water treatment facility and all discharged water will be sampled to ensure that King County discharge limits are not exceeded for any PCB Aroclor. The discharge limit is currently set at 1.0 µg/L for each PCB Aroclor.

The truck haul route and decontamination/wheel wash facility will be developed with the selected excavation contractor. It is anticipated that traffic will enter and exit the site through the security gate located at the northwest corner of the site. The estimated quantity of material to be excavated is 200 to 300 cubic yards. Excavation activities are expected to generate 20 to 30 total truck trips over a two-week period.

2.5 PERMITS, APPROVALS AND NOTIFICATION

In addition to Ecology and EPA review and approval of this interim action work plan, other local, state, and federal approvals, notification, or permits that apply to the interim action include the following:

- King County Industrial Waste (KCIW) Program. A construction dewatering request form will be filed with KCIW a minimum of 30 days prior to commencement of construction for approval of construction wastewater discharge. This form will include approval construction dewatering for all construction activities occurring at NBF during the 2011 Construction Season (including the 3-333 building interim action excavation, the NBF/GTSP Fenceline interim action excavation, and the Long-Term Stormwater Treatment construction and related King County storm drain rerouting activities).

3.0 SOIL EXCAVATION PROCEDURES

This section describes the procedures for excavation of TSCA-regulated soil and soil regulated under MTCA. Prior to excavation of soil, groundwater monitoring wells within the excavation area will be abandoned in accordance with WAC-173-160-460.

3.1 SOIL WITH PCBS GREATER THAN OR EQUAL TO 50 mg/kg

Excavated soil with total PCB concentrations greater than or equal to 50 mg/kg will be managed separately from soil with total PCB concentrations less than 50 mg/kg; soil with PCB concentrations greater than or equal to 50 mg/kg will be managed and disposed as TSCA waste.

Total PCB concentration data from sampling of soil near the 3-333 building interim action area during historical soil investigations, and the more recent soil and groundwater investigations in 2010 and 2011 were used to identify areas where PCB concentrations are known to be greater than or equal to 50 mg/kg. PCB results are summarized and the planned excavation areas for TSCA soil are presented on Figure 7. Actual TSCA soil excavation areas may be adjusted based on confirmation sample results and field conditions encountered during the interim action. Soil with total PCB concentrations greater than or equal to 50 mg/kg will be removed and disposed at a properly permitted Subtitle C landfill in accordance with TSCA risk-based cleanup and disposal procedures [40 CFR 761.61(c)]. Specific procedures for cleanup of TSCA-regulated PCB remediation waste are described below and in the following sections.

Based on the existing soil data, the excavation of TSCA-regulated soil is planned to typically extend down to approximately 6 ft below ground surface (BGS); however, the excavation will extend down to approximately 8 ft BGS in areas where TSCA material was identified at deeper intervals (see Figure 7). Soil excavation will be extended below the groundwater level to the extent practicable to achieve the target IALs. The need to protect buildings and existing utilities will limit the actual excavation depth and area, as discussed in Section 2.3. Excavation shoring, dewatering, and groundwater management are discussed in Section 2.4.

If TSCA-regulated soil cannot be excavated, or if it is otherwise impracticable to remove PCB-contaminated material to achieve the IALs, other controls have been identified as a contingency. The potential contingent activities include paving with an asphalt cap and, where the presence of groundwater or obstructions limit the depth of excavation and soil concentrations remain above the IALs, placement of a layer of activated carbon and geotextile prior to backfilling. The activated carbon/geotextile layer will provide treatment of groundwater that may rise above interim action excavation elevations, and provide a separation of clean fill material and residual contaminated soil in the event future explorations or excavations are required.

Soil will be removed by contracted personnel using a combination of excavation equipment and hand tools. Excavated soil will be allowed to drain to remove free liquids, transferred to lined trucks and/or roll-off containers, and transported for disposal at the Waste Management NW chemical waste landfill in Arlington, Oregon that is permitted to accept TSCA waste under 40 C.F.R. § 761.75.

All equipment used for soil excavation that contacts TSCA-regulated material will be decontaminated using solvent soap washing techniques and/or wipe sampled in accordance with the decontamination procedures required under 40 C.F.R. § 761.79 or will alternatively be discarded as contaminated TSCA waste and disposed in the same manner as TSCA-regulated soil.

3.1.1 CONFIRMATION SAMPLE COLLECTION PROCEDURES

Confirmation samples will include samples collected during the Focused Soil Investigation in 2010, the PEL Soil and Groundwater Investigation in 2010 and 2011, and samples collected during the pre-excavation soil sampling activities that took place in May 2011, as well as samples collected during the excavation. Using existing data to define the vertical extent of contamination will limit the number of samples to be collected during excavation of soil beneath the groundwater level. Additional excavation confirmation samples will be collected along the base and sidewalls of TSCA-regulated soil excavation areas to the extent necessary. To the extent practicable, soil removal will be performed within the defined limits where prior sampling has demonstrated compliance with IALs or until confirmation sampling results demonstrate that the IALs have been achieved. In the event that confirmation sampling indicates concentrations greater than the IALs, additional excavation will be conducted and/or contingency measures discussed above will be implemented to limit the potential migration of or exposure to PCBs.

As stated above, pre-excavation confirmation soil sampling was conducted in May 2011. Pre-excavation confirmation soil sample locations were determined based on the locations of existing at-depth confirmation samples from the Focused Soil Investigation (Landau Associates 2010b) and the PEL Soil and Groundwater Investigation (Landau Associates 2011b). The pre-excavation confirmation sample locations are shown on Figure 8; pre-excavation soil sample depths and analytes are shown in Table 1. Pre-excavation soil sample locations were selected to provide the appropriate coverage on the excavation bottom and side walls as discussed in the following paragraph.

For those portions of the excavations where existing data, including samples collected in May 2011, provide sufficient information to define the vertical extent of the contamination, confirmation samples will be replaced by measurements of the excavation bottom depth/elevation. Additional confirmation soil samples will be collected, as needed, from other areas of the excavations to provide sufficient samples to represent areas of approximately 300 square feet (sf) on the excavation bottom and sidewalls. A sample will be collected from an appropriate location within each sampling area. The exact location and number of any additional confirmation samples to be collected along the base and sidewalls of the TSCA-regulated soil

excavation areas will be determined in the field. Confirmation soil sample results will be compared directly to the IALs. Additional confirmation samples, including deeper soil samples, may be collected, as needed, depending on sampling results. In the event that confirmation samples yield total PCB concentrations greater than the IAL, soil excavation will proceed vertically or horizontally to the extent practicable and the confirmation sampling procedures will be repeated. Confirmation soil samples collected during the excavation will be collected from the excavator bucket using a clean, stainless-steel spoon or similar hand tool. Soil samples will be placed into 8-ounce glass sample jars, labeled, and stored on ice.

A complete record of all significant field activities will be maintained. All recordkeeping will conform to 40 C.F.R. § 761.61(a)(9) and 40 C.F.R § 761.125(c)(5). Documentation will include field logbooks, field sampling forms, photographs, sample labels, chain-of-custody (COC) forms, and project and data management file copies. Field logbooks will be used to record pertinent interim action soil removal activities. Confirmation sample locations will be photo-documented with a digital camera, with some identification of the sample location in the photograph. Sample possession and handling will be documented so that the sample is traceable from the time of sample collection, to the laboratory, and through data analysis.

3.2 SOIL WITH PCBS LESS THAN 50 mg/kg

Excavated soil with total PCB concentrations less than 50 mg/kg will be managed separately from TSCA-regulated soil, and the non-TSCA soil will be managed and disposed in accordance with MTCA requirements. Non-TSCA soil excavated from the site will be transported to an intermodal facility, likely either the Waste Management or Rabanco transfer station, for shipment to a disposal facility. Other options may be considered including direct shipment to a waste disposal facility. Non-TSCA soil excavated from the site will be disposed in a facility permitted, licensed, or registered to manage municipal solid waste subject to 40 CFR Part 258 or non-municipal non-hazardous waste subject to 40 CFR §§257.5 through 257.30, as applicable. Candidate disposal facilities are anticipated to include Columbia Ridge Landfill in Arlington, Oregon, and Roosevelt Regional Landfill near Roosevelt, Washington.

Although some PCB-containing materials have been identified at NBF, including concrete joint material, caulk, and paint, potential sources for the PCBs present in soil in the fenceline area have not been identified. PCBs were initially detected by Metro (Municipality of Metropolitan Seattle) at the NBF/GTSP site in 1982. Investigations and interviews by Metro at that time did not identify any recent releases of PCBs. Extensive subsequent investigations and review of historical documents by Ecology and Boeing also did not identify PCB releases at the NBF property. Based on these investigations, releases to soil in the 3-333 building area were determined to have occurred prior to April 1978, the date specified in the TSCA definition of a PCB remediation waste (40CFR 761.3). Therefore, soil with concentrations of PCBs less than 50 mg/kg is not considered PCB remediation waste and the cleanup and disposal of this soil will be

conducted in compliance with MTCA requirements and as an interim action in accordance with the NBF/GTSP Agreed Order.

Total PCB concentration data from sampling of soil near the 3-333 building interim action area during historical soil investigations, and the more recent soil and groundwater investigations in 2010 and 2011 were used to identify areas where PCB concentrations are known to be less than 50 mg/kg, but greater than the IALs. PCB results are summarized and the planned excavation areas for non-TSCA soil are presented on Figure 7. Actual non-TSCA excavation areas may be adjusted based on confirmation sample results and field conditions encountered during the interim action. Soil with total PCB concentrations less than 50 mg/kg and greater than the IALs will be removed and disposed at a permitted Subtitle D solid waste landfill in accordance with MTCA requirements. Specific procedures for cleanup of non-TSCA soil are outlined below and in the following sections.

As discussed in Section 2.1, a total PCB soil concentration of 1.0 mg/kg will be used as a target IAL in areas where PCBs are not detected in groundwater, and 0.5 mg/kg in areas where PCBs are detected in groundwater, consistent with the IAL's planned for use for the NBF/GTSP fenceline interim action soil excavation. Based on the existing soil data, the excavation of non-TSCA soil is anticipated to typically extend down to approximately 6 ft BGS in most areas; however, the excavation will extend down to approximately 8 ft BGS in areas where TSCA material was identified at deeper intervals (see Figure 7). There is an isolated location (at NGW517) where soil with PCB concentrations greater than 0.5 mg/kg was identified to a depth of 14 ft BGS. Given the proximity of this location to the north side of the 3-335 building, it is not practicable to extend the excavation to that depth. Pre-excavation confirmation sampling will aid in identifying the extent and depth of contamination in this area, however it is assumed that a layer of activated carbon and geotextile fabric will be placed in the vicinity of NGW517. A groundwater monitoring plan describing how compliance with the groundwater IALs will be demonstrated in the vicinity of NGW517 will be submitted to Ecology for review after the interim action construction is substantially complete.

Soil excavation will be extended below the groundwater level to the extent practicable to achieve the target IALs. The need to protect buildings and the presence of groundwater will limit the actual excavation depth, as discussed in Section 2.3. Excavation shoring, dewatering, and groundwater management are discussed in Section 2.4.

Where confirmation sampling indicates soil remains at concentrations greater than the IALs and, due to buildings, utilities, or other constraints, the soil cannot be excavated or it is otherwise impracticable to remove contaminated material, other contingency measures will be evaluated to protect human health and the environment and prevent exposure to residual contaminants. Such contingency measures include paving the affected areas with an asphalt cap. In addition, where the presence of groundwater or obstructions limit the depth of excavation and soil concentrations remain above the IALs, a layer of activated carbon and geotextile will be placed prior to backfilling. The activated carbon/geotextile layer will provide treatment of

groundwater that may rise above interim action excavation elevations, and provide a separation of clean fill material and residual contaminated soil in the event future explorations or excavations are required. .

Soil will be removed by contracted personnel using a combination of excavation equipment and hand tools. Excavated soil will be allowed to drain to remove free liquids, transferred to trucks and/or roll-off containers, and transported under bill of lading to either the Waste Management or Rabanco transfer station for subsequent disposal at a permitted Subtitle D solid waste landfill.

3.2.1 CONFIRMATION SAMPLE COLLECTION PROCEDURES

Confirmation samples will include samples collected during the Focused Soil Investigation in 2010, the PEL Soil and Groundwater Investigation in 2010 and 2011, and samples collected during the pre-excavation soil sampling activities that took place in May 2011, as well as samples collected during the excavation. Using existing data to define the vertical extent of contamination will limit the number of samples to be collected during excavation of soil beneath the groundwater level. Some additional excavation confirmation samples will be collected along the base and sidewalls of non-TSCA soil excavation areas. To the extent practicable, soil removal will be performed within the defined limits where prior sampling has demonstrated compliance with IALs or until confirmation sampling results demonstrate that the IALs have been achieved. In the event that confirmation sampling indicates concentrations greater than the IALs, additional excavation will be conducted and/or contingency measures discussed above will be implemented to limit the potential migration or exposure of PCBs.

As stated above, pre-excavation confirmation soil sampling was conducted in May 2011. Pre-excavation confirmation soil sample locations were determined based on the locations of existing at-depth confirmation samples from the Focused Soil Investigation (Landau Associates 2010b) and the PEL Soil and Groundwater Investigation (Landau Associates 2011b). The pre-excavation confirmation sample locations are shown on Figure 8; pre-excavation soil sample depths and analytes are shown in Table 1. Pre-excavation soil sample locations have been selected to provide the appropriate coverage on the excavation bottom and side walls as discussed in the following paragraph.

For those portions of the excavations where existing data, including samples to be collected later this year prior to excavation, provide sufficient information to define the vertical extent of the contamination, confirmation samples will be replaced by measurements of the excavation bottom depth/elevation. Additional confirmation soil samples will be collected, as needed, from other areas of the excavations to provide sufficient samples to represent areas of approximately 300 square foot (sf) on the excavation bottom and sidewalls. A sample will be collected from an appropriate location within each sampling area. The exact location and number of any additional confirmation samples to be collected along the base and sidewalls of the TSCA-regulated soil excavation areas will be determined in the field. Confirmation soil sample results may be compared directly to the IALs or may be evaluated using a statistical approach

consistent with WAC 173-340-740(7)(d). Additional confirmation samples, including deeper soil samples, may be collected, as needed, depending on sampling results. In the event that confirmation samples indicate total PCB concentrations greater than the IAL, soil excavation will proceed vertically or horizontally to the extent practicable and the confirmation sampling procedures will be repeated. Confirmation soil samples will be collected using a clean, stainless-steel spoon or similar hand tool. Soil samples will be placed into an 8-ounce glass sample jar, labeled, and stored on ice.

A groundwater monitoring plan describing how compliance with the groundwater IALs will be demonstrated in the 3-333 building excavation area will be submitted to Ecology for review after the interim action construction is substantially complete.

3.3 SAMPLE DOCUMENTATION AND HANDLING

A complete record of all significant field activities will be maintained. All recordkeeping will conform to 40 C.F.R. § 761.61(a)(9) and 40 C.F.R § 761.125(c)(5). Documentation will include field logbooks, field sampling forms, photographs, sample labels, chain-of-custody (COC) forms, and project and data management file copies. Field logbooks will be used to record pertinent interim action soil removal activities. Confirmation sample locations will be photo-documented with a digital camera, with some identification of the sample location in the photograph. Sample possession and handling will be documented so that the sample is traceable from the time of sample collection, to the laboratory, and through data analysis.

3.4 CHEMICAL ANALYSES

Confirmation samples will be transported to Boeing's contracted analytical laboratory, Analytical Resources Inc. (ARI), in Tukwila, Washington, within 24 hours of sample collection. All samples will be analyzed for PCB aroclors by EPA Method 8082 in accordance with 40 C.F.R. § 761.272. The anticipated reporting limit for PCB aroclors in soil is 32 micrograms per kilogram (µg/kg). The anticipated reporting limit for PCB aroclors in water is 0.01 µg/L. Actual reporting limits may be higher depending on laboratory interferences and other aroclor detections. Sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures to be used are described in ARI's standard operating procedures (SOPs) SOP 350S and SOP 403S, which are available from ARI on request.

3.5 SAMPLE LABELING, SHIPPING, AND CHAIN-OF-CUSTODY

Each soil sample will be assigned a unique alphanumeric identifier that will include the sampling event identifier IA3-333 for Interim Action 3-333 building excavation, the sample location identification, the depth of the sample BGS, and the date in month-day-year format. For example, the first soil sample

collected from location S01, from 2.0 to 2.5 ft BGS, on August 7, 2011 will be identified as IA3-333-S01-2.0-2.5-080711.

Sample container labels will be completed immediately before or immediately following sample collection. Container labels and COC forms will include the project name (Boeing NBF), the Boeing project manager's name (Carl Bach), the project number (025082.211.004), the sample ID, the initials of the person collecting the sample, the date and time of collection, and the analysis required. Samples will be placed on ice in a cooler immediately after collection and delivered or sent by courier to ARI by Landau Associates within 24 hours of sample collection.

4.0 HEALTH AND SAFETY PLAN

A Health and Safety Plan (HASP) was prepared for the NBF fenceline area interim action and will be applicable to the excavation activities described in this work plan. The HASP is included in Appendix E.

5.0 REPORTING

Landau Associates will prepare an interim action completion report documenting the implementation of cleanup activities summarized in this work plan. For TSCA compliance, the report will meet the applicable requirements referenced at 40 C.F.R. § 761.61(a)(9) and 40 C.F.R § 761.125(c)(5). Reporting will also meet the applicable construction documentation requirements for MTCA listed in WAC 173-340-400 (6)(b). The report will include the date and time the cleanup was completed, a description of the excavation locations, pre-excavation sampling data used to delineate contamination and the areas of TSCA/non-TSCA excavations, the approximate depth of soil excavation and amount of soil removed, the amount of excavation and construction water that was extracted and discharged, as-built plans of the construction excavation areas, post-cleanup verification sampling data including the sampling methodology and analytical techniques used, and any deviations from this work plan. The report will also include laboratory data reports, summary tables of validated confirmation sample data, and figures showing final cleanup areas and results.

6.0 SCHEDULE

The cleanup activities described in this work plan are currently anticipated to be during the 2011 construction season following regulatory approval, including Ecology approval of the work plan as an interim action under the Administrative Order and EPA approval of the TSCA portion of this work plan for cleanup of PCB remediation waste.

Cleanup activities are currently expected to require approximately 30 days to complete, depending on weather conditions and confirmation sample results. All samples collected for determining the extent of additional soil excavation will be submitted to the laboratory on a requested 48-hour turnaround time to expedite decision making and cleanup processes. The draft cleanup report will be submitted to EPA and Ecology approximately 60 days after completion of soil removal, excavation backfilling, and site restoration activities.

7.0 USE OF THIS DOCUMENT

This work plan has been prepared for the exclusive use of The Boeing Company and applicable regulatory agencies for specific application to the NBF 3-333 building interim action cleanup activities. No other party is entitled to rely on the information included in this document without the express written consent of Landau Associates. Further, the reuse of information provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

This document has been prepared under the supervision and direction of the following key staff.

LANDAU ASSOCIATES, INC.

Kristy J. Hendrickson, P.E.
Principal

David A. Pischer, P.E.
Senior Associate

Colette M. Griffith, E.I.T.
Project Engineer

KJH/DAP/CMG/tam

8.0 REFERENCES

Ecology. 2008. *North Boeing Field/Georgetown Steam Plant Agreed Order No. DE 5685*. In the Matter of Remedial Action by: The Boeing Company, King County and the City of Seattle. State of Washington, Department of Ecology. Effective Date August 14, 2008.

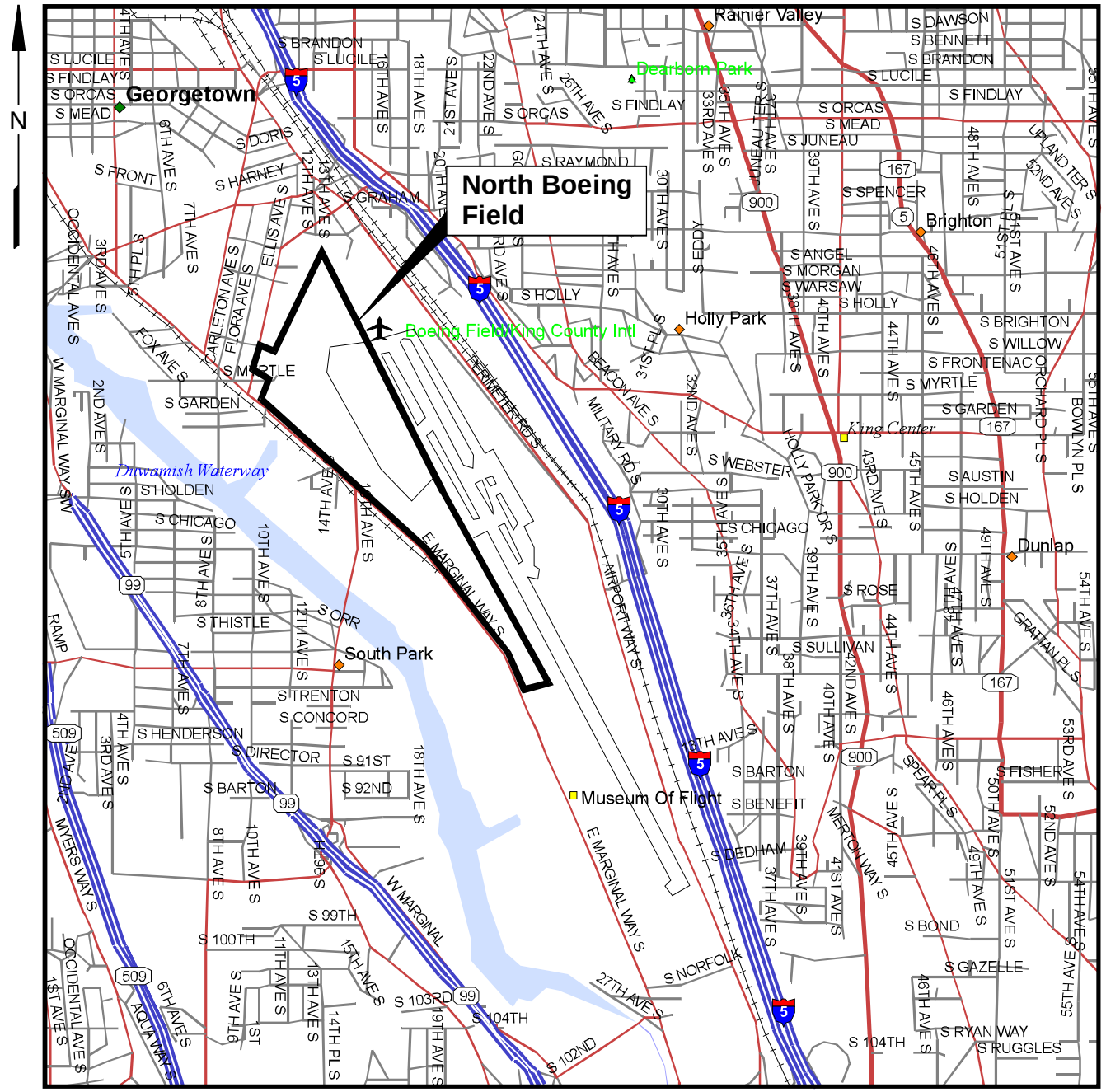
Edens, Mark. 2010. Email message from Mark Edens, Washington State Department of Ecology to Jennie Goldberg, Priscilla Tomlinson, and Betsy Day re: *Preliminary Screening Levels for GTSP*. December 10.

Landau Associates. 2011a. *Interim Action Work Plan, 2011 Fenceline Area Soil Excavation, North Boeing Field, Seattle, Washington*. Prepared for The Boeing Company; submitted as Ecology Review Draft. April 21.

Landau Associates. 2011b. *Report, PEL Soil and Groundwater Investigation, North Boeing Field, Seattle, Washington.* Prepared for The Boeing Company. March 17.

Landau Associates. 2010. *Work Plan, Soil and Groundwater Investigation, North Boeing Field, Seattle, Washington*. Prepared for The Boeing Company. August 17. Revised September 7.

Landau Associates. 2010b. *Report, Focused Soil Investigation 2010, North Boeing Field, Seattle, Washington*. Prepared for The Boeing Company. October 14.



Map from DeLorme Street Atlas USA, 2002

Work Plan | V:\1025\082\210.002\WP Draft2\Figure 1.cdr 6/17/2010

LANDAU ASSOCIATES

North Boeing Field Seattle, Washington	**Vicinity Map**	Figure 1

Georgetown Steam Plant

3-323

3-334

3-331

3-332

3-302

3-326

3-322

3-333

3-333 Building Interim Action Area

3-306

3-368

Test Structures

3-626

3-335

3-353

3-315

3-313

3-324

3-314

N

Y:\Projects\025082\MapDocs\3-333 Building Excavation\Fig2-PEL.mxd 5/2/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- PEL Boundary
- North Lateral
- North-Central Lateral
- Other lines

0 100 200

Scale in Feet

Note

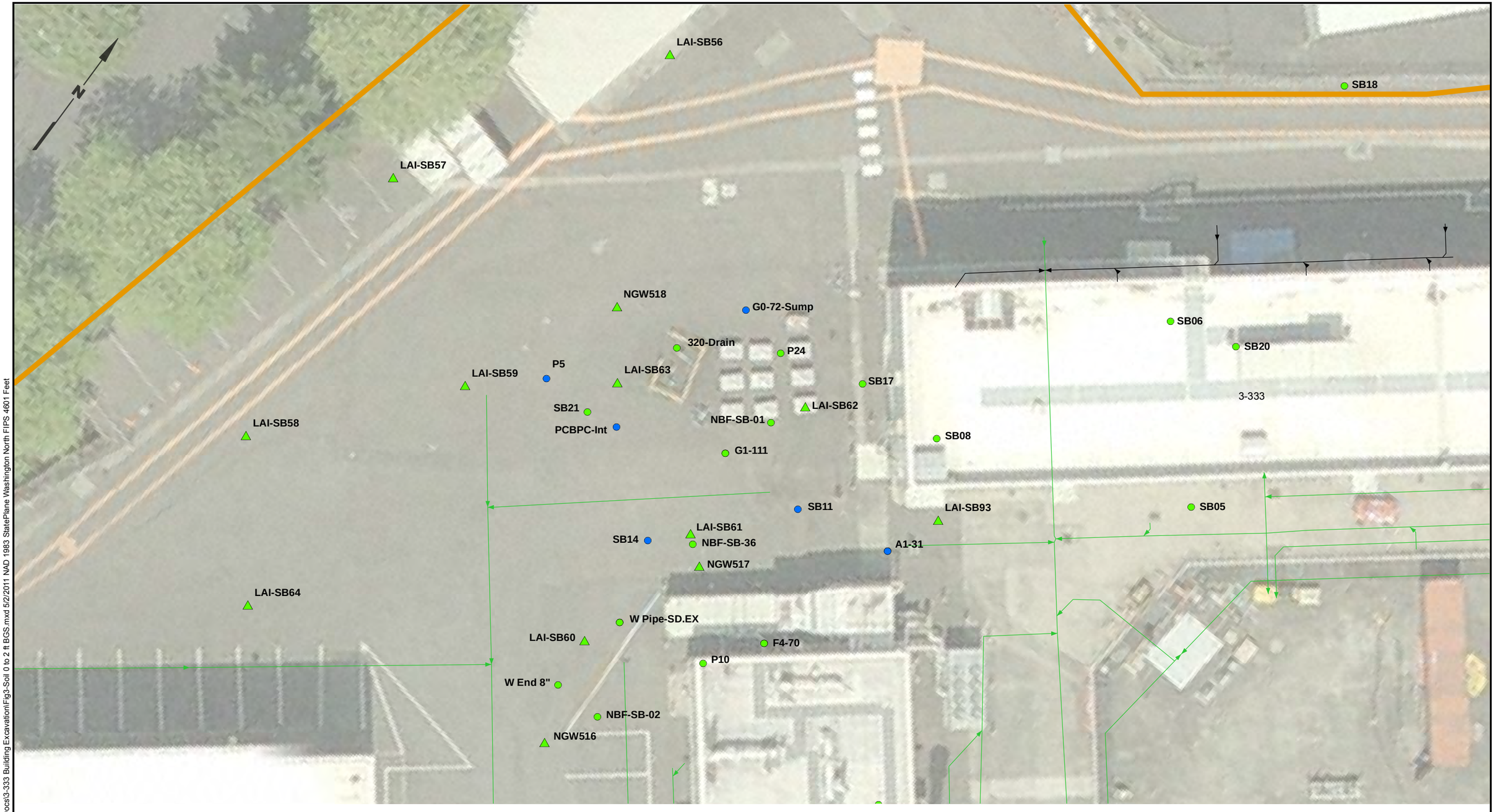
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Propulsion Engineering Labs (PEL)

Figure 2



Y:\Projects\025082\MapDocs\3-333 Building Excavation\Fig3-Soil 0 to 2 ft BGS.mxd 5/2/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Result ≤ 0.5 mg/kg
- Result > 0.5 mg/kg
- Result ≥ 50 mg/kg
- Historic Soil Sample Location
- 2010 Soil Sample Location
- North Lateral
- North-Central Lateral
- Other lines
- PEL Boundary

0 20 40

Scale in Feet

Note

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

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Soil Total PCB Results 0-2 ft Below Ground Surface

Figure 3

Y:\Projects\025082\MapDocs\3-333 Building Excavation\Fig4-Soil 2 to 4 ft BGS.mxd 4/25/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Result ≤ 0.5 mg/kg
- Result > 0.5 mg/kg
- Result ≥ 50 mg/kg
- Historic Soil Sample Location
- 2010 Soil Sample Location
- North Lateral
- North-Central Lateral
- Other lines
- PEL Boundary

0 20 40

Scale in Feet

Note

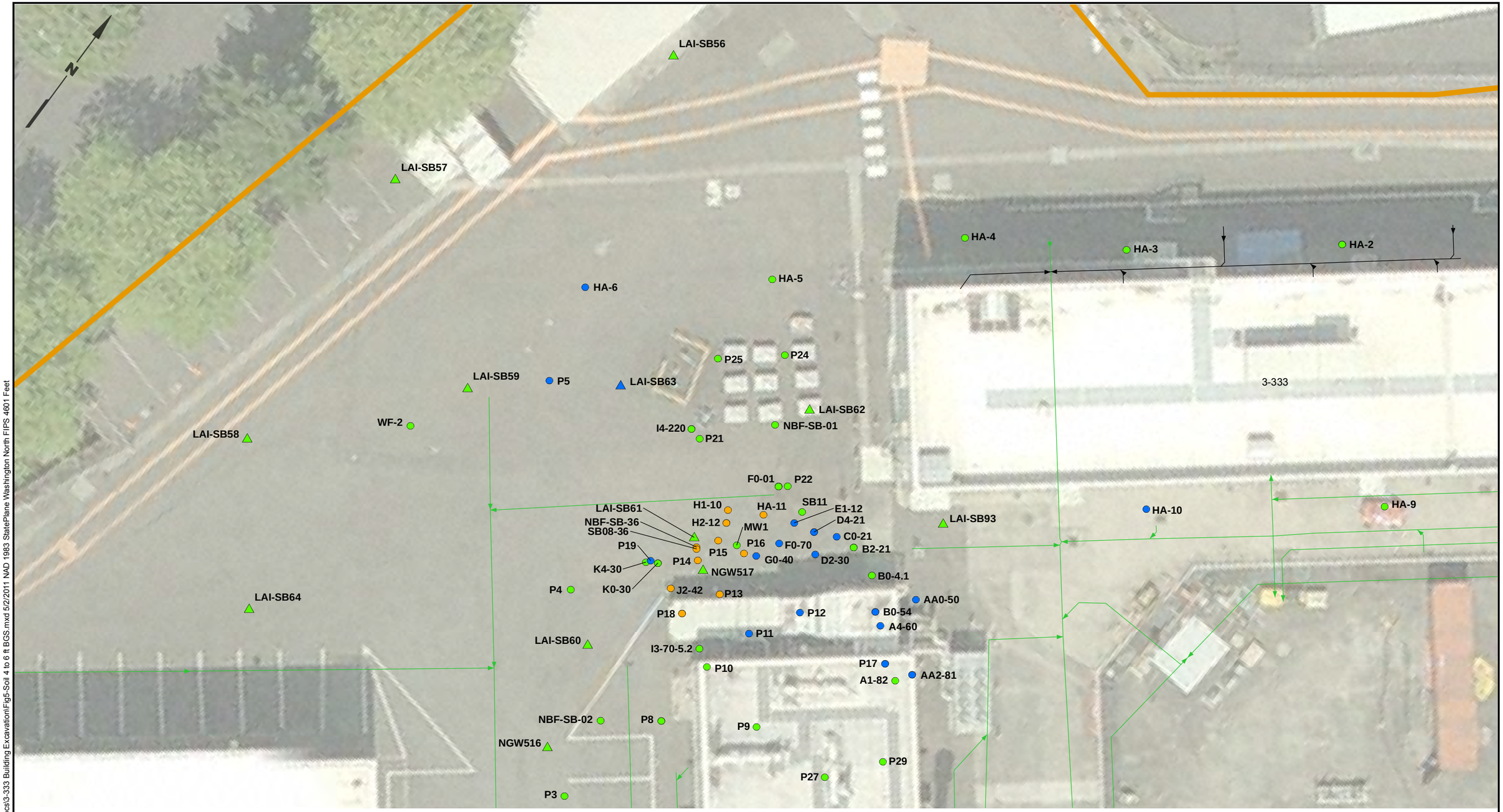
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Soil Total PCB Results 2-4 ft Below Ground Surface

Figure 4



Y:\Projects\025082\MapDocs\3-333 Building Excavation\Fig5-Soil 4 to 6 ft BGS.mxd 5/2/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Result ≤ 0.5 mg/kg
- Result > 0.5 mg/kg
- Result ≥ 50 mg/kg
- Historic Soil Sample Location
- 2010 Soil Sample Location
- North Lateral
- North-Central Lateral
- Other lines
- PEL Boundary

0 20 40

Scale in Feet

LANDAU ASSOCIATES

Note

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

North Boeing Field
Seattle, Washington

Soil Total PCB Results 4-6 ft Below Ground Surface

Figure 5

Y:\Projects\025082\MapDocs\3-333 Building Excavation\Fig6-Soil 6 ft and Below.mxd 5/6/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Result ≤ 0.5 mg/kg
- Result > 0.5 mg/kg
- Result ≥ 50 mg/kg
- Historic Soil Sample Location
- 2010 Soil Sample Location
- North Lateral
- North-Central Lateral
- Other lines
- PEL Boundary

0 20 40

Scale in Feet

Note

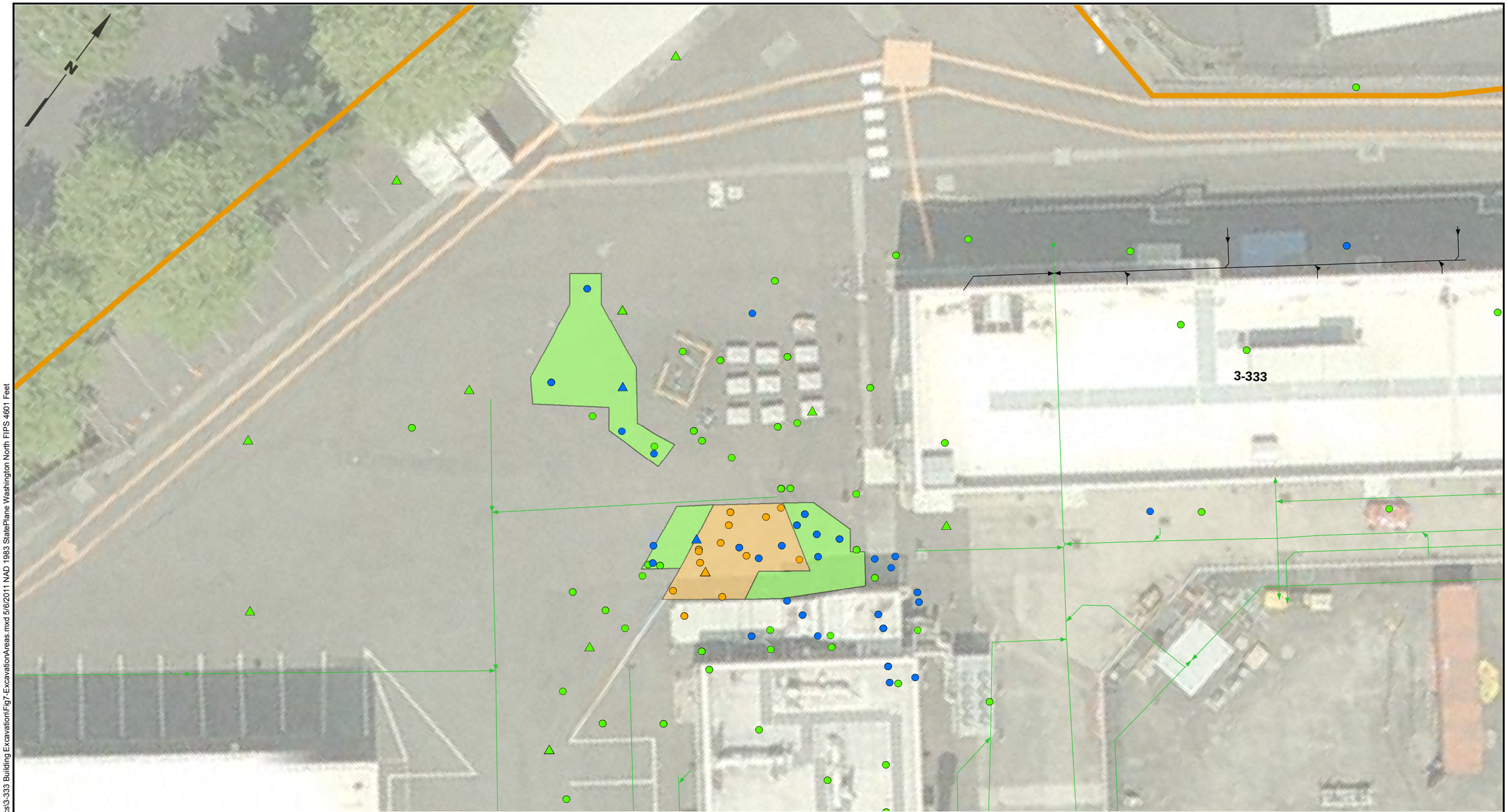
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. NGW517 = ≥ 50 ppm to 8 ft BGS, > 0.5 ppm to 14 ft BGS, < 0.5 ppm from 14 to 15 ft BGS.

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Soil Total PCB Results >6 ft Below Ground Surface

Figure 6



Y:\Projects\025082\MapDocs\3-333 Building Excavation\Fig7-ExcavationAreas.mxd 5/6/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Result ≤ 0.5 mg/kg
- Result > 0.5 mg/kg
- Result ≥ 50 mg/kg
- Historic Soil Sample Location
- 2010 Soil Sample Location
- Non-TSCA Excavation
- TSCA Excavation
- North Lateral
- North-Central Lateral
- Other lines
- PEL Boundary

Notes

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

0 20 40

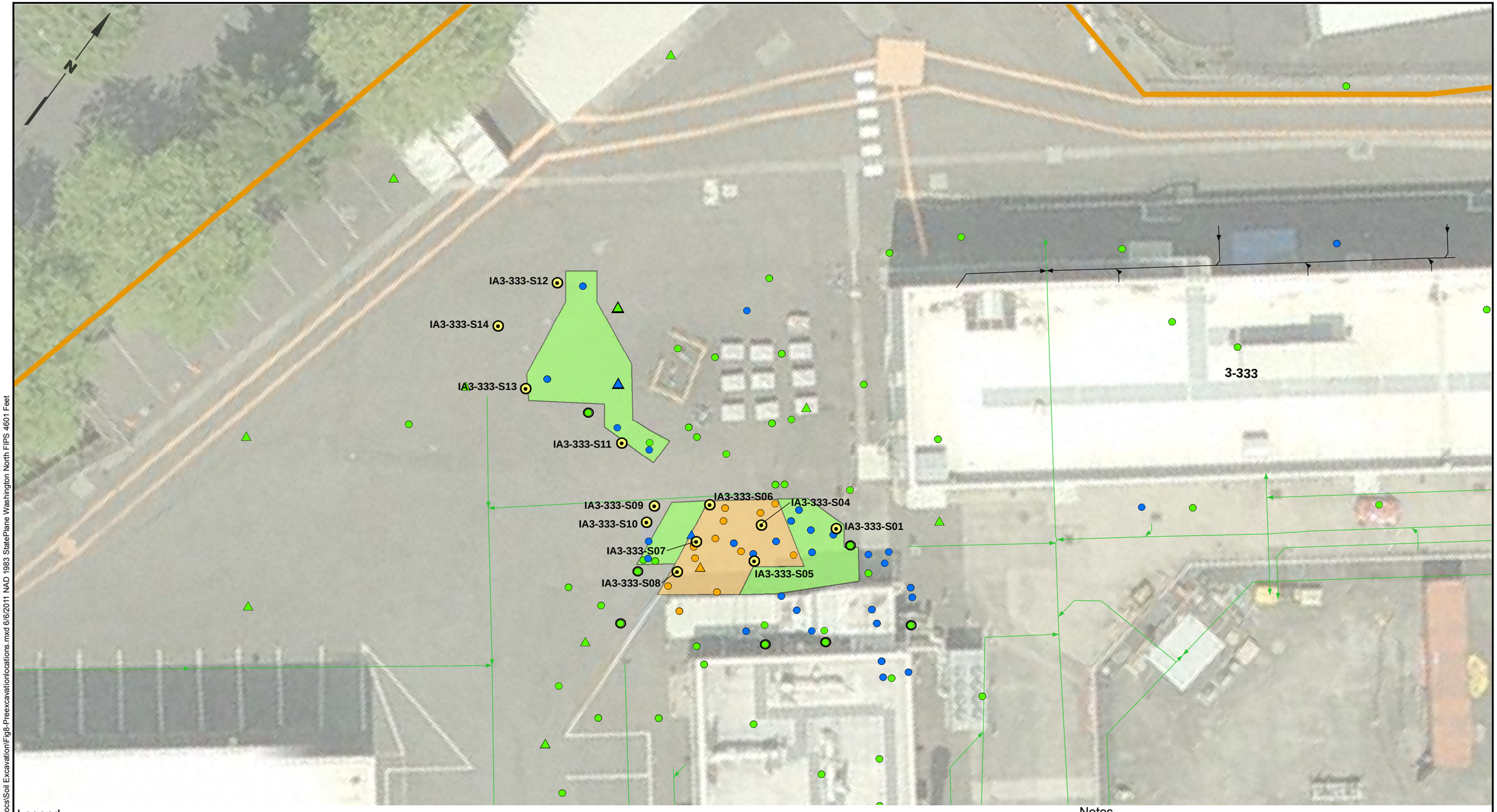
Scale in Feet

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Comprehensive Soil PCB Results and 3-333 Building Excavation Areas

Figure 7



Y:\Projects\025082\MapDocs\Soil Excavation\Fig8-Preexcavationlocations.mxd 6/6/2011 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Result ≤ 0.5 mg/kg
- Result > 0.5 mg/kg
- Result ≥ 50 mg/kg
- Historic Soil Sample Location
- 2010 Soil Sample Location
- Existing Sample Location with PCB Concentrations Less Than IAL to be Used as Confirmation Sample Locations
- Pre-excavation Confirmation Soil Sample Location
- Non-TSCA Excavation
- TSCA Excavation
- North Lateral
- North-Central Lateral
- Other lines
- PEL Boundary

0 20 40
Scale in Feet

Notes

1. SO2 and SO3 were not collected due to the presence of electrical utilities identified during pre-sample utility locates.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Pre-excavation Confirmation Soil Sample Locations

Figure 8

TABLE 1
PRE-EXCAVATION CONFIRMATION SOIL SAMPLE ANALYSES
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Sample Location	Sample Depth	Analyses (a)
IA3-333-S01	8-9 ft	PCBs
	11-12 ft	PCBs
IA3-333-S02 (b)	NA	NA
IA3-333-S03 (b)	NA	NA
IA3-333-S04	7-8 ft	PCBs
IA3-333-S05	8-9 ft	PCBs
	11-12 ft	PCBs
	14-15 ft	PCBs
IA3-333-S06	7-8 ft	PCBs
IA3-333-S07	8-9 ft	PCBs
	11-12 ft	PCBs
	14-15 ft	PCBs
IA3-333-S08	7-8 ft	PCBs
	11-12 ft	PCBs
	14-15 ft	PCBs
IA3-333-S09	7-8 ft	PCBs
IA3-333-S10	7-8 ft	PCBs
IA3-333-S11	7-8 ft	PCBs
IA3-333-S12	8-9 ft	PCBs
IA3-333-S13	7-8 ft	PCBs
IA3-333-S14	4.5-6 ft	PCBs

IA3-333 = Interim Action 3-333 Building Area Confirmation Sample Location

(a) PCBs analyzed by EPA Method 8082.

(b) Planned sample locations IA3-333-S02 and IA3-333-S03 were not collected due to the presence of electrical utilities identified during pre-sample utility locates.

APPENDIX A

Interim Action Level Development Tables

TABLE A-1
SOIL INTERIM ACTION LEVEL DEVELOPMENT
NORTH BOEING FIELD
SEATTLE, WASHINGTON

	Original Column Letter in Ecology Soil Screening Level Tables (a)											
	B	H	M	N	---	---	BM	BS	BV	BX		
	Method A	Method B	Method C		Pathway Evaluation		Applicable or Relevant and Appropriate Requirements				**Soil Interim Action Levels**	
Chemical	Method A Industrial Properties Table 745-1	Soil, Direct Contact Method B-HH, Petroleum Mixture, WAC 173-340-740(3)(b)(iii)(B)(III) ***EQ. 740-3*** *(4-Phase Model)*	Direct Contact Carcinogen CLARC Equation 745-2 (Only Used if No Adequately Protective ARAR is Available)	Direct Contact Noncarcinogen CLARC Equation 745-1 (Only Used if No Adequately Protective ARAR is Available)	Leaching from Vadose Zone to Final Groundwater Cleanup Level	Leaching from Saturated Zone to Final Groundwater Cleanup Level	EPA Regional Screening Level Industrial Direct Contact (Adjusted to 10^{-5} risk)	Toxic Substances Control Act High Occupancy	Natural Background Level	Applicable **PQL** Ch. 173-340 WAC	Soil IAL for areas where groundwater not impacted by constituent	Soil IAL for areas where groundwater impacted by constituent
PCB Mixtures (mg/kg)			6.60E+01 (b)		Site-specific Evaluation	Site-specific Evaluation	7.74E+00	1.00E+00		3.50E-02	1.00E+00 (c)	5.00E-01 (d)
Gasoline-range Petroleum Hydrocarbons (mg/kg)	100/30 (e)									2.39E+01		
Diesel-range Petroleum Hydrocarbons (mg/kg)	2.00E+03									7.42E+00		
Motor oil-range Petroleum Hydrocarbons (mg/kg)	2.00E+03									7.42E+00		
Total Petroleum Hydrocarbons (mg/kg)		3.00E+03 (f)									3.00E+03 (f)	3.00E+03 (f)

(a) From Ecology's (2010) Draft LDW ARARs & CULs v12-17-2010.
(b) Not applicable because adequately protective ARAR is available.
(c) Based on TSCA cleanup level for direct contact.
(d) Based on concentrations protective of the leaching pathway as evaluated using site data.
(e) Cleanup level is 100 mg/kg for gasoline mixtures without benzene and with a total of ethylbenzene, toluene, and xylenes of less than 1 percent of the mixture; for all other gasoline mixtures the cleanup level is 30 mg/kg.
(f) Method B cleanup level calculated using Ecology's MTCATPH11 spreadsheet and VPH/EPH results from GTSP as described in the GTSP Interim Action Technical Memorandum on Data Screening (Integral 2011).
Being used at NBF for the area west of GTSP fuel tank area to be consistent with GTSP although NBF is an industrial property under MTCA.

TABLE A-2
GROUNDWATER SCREENING LEVEL AND INTERIM ACTION LEVEL DEVELOPMENT
NORTH BOEING FIELD
SEATTLE, WASHINGTON

	Original Column Letter in Ecology Groundwater Screening Level Tables (a)											
	B	K	M	O	P	Y	Z	---	AC	---		
	Method A	Method B				Pathway Evaluation					**Groundwater Screening Level**	**Groundwater Interim Action Level**
Chemical	Method A Table 740-1	Safe Drinking Water Act MCL (b)	State Board of Health MCL (c)	Ground Water, Method B-HH, Non-carcinogenic/ Potable WAC 173-340-720(4)(b)(iii)(A) *CLARC Database (Only Used if No Adequately Protective ARAR is Available)* (b)	Ground Water, Method B-HH, Carcinogen/Potable WAC 173-340-720(4)(b)(iii)(B) *CLARC Database (Only Used if No Adequately Protective ARAR is Available)* (b)	Groundwater to Sediment CSL	Groundwater to Sediment SQS	Surface Water Screening Level	Natural Background Level	RL	Based on Protection of Drinking Water and Surface Water (b)	IAL after Adjustment for PQL
PCB Mixtures (µg/L)		5.00E-01	5.00E-01		4.40E-02	1.45E+00	2.68E-01	1.53E-03		1.00E-02	1.53E-03	3.00E-02
Gasoline-range Petroleum Hydrocarbons (µg/L)	8.00E+02/ 1.00E+03 (c)									3.00E+02		8.00E+02/1.00E+03 (b)
Diesel-range Petroleum Hydrocarbons (µg/L)	5.00E+02									1.00E+02		5.00E+02
Motor oil-range Petroleum Hydrocarbons (µg/L)	5.00E+02									1.00E+02		5.00E+02

(a) From Ecology's (2010) Draft LDW ARARs & CULs v12-17-2010.
(b) NBF groundwater not used for drinking water; however, until non-potability demonstrated under WAC 173-340-720 (2), drinking water ARARs will be used for this interim action.
(c) Cleanup level is 800 µg/L if benzene is present in groundwater and 1,000 µg/L if benzene is not present in groundwater.

TABLE A-3
SURFACE WATER SCREENING LEVEL
AND INTERIM ACTION LEVEL DEVELOPMENT (a)

	Original Column Letter in Ecology Groundwater Screening Level Tables (a)										
	B	M	N	O	P	Q	R	AA	AB	AC	AD
	Method A	Method B						Surface Water MTCA Method A,B,C Required ARARs			
Chemical	Method A Table 740-1	Surface Water, Method B-HH Non-Carcinogen Fish Consumption WAC 173-340-730(3)(b)(iii)(A) Equation 730-1 CLARC Database	Surface Water, Method B-HH Non-Carcinogen Fish Consumption WAC 173-340-730(3)(c) Equation 730-1 MOD-Tribal Adult	Surface Water, Method B-HH Non-Carcinogen Fish Consumption WAC 173-340-730(3)(c) Equation 730-1 MOD-Tribal Child	Surface Water, Method B-HH Carcinogen Fish Consumption WAC 173-340-730(3)(b)(iii)(B) Equation 730-2 CLARC Database	Surface Water, Method B-HH Carcinogen Fish Consumption WAC 173-340-730(3)(b)(iii)(B) Equation 730-2 MOD-Tribal Adult	Surface Water, Method B-HH Carcinogen Fish Consumption WAC 173-340-730(3)(b)(iii)(B) Equation 730-2 MOD-Tribal Adult	Surface Water Aquatic Life SWQS: RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh-Acute** (b)	Surface Water Aquatic Life SWQS: RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh-Chronic** (b)	Surface Water Aquatic Life SWQS: RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine-Acute**	Surface Water Aquatic Life SWQS: RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine-Chronic**
PCB Mixtures (µg/L)					1.04E-04	1.58E-05	7.23E-05	2.00E+00	1.40E-02	1.00E+01	3.00E-02
Gasoline-range Petroleum Hydrocarbons (µg/L)	8.00E+02/ 1.00E+03 (c)										
Diesel-range Petroleum Hydrocarbons (µg/L)	5.00E+02										
Motor oil-range Petroleum Hydrocarbons (µg/L)	5.00E+02										

TABLE A-3
SURFACE WATER SCREENING LEVEL
AND INTERIM ACTION LEVEL DEVELOPMENT (a)

	Original Column Letter in Ecology Groundwater Screening Level Tables (a)											
	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AQ	AR
	Surface Water MTCA Method A,B,C Required ARARs Continued											
Chemical	Surface Water HH-**Consumption; Organism Only** CWA §304 **NRWQC**	Surface Water HH-**Organoleptic Effects** CWA § 304 **NRWQC**	Surface Water Aquatic Life Fresh/Acute CWA § 304 **NRWQC** (b)	Surface Water Aquatic Life Fresh/ Chronic CWA § 304 **NRWQC** (b)	Surface Water Aquatic Life Marine/Acute CWA § 304 **NRWQC**	Surface Water Aquatic Life Marine/Chronic CWA § 304 **NRWQC**	Surface Water Aquatic Life Fresh/Acute **NTR** - 40 CFR 131.36 (b)	Surface Water Aquatic Life Fresh/Chronic **NTR** - 40 CFR 131.36 (b)	Surface Water Aquatic Life Marine/Acute **NTR** - 40 CFR 131.36	Surface Water Aquatic Life Marine/Chronic **NTR** - 40 CFR 131.36	Surface Water HH- Fresh Water **Organism Consumption Only** **NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH 10^{-6} Carc Risk	Surface Water HH- Marine Water **Organism Consumption Only** **NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH 10^{-6} Carc Risk
PCB Mixtures (µg/L)	6.40E-05			1.40E-02		3.00E-02					1.70E-04	1.70E-04
Gasoline-range Petroleum Hydrocarbons (µg/L)												
Diesel-range Petroleum Hydrocarbons (µg/L)												
Motor oil-range Petroleum Hydrocarbons (µg/L)												

TABLE A-3
SURFACE WATER SCREENING LEVEL
AND INTERIM ACTION LEVEL DEVELOPMENT (a)

	Original Column Letter in Ecology Groundwater Screening Level Tables (a)									
	AV	AW	AX	AY	AZ	BA	BB	BF	BD	
	Surface Water ARAR									**Surface Water Screening Level**
Chemical	Groundwater to Sediment Protection Ecology **CSL** WAC 173-340-730(1)(d)	Groundwater to Sediment Protection Ecology **SQS** WAC 173-340-730(1)(d)	Surface Water HH-Adult Non-Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (EQ 730-1)	Surface Water HH-Child Non-Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (EQ 730-1)	Surface Water HH-Adult Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (EQ 730-2)	Surface Water HH-Child Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (EQ 730-2)	Natural Background Level	Natural Background Level LDW	RL	
PCB Mixtures (µg/L)	1.45E+00	2.68E-01			2.30E-05	1.13E-04	3.30E-04	1.53E-03	1.00E-02	1.53E-03
Gasoline-range Petroleum Hydrocarbons (µg/L)									3.00E+02	8.00E+02/1.00E+03 (b)
Diesel-range Petroleum Hydrocarbons (µg/L)									1.00E+02	5.00E+02
Motor oil-range Petroleum Hydrocarbons (µg/L)									1.00E+02	5.00E+02

(a) From Ecology's (2010) Draft LDW ARARs & CULs v12-17-2010.
(b) Data from salinity monitoring in Slip 4 conducted in accordance with the work plan approved by EPA (*Final Slip 4 Salinity Monitoring Plan, North Boeing Field;* prepared by Geosyntec Consultants, January 2011) demonstrate that marine water quality criteria are appropriate for Slip 4. After approval of the technical memorandum documenting the salinity study, it is anticipated that marine rather than fresh water quality criteria will be applied to Slip 4 surface water.
(c) Cleanup level is 800 µg/L if benzene is present in groundwater and 1,000 µg/L if benzene is not present in groundwater.

TABLE A-4
SOIL ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
Soil Method A	B	Soil Method A, Unrestricted Land Use-HH WAC 173-340-740(2)(b)(iii) CLARC Database		X	Site qualifies as industrial property
	C	Soil Method A, Unrestricted Land Use-Ecol WAC 173-340-740(2)(b)(ii); Table 749-2		X	Site qualifies as industrial property
	D	Soil Method A, Industrial Land Use-HH WAC 173-340-745(3)(b)(i) CLARC Database	(X)		Site does not qualify for Method A except for petroleum
	E	Soil Method A, Industrial Land Use-Ecol, WAC 173-340-745(3)(b)(iii) Table 749-2		X	Site qualifies for exclusion from TEE
Soil Method B	F	Soil Direct Contact Method B-HH Carcinogen WAC 173-340-740(3)(b)(iii)(B)(II) CLARC Database		X	Site qualifies as industrial property
	G	Soil Direct Contact Method B-HH Non-carcinogen WAC 173-340-740(3)(b)(iii)(B)(I)		X	Site qualifies as industrial property
	H	Soil Direct Contact Method B-HH Petroleum Mixture WAC 173-340-740(3)(b)(iii)(B)(III) equation. 740-3 (4-Phase Model)	(X)		Used for IAL in area west of GTSP fuel tank area even though property is industrial
	I	Site-Specific Wildlife Exposure Model WAC 173-340-7493(3) Table 749-4 and -5		X	NBF site meets TEE exclusion
	J	Soil Terrestrial Method B-Ecol WAC 173-340-740(3)(b)(ii); WAC 173-340-7493 Table 749-3 **Plants**		X	NBF site meets TEE exclusion
	K	Soil Terrestrial Method B-Ecol WAC 173-340-740(3)(b)(ii); WAC 173-340-7493 Table 749-3 **Soil Biota**		X	NBF site meets TEE exclusion
	L	Soil Terrestrial Method B-Ecol WAC 173-340-740(3)(b)(ii); WAC 173-340-7493 Table 749-3 **Wildlife**		X	NBF site meets TEE exclusion
Soil Method C	M	Soil Direct Contact Method C-HH Carcinogen WAC 173-340-745(5)(b)(iii)(B)(II) Ingestion Only CLARC Database equation 745-2	X		Site qualifies for Method C industrial land use, only applicable if no appropriately protective ARAR is available
	N	Soil Direct Contact Method C-HH Non-carcinogen WAC 173-340-745(5)(b)(iii)(B)(I) Ingestion Only CLARC Database equation 745-1	X		Site qualifies for Method C industrial land use, only applicable if no appropriately protective ARAR is available
	O	Soil Direct Contact Method C-HH Carcinogen WAC 173-340-745(5)(b)(iii)(B)(II) Ingestion + Dermal equation 745-5		X	Not applicable; only applicable if proposed changes to Eq 745-1 and 745-2 would result in significantly higher soil cleanup level than would be calculated without the proposed changes
	P	Soil Direct Contact Method C-HH Non-carcinogen WAC 173-340-745(5)(b)(iii)(B)(I) Ingestion + Dermal equation 745-4		X	Not applicable; only applicable if proposed changes to Eq 745-1 and 745-2 would result in significantly higher soil cleanup level than would be calculated without the proposed changes
	Q	Soil Direct Contact Method C-HH Petroleum Mixture WAC 173-340-745(5)(b)(iii)(B)(III) equation 740-3 (4-Phase Model)		X	Method B used for IAL to be consistent with GTSP
	R	Soil to Method B-HH Groundwater Protection -NC, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	S	Soil to Method B-HH Groundwater Protection - NC, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	T	Soil to Method B - HH Groundwater Protection - Carc, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 CLARC Database Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	U	Soil to Method B - HH Groundwater Protection - Carc, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 CLARC Database Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	V	Soil to Method C-HH Groundwater Protection - NC, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 Vadose Soil		X	Not applicable, groundwater not meet criteria for Method C
	W	Soil to Method C-HH Groundwater Protection - NC, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 Saturated Soil		X	Not applicable, groundwater not meet criteria for Method C
	X	Soil to Method C-HH Groundwater Protection - Carc, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 Vadose Soil		X	Not applicable, groundwater not meet criteria for Method C

TABLE A-4
SOIL ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
Soil Pathway Evaluation	Y	Soil to Method C-HH Groundwater Protection - Carc, WAC 173-340-740(3)(b)(iii)(A) equation 747-1/747-2 Saturated Soil		X	Not applicable, groundwater not meet criteria for Method C
	Z	Soil to Sediment Protection Ecology CSL WAC 173-340-740(1)(d) equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AA	Soil to Sediment Protection Ecology SQS WAC 173-340-740(1)(d) equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AB	Soil to Sediment Protection Ecology CSL WAC 173-340-740(1)(d) equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AC	Soil to Sediment Protection Ecology SQS WAC 173-340-740(1)(d) equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AD	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Acute** Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AE	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Acute** Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AF	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Chronic** Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AG	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Chronic** Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AH	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Acute** Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AI	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Acute** Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AJ	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Chronic** Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AK	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Chronic** Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AL	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Saltwater Acute equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AM	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Saltwater Acute equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AN	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Saltwater Chronic equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AO	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Saltwater Chronic equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AP	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Freshwater Acute equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AQ	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Freshwater Acute equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum

TABLE A-4
SOIL ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
	AR	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Freshwater Chronic equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AS	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC Freshwater Chronic equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AT	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC HH-Consumption; Water & Organisms equation 747-1/747-2 Vadose Soil		X	Lower Duwamish Waterway not classified for drinking water per WAC 173-201A-602
	AU	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC HH-Consumption; Water & Organisms equation 747-1/747-2 Saturated Soil		X	Lower Duwamish Waterway not classified for drinking water per WAC 173-201A-602
	AV	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC HH-Consumption Organisms equation 747-1/747-2 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AW	Soil to Surface Water Protection WAC 173-340-740(1)(d) NRWQC HH-Consumption Organisms equation 747-1/747-2 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AX	Soil to Surface Water Protection Aquatic Life Fresh/Acute, **NTR** - 40 CFR 131.36 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AY	Soil to Surface Water Protection Aquatic Life Fresh/Acute, **NTR** - 40 CFR 131.36 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	AZ	Soil to Surface Water Protection Aquatic Life Fresh/Chronic, **NTR** - 40 CFR 131.36 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BA	Soil to Surface Water Protection Aquatic Life Fresh/Chronic, **NTR** - 40 CFR 131.36 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BB	Soil to Surface Water Protection Aquatic Life Marine/Acute, **NTR** - 40 CFR 131.36 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BC	Soil to Surface Water Protection Aquatic Life Marine/Acute, **NTR** - 40 CFR 131.36 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BD	Soil to Surface Water Protection Aquatic Life Marine/Chronic, **NTR** - 40 CFR 131.36 Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BE	Soil to Surface Water Protection Aquatic Life Marine/Chronic, **NTR** - 40 CFR 131.36 Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BF	Soil to Surface Water Protection HH-Fresh Water **Water & Organism Consumption NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk Vadose Soil		X	Lower Duwamish Waterway not classified for drinking water per WAC 173-201A-602
	BG	Soil to Surface Water Protection HH-Fresh Water **Water & Organism Consumption NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk Saturated Soil		X	Lower Duwamish Waterway not classified for drinking water per WAC 173-201A-602
	BH	Soil to Surface Water Protection HH-Fresh Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BI	Soil to Surface Water Protection HH-Fresh Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum

TABLE A-4
SOIL ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
	BJ	Soil Protective of Vapor, Direct Contact, WAC 173-340-740(3)(b)(iii)(C)		X	For PCBs and petroleum not meet conditions in WAC 173-340-740(3)(b)(iii)(C)
	BK	Soil Protective of Vapor, Indoor/Ambient Exposure WAC 173-340-740(3)(c)(iv)(B)		X	Modified Method B soil cleanup levels not being used
Soil Potential ARARs	BL	CERCLA EPA Regional Screening Level (RSL: May, 2010) Residential		X	Site qualifies as industrial property
	BM	CERCLA EPA Regional Screening Level (RSL: May, 2010) Industrial	X		Used but risk level for industrial property adjusted to 10^{-5}
	BN	CERCLA - National Oil & Hazardous Substances Pollution Contingency Plan (NCP) - 40 CFR 300 Preliminary Remediation/Cleanup Goals (2007)		X	No values for PCBs or TPH
	BO	Soil Protection of Surface Water HH-**Organoleptic Effects** CWA §304 **NRWQC** Vadose Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BP	Soil Protection of Surface Water HH-**Organoleptic Effects** CWA §304 **NRWQC** Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BQ	CA EPA OEHHA HH-Direct Exposure **Residential** Screening Levels		X	CalEPA SLs are not ARARs for MTCA cleanups
	BR	CA EPA OEHHA HH-Direct Exposure **Industrial** Screening Levels		X	CalEPA SLs are not ARARs for MTCA cleanups
	BS	Soil - Toxic Substances Control Act **(TSCA)** 40 CFR 761.61	X		
	BT	CERCLA EPA Regional Screening Level (RSL: May, 2010) Potable Groundwater Protection (Risk Based) Saturated Soil		X	Site-specific evaluation for PCBs, 4-phase model used for petroleum
	BU	EPA LDW Plant 2 TMCL's Groundwater Protection (Risk Based)		X	The values in this column are preliminary values from Boeing Plant 2, are being revised, and are not necessarily applicable to NBF soil and groundwater
Always Applicable	BV	Natural **Background** Levels Ch. 173-340 WAC	X		If derived IAL is less than this value, adjust up to this value
	BW	Applicable **DL (MDL)** Ch. 173-340 WAC		X	Method detection limit used to calculate PQL
	BX	Applicable **PQL (RL)** Ch. 173-340 WAC	X		If derived screening level is less than the PQL, screening level is adjusted up to the PQL. RL is not applicable.
EPA Method	BY	Analytical Method		X	Analytical method, not screening level or ARAR

(X) = used under specific conditions explained in the comment column
ARAR = applicable or relevant and appropriate requirement
CA EPA OEHHA = California Environmental Protection Agency Office of Environmental Health Hazard Assessment
CalEPA = California Environmental Protection Agency
Carc = carcinogenic
CLARC = cleanup level and risk calculation
COC = chemical of concern
COPC = chemical of potential concern
CSL = cleanup screening level
CUL = cleanup level
DL = detection level
Ecol = ecological
HH = human health
LDW = Lower Duwamish Waterway
MDL = method detection limit
MTCA = Model Toxics Control Act
NBF = North Boeing Field
NC = noncarcinogenic
NRWQC = U.S. Environmental Protection Agency water quality criterion
NTR = national toxics rule
PQL = practical quantitation limit
RL = Reporting Limit
SL = screening level
SQS = sediment quality standard
SWQS = Washington State surface water quality standard
TEE = terrestrial ecological evaluation
TMCL = total maximum contaminant load
TSCA = Toxic Substances Control Act

(a) From Ecology's (2010) Draft LDW ARARs & CULs v12-17-2010.

TABLE A-5
GROUNDWATER ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
Groundwater Method A	B	Groundwater Method A-HH **Potable** (Table 720-1) WAC 173-340-720(3)(b)(i)	(X)		Site does not qualify for Method A except for petroleum
	C	Groundwater Method A-HH **Potable ARARs** WAC 173-340-720(3)(b)(ii)		X	Site does not qualify for Method A except for petroleum; values in this column are USGS health-based screening levels, which are not regulatory values and therefore not ARARs
	D	Groundwater State Quality Criteria WAC 173-340-(3)(b)(ii); WAC 173-200-040(3) **Table 9.1**		X	Not an ARAR under MTCA
	E	Groundwater Method A-HH Potable Safe Drinking Water Act, 40 CFR 141: WAC 173-290-310; WAC 173-340-720(3)(b)(ii)(A) **MCL**		X	Site does not qualify for Method A except for petroleum
	F	Groundwater Safe Drinking Water Act, 40 CFR 141: WAC 173-290-310; WAC 173-340-720(3)(b)(ii)(B) **MCLG** **(Non-Zero Goals)**		X	Site does not qualify for Method A except for petroleum
	G	Groundwater State Board Health, Ch. 246-290 WAC: WAC 173-340-720(3)(b)(ii)(C) **MCL**		X	Site does not qualify for Method A except for petroleum
	H	Groundwater State Board Health, Ch. 246-290 WAC: WAC 173-340-720(3)(b)(ii)(C) **MCLG**		X	Site does not qualify for Method A except for petroleum
	I	Groundwater Method A-**Potable** No Table Values WAC 173-340-720(3)(b)(iii)		X	Site does not qualify for Method A except for petroleum
	J	Groundwater Method A-HH Potable/Protect Surface Water WAC 173-340-720(3)(b)(iv)		X	Lower Duwamish Waterway not classified as drinking water per WAC 173-201A-602
Groundwater Method B	K	Groundwater Method B-HH Potable ARARs WAC 173-340-720(4)(b)(i) Safe Drinking Water Standards — **MCLs**	X		NBF groundwater not used for drinking water, however until non-potability demonstrated under WAC 173-340-720 (2) drinking water ARARs will be used for this interim action
	L	Groundwater Method B-HH Potable ARARs WAC 173-340-720(4)(b)(i) Safe Drinking Water Standards — **MCLGs**		X	Only non-zero MCLGs are ARARs. Not available for PCBs or TPH
	M	Groundwater Method B-HH Potable ARARs WAC 173-340-720(4)(b)(i) State Department of Health Standards — **MCLs**	X		NBF groundwater not used for drinking water, however until non-potability demonstrated under WAC 173-340-720 (2) drinking water ARARs will be used for this interim action
	N	Groundwater Method B-HH Potable ARARs WAC 173-340-720(4)(b)(i) State Department of Health Standards — **MCLGs**		X	Only non-zero MCLGs are ARARs. Not available for PCBs or TPH
	O	Groundwater Method B-HH Non-carcinogenic/Potable WAC 173-340-720(4)(b)(iii)(A) CLARC Database	X		Applicable only if no adequately protective ARAR is available. NBF groundwater not used for drinking water, however until non-potability demonstrated under WAC 173-340-720 (2) drinking water ARARs will be used for this interim action
	P	Groundwater Method B-HH Carcinogen/Potable WAC 173-340-720(4)(b)(iii)(B) CLARC Database	X		Applicable only if no adequately protective ARAR is available. NBF groundwater not used for drinking water, however until non-potability demonstrated under WAC 173-340-720 (2) drinking water ARARs will be used for this interim action
	Q	Groundwater Method B-HH Potable, Petroleum Mixture WAC 173-340-720(4)(b)(iii)(C) EQ. 720-3 (4-Phase Model)		(X)	Method B cleanup levels specific to NBF were not calculated for IAL; Method A used.

TABLE A-5
GROUNDWATER ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
Groundwater Method C	R	Groundwater Method C-HH Potable ARARs WAC 173-340-720(5)(b)(i)		X	Not applicable; groundwater does not meet criteria for Method C
	S	Groundwater Method C-HH Protect Surface Water Highest Beneficial Use WAC 173-340-720(5)(b)(ii)		X	Not applicable; surface water does not meet criteria for Method C
	T	Groundwater Method C-HH Non-carcinogenic/Potable WAC 173-340-720(5)(b)(iii)(A) CLARC Database		X	Not applicable; groundwater does not meet criteria for Method C
	U	Groundwater Method C-HH Carcinogen/Potable WAC 173-340-720(5)(b)(iii)(B) CLARC Database		X	Not applicable; groundwater does not meet criteria for Method C
	V	Groundwater Method C-HH Potable, Petroleum Mixture WAC 173-340-720(5)(b)(iii)(C) EQ. 720-3 (4-Phase Model)		X	Not applicable
Groundwater Pathway Evaluation	W	Groundwater Method B-HH Potable/Protect Surface Water WAC 173-340-720(4)(b)(ii)		X	The values in this column are from T117 and are not necessarily applicable to GTSP because of differences in site conditions and additive risk due to different lists of COCs
	X	Groundwater Non-Potable Surface Water Protection WAC 173-340-720(6)		X	NBF groundwater not used for drinking water, however until non-potability demonstrated under WAC 173-340-720 (2) drinking water ARARs will be used for this interim action
	Y	Groundwater to Sediment Protection Ecology **CSL** WAC 173-340-720(1)(c)	(X)		Only for specific chemicals identified as COCs in Slip 4 sediment [PCBs, indeno(1,2,3-cd)pyrene, BEHP, mercury, lead, zinc, and dioxin]
	Z	Groundwater to Sediment Protection Ecology **SQS** WAC 173-340-720(1)(c)	(X)		Only for specific chemicals identified as COCs in Slip 4 sediment
ARAR's	AA	EPA RCRA Plant 2 TMCLs		X	The values in this column are preliminary values from Boeing Plant 2, are being revised, and are not necessarily applicable to NBF soil and groundwater
ARAR's (Not Applied)	AB	EPA Tap Water Residential Screening Levels (5/2010)	X		
Always Applicable	AC	Natural **Background** Levels Ch. 173-340 WAC	X		If derived screening level is below this value, screening level is adjusted to this value
	AD	Applicable **DL (MDL)** Ch. 173-340 WAC		X	Method detection limit used to calculate PQL
	AE	Applicable **PQL (RL)** Ch. 173-340 WAC	X		If derived screening level is less than the RL, screening level is adjusted up to the RL.
EPA Method	AF	Analytical Methods		X	Analytical method, not screening level or ARAR

(X) = used under specific conditions explained in the comment column
ARAR = applicable or relevant and appropriate requirement
BEHP = bis(2-ethylhexyl)phthalate
CLARC = cleanup level and risk calculation
COC = chemical of concern
CSL = cleanup screening level
DL = detection limit
NBF = North Boeing Field
HH = human health
IAL = interim action level
MCG = maximum contaminant level goal
MCL = maximum contaminant level
MCLG = maximum contaminant level goal
MDL = method detection limit
PQL = practical quantitation limit
RL = Reporting Limit
SL = screening level
SQS = sediment quality standard
TMCL = total maximum contaminant load
USGS = U.S. Geological Survey

(a) From Ecology's (2010) Draft LDW ARARs & CULs v12-17-2010.

TABLE A-6
SURFACE WATER ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included? Yes	Included? No	Comments
Surface Water Method A	B	Surface Water Method A-HH ARARs WAC 173-340-730(2)(b)(i) [See Required ARARs]	(X)		Site does not qualify for Method A except for petroleum
	C	Surface Water Method A-WAC 173-340-730(2)(b)(i)(A) [See Required ARARs]		X	Site does not qualify for Method A
	D	Surface Water Method A-HH/Aquatic Organisms: CWA §304 WAC 173-340-730(2)(b)(i)(B) [See Required ARARs]		X	Site does not qualify for Method A
	E	Surface Water Method A-HH NTR - 40 CFR 131 WAC 173-340-730(2)(b)(i)(C) [See Required ARARs]		X	Site does not qualify for Method A
	F	Surface Water Method A-HH Potability WAC 173-340-730(2)(b)(ii) [See Required ARARs]		X	Site does not qualify for Method A
	G	Surface Water Method A-HH No Table Values WAC 173-340-730(2)(b)(iii) [See applicable surface water background or PQL values]		X	Site does not qualify for Method A
Surface Water Method B	H	Surface Water Method B-HH ARARs WAC 173-340-730(3)(b)(i) [See Required ARARs]		X	No values in column
	I	Surface Water Method B-WA WQS: Ch. 173-2101 A WAC 173-340-730(3)(b)(i)(A) [See Required ARARs]		X	See Columns AA-AD
	J	Surface Water Method B-HH/Aquatic Organisms:CWA §304 WAC 173-340-730(3)(b)(i)(B) [See Required ARARs]		X	See Columns AE-AK
	K	Surface Water Method B-HH NTR - 40 CFR 131 WAC 173-340-730(3)(b)(i)(C) [See Required ARARs]		X	See Columns AL-AR
	L	Surface Water Method B, Environmental Effects WAC 173-340-730(3)(b)(ii) [WET TESTING]		X	Method A will be used for TPH in accordance with WAC 173-340-730(3)(b)(iii)(C). Skykomish WET results are specific to the petroleum mixture at Skykomish and are not relevant to the petroleum mixture at GTSP
	M	Surface Water Method B-HH Non-carcinogen Fish Consumption WAC 173-340-730(3)(b)(iii)(A) Equation 730-1 CLARC Database	X		
	N	Surface Water, Method B-HH, Non-carcinogen, Fish Consumption WAC 173-340-730(3) (c) Equation 730-1 MOD - Tribal Adult	X		
	O	Surface Water, Method B-HH, Non-carcinogen, Fish Consumption WAC 173-340-730(3) (c) Equation 730-1 MOD - Tribal Child	X		
	P	Surface Water Method B-HH Carcinogen Fish Consumption WAC 173-340-730(3)(b)(iii)(B) Equation 730-2 CLARC Database	X		
	Q	Surface Water, Method B-HH, Carcinogen, Fish Consumption WAC 173-340-730(3)(b)(iii)(B) Equation 730-2 MOD - Tribal Adult	X		
	R	Surface Water, Method B-HH, Carcinogen, Fish Consumption WAC 173-340-730(3)(b)(iii)(B) Equation 730-2 MOD - Tribal Child	X		
	S	Surface Water Method B-HH Petroleum Mixture WAC 173-340-730(3)(b)(iii)(C)		X	Method A will be used for TPH in accordance with WAC 173-340-730(3)(b)(iii)(C). The values in this column are from T117 and are not necessarily applicable to GTSP because of differences in additive risk due to different lists of COCs
	T	Surface Water Method B-HH Potability WAC 173-340-730(3)(b)(iv)		X	Lower Duwamish Waterway not classified as drinking water per WAC 173-201A-602
Surface Water Method C	U	Surface Water Method C-HH ARARs WAC 173-340-730(4)(b)(i) [See Required ARARs]		X	Site does not qualify for Method C
	V	Surface Water Method C, Environmental Effects WAC 173-340-730(4)(b)(ii) [WET TESTING]		X	Site does not qualify for Method C
	W	Surface Water Method C, Non-carcinogen Fish Consumption WAC 173-340-730(4)(b)(iii)(A) Equation 730-1 CLARC Database		X	Site does not qualify for Method C
	X	Surface Water Method C, Carcinogen Fish Consumption WAC 173-340-730(4)(b)(iii)(B) Equation 730-2 CLARC Database		X	Site does not qualify for Method C
	Y	Surface Water Method C, Petroleum Mixture WAC 173-340-730(4)(b)(iii)(C)		X	Site does not qualify for Method C
	Z	Surface Water Method C-HH Potability WAC 173-340-730(4)(b)(iv)		X	Site does not qualify for Method C
Surface Water MTCA Method A,B,C Required ARARs	AA	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Acute**	X		
	AB	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Chronic**	X		
	AC	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Acute**	X		
	AD	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Chronic**	X		
	AE	Surface Water HH-**Consumption; Water + Organism** CWA §304 **NRWQC**		X	Lower Duwamish Waterway not classified as drinking water per WAC 173-201A-602
	AF	Surface Water HH-**Consumption; Organism Only** CWA §304 **NRWQC**	X		
	AG	Surface Water HH-**Organoleptic Effects** CWA §304 **NRWQC**	X		
	AH	Surface Water Aquatic Life Fresh/Acute CWA §304 **NRWQC**	X		
	AI	Surface Water Aquatic Life Fresh/Chronic CWA §304 **NRWQC**	X		
	AJ	Surface Water Aquatic Life Marine/Acute CWA §304 **NRWQC**	X		
	AK	Surface Water Aquatic Life Marine/Chronic CWA §304 **NRWQC**	X		
	AL	Surface Water Aquatic Life Fresh/Acute **NTR** - 40 CFR 131.36	X		

TABLE A-6
SURFACE WATER ARAR SCREENING RATIONALE
NORTH BOEING FIELD
SEATTLE, WASHINGTON

Media Column Title (a)	Column Letter	Pathway Column Title (a)	Included?		Comments
			Yes	No	
Surface Water ARAR	AM	Surface Water Aquatic Life Fresh/Chronic **NTR** - 40 CFR 131.36	X		
	AN	Surface Water Aquatic Life Marine/Acute **NTR** - 40 CFR 131.36	X		
	AO	Surface Water Aquatic Life Marine/Chronic **NTR** - 40 CFR 131.36	X		
	AP	Surface Water HH-Fresh Water **Water & Organism Consumption NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk		X	Lower Duwamish Waterway not classified as drinking water per WAC 173-201A-602
	AQ	Surface Water HH-Fresh Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk	X		
	AR	Surface Water HH-Marine Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10-6 Carc Risk	X		
	AS	Surface Water Discharge **(NPDES)** 40 CFR 122, 125/RCW 90-48; WAC 173-216, -220, -122		X	Applicable to construction storm water but not to surface water
	AT	Waste Water - Toxics Substances Control Act **(TSCA)** 40 CFR 761.61		X	Applicable to construction storm water but not to surface water
	AU	Shoreline Management Act RCW 90-58; WAC 173-16; King County/City Seattle Shoreline Master Plans (KCC Title 25;SMC 23.60)		X	Site is outside of shoreline district boundaries
	AV	Groundwater to Sediment Protection Ecology **CSL** WAC 173-340-730(1)(d)	(X)		Only for specific chemicals identified as COCs in Slip 4 sediment (including PCBs)
	AW	Groundwater to Sediment Protection Ecology **SQS** WAC 173-340-730(1)(d)	(X)		Only for specific chemicals identified as COCs in Slip 4 sediment (including PCBs)
	AX	Surface Water HH - Adult Non-Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (using EQ 730-1)	X		
	AY	Surface Water HH - Child Non-Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (using EQ 730-1)	X		
	AZ	Surface Water HH - Adult Non-Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (using EQ 730-2)	X		
	BA	Surface Water HH - Child Non-Carcinogen Tribal Fish Consumption without Salmon EPA RCRA (using EQ 730-2)	X		
Always Applicable	BB	Natural **Background** Levels Ch. 173-340 WAC	X		If derived screening level is below this value, screening level is adjusted to this value
	BC	Applicable **DL (MDL)** Ch. 173-340 WAC		X	Method detection limit used to calculate PQL
	BD	Applicable **PQL (RL/RDL)** Ch. 173-340 WAC	X		If derived screening level is less than the RL, screening level is adjusted up to the RL.
	BE	Analytical method		X	Analytical method, not screening level or ARAR
	BF	Natural Background Levels, Ch. 173-340 WAC, LDW	X		If derived screening level is below this value, screening level is adjusted to this value

(X) = used under specific conditions explained in the comment column
ARAR = applicable or relevant and appropriate requirement
CLARC = cleanup level and risk calculation
COC = chemical of concern
CSL = cleanup screening level
CWA = clean water act
EPA = U.S. Environmental Protection Agency
GTSP = Georgetown Steam Plant
HH = human health
MDL = method detection limit
NPDES = national pollutant discharge elimination system
NRWQC = U.S. Environmental Protection Agency water quality criterion
NTR = national toxics rule
PQL = practical quantitation limit
RCRA = Resource Conservation and Recovery Act
RL = Reporting Limit
SQS = sediment quality standard
SL = screening level
SWQS = Washington State surface water quality standard
TSCA = Toxic Substances Control Act
WET = whole effluent toxicity
WQS = water quality standard

(a) From Ecology's (2010) Draft LDW ARARs & CULs v12-17-2010

TABLE A-7
COMPARISON OF SOIL AND GROUNDWATER PCB CONCENTRATIONS DETECTED AT PEL AREA GROUNDWATER MONITORING WELLS

Groundwater and Soil Sample Location	Total PCBs detected in Groundwater (µg/L)	Maximum PCB Concentration in Soil (a) (mg/kg)
NGW501	2.3	18
NGW502	8.1	520
NGW503	0.088	1.6
NGW504	2.0	156
NGW505	ND (b)	0.19
NGW506	ND (b)	0.12
NGW507	0.032	0.79
NGW508	ND (b)	ND (c)
NGW509	ND (b)	ND (c)
NGW510	ND (b)	0.11
NGW511	ND (b)	ND (c)
NGW512	ND (b)	ND (c)
NGW513	ND (b)	0.77
NGW514	ND (b)	0.061
NGW515 (d)	0.34	2.2
NGW516 (d)	ND (b)	0.44
NGW517 (d)	0.76	140
NGW518	ND (b)	0.28
NGW519	ND (b)	0.32

(a) Maximum detection across the combined saturated/unsaturated zone due to the very shallow groundwater and the seasonal variablility of the groundwater table across the site
(b) PCBs not detected above the laboratory reporting limit of 0.01 µg/L
(c) PCBs not detected above the laboratory reporting limit, generally at 0.032 mg/kg
(d) Well was redeveloped and resampled after initial sampling event to reduce turbidity of sample to provide more accurate PCB results. Results shown are from the resampling event.

APPENDIX B

Ecology Draft Preliminary Screening Levels and potential ARARs

GTSP-NBF Site Preliminary Screening Levels

WORKSHEET NAME	NAME DESCRIPTION
Most Stringent Levels W-O PSW	**Most Stringent** Screening **Levels W**ith**O**ut **P**otable **S**urface **W**ater in Site
Soil	**Soil**
Groundwater	**Groundwater**
Surface Water	**Surface Water**
Air	**Air**
EQ 730-1 Non-Carc-SW CUL	**EQ 730-1 Non-Carc-SW CUL**
EQ 730-2 Carc-SW CUL	**EQ 730-2 Carc-SW CUL**
EQ 747-1 Soil to Protect Water	**EQ 747-1 Soil to Protect Water**
Most String Soil to Protect PGW	**Most String Soil to Protect P**otable **GW**
Most String Soil to Protect NSW	**Most String Soil to Protect N**on-potable/Fresh **SW**

INFORMATION

Assumes SW at the Site is Fresh/Marine, but NOT potable, and GW is potable

Provides all ARARs, including protection of GW, SW & Sediments

Provides all ARARs, including protection of SW & Sediments

Provides all ARARs, including protection of Sediments & potable GW standards (for potable SW comparison)

Provides all ARARs, including dusts/fumes/gases

Shows how HH protection Cleanup Levels for SW were calculated using MTCA equation 730-1

Shows how HH protection Cleanup Levels for SW were calculated using MTCA equation 730-2

Shows how to calcualate chemical equilibrium partitioning from soil to water using MTCA equation 747-1

Uses EQ 747-1 to calculate most stringent protective soil values when potable groundwater exists at Site

Uses EQ 747-1 to calculate most stringent protective soil values when fresh non-potable surface water exists

MEDIA - MTCA Standard	Soil Standard to Protect Potable Ground Waters	GW MOST STRINGENT POTABLE*	SW MOST STRINGENT Non-Potable	SEDIMENT MOST STRINGENT	AIR MOST STRINGENT
Note: Natural Background and PQL's Have Not Been Incorporated Into These Screening Levels Because They Are Site Specific And Have Not Been Determined By Ecology	***Screening Levels***	***Screening Levels****	***Screening Levels***	***Screening Levels***	***Screening Levels***
UNITS	**mg/kg**	**µg/L**	**µg/L**	**mg/kg DW**	**ppbv**
pcb mixtures	**7.13627E-07**	**2.30915E-05**	**1.58209E-05**	**0.00011**	**0.000291233**
pcb - Aroclor 1016	**1.76531E-06**	**0.0000641**	**0.000452025**	**0.24**	
pcb - Aroclor 1221	**2.44557E-07**	**2.30915E-05**	**2.30352E-05**		
pcb - Aroclor 1232	**0.00012**		**0.014**		
pcb - Aroclor 1242	**1.69278E-08**	**2.30915E-05**	**2.30352E-05**		
pcb - Aroclor 1248	**1.01785E-06**	**2.30915E-05**	**2.30352E-05**	**0.24**	
pcb - Aroclor 1254	**4.16425E-07**	**5.49145E-06**	**5.48457E-06**	**0.24**	
pcb - Aroclor 1260	**4.77489E-06**	**2.30915E-05**	**2.30352E-05**	**0.24**	
Total Petroleum Hydrocarbons	**NA**	**NA**	**0.208**	**5.7**	
Gasoline	**100**	**1000**	**1000**		**300000**
Gasoline (w/benzene)	**30**	**800**	**800**		
Diesel	**2000**	**500**	**500**		
Heavy Oil	**2000**	**500**	**500**		

*- Groundwater must meet surface water standards at point of compliance when surface water standards are less than potable groundwater standards

MEDIA - MTCA Standard	SOIL Method A				SOIL Method B						
PATHWAYS HH - Human Health Ecol- Ecological	Soil, Method A, Unrestricted Land Use-HH, WAC 173-340-740(2)(b)(iii) *CLARC Database/* ***Table 740-1***	Soil, Method A, Unrestricted Land Use-Ecol, WAC 173-340-740(2)(b)(ii); ***Table 749-2***	Soil, Method A, Industrial Land Use-HH, WAC 173-340-745(3)(b)(i) *CLARC Database/* ***Table 745-1***	Soil, Method A, Industrial Land Use-Ecol, WAC 173-340-745(3)(b)(iii) ***Table 749-2***	Soil, Direct Contact Method B-HH, Carcinogen, WAC 173-340-740(3)(b)(iii)(B)(II) ***CLARC Database*** *EQ. 740-2*	Soil, Direct Contact Method B-HH, Non-carcinogen, WAC 173-340-740(3)(b)(iii)(B)(I) ***CLARC Database*** *EQ. 740-1*	Soil, Direct Contact Method B-HH, Petroleum Mixture, WAC 173-340-740(3)(b)(iii)(B)(III) ***EQ. 740-3*** *(4-Phase Model)*	Site Specific Wildlife Exposure Model WAC 173-340-7493(3) *Table 749-4 & 5*	Soil Terrestrial Method B-Ecol, WAC 173-340-740(3)(b)(ii); WAC 173-340-7493 ***Table 749-3 PLANTS***	Soil Terrestrial Method B-Ecol, WAC 173-340-740(3)(b)(ii); WAC 173-340-7493 ***Table 749-3 Soil Biota***	Soil Terrestrial Method B-Ecol, WAC 173-340-740(3)(b)(ii); WAC 173-340-7493 ***Table 749-3 Wildlife***
UNITS	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
pcb mixtures	**1**	**2**	**10**	**2**	**0.5**		*	*	**40**		
pcb - Aroclor 1016						**5.6**	*	*			
pcb - Aroclor 1221							*	*			
pcb - Aroclor 1232							*	*			
pcb - Aroclor 1242							*	*			
pcb - Aroclor 1248							*	*			
pcb - Aroclor 1254						**1.6**	*	*			
pcb - Aroclor 1260							*	*			
Total Petroleum Hydrocarbons							*	*			
Gasoline	**100**	**200**	**100**	**12000**			*	*		**100**	**5000**
Gasoline (w/benzene)	**30**		**30**				*	*			
Diesel	**2000**	**460**	**2000**	**15000**			*	*		**200**	**6000**
Heavy Oil	**2000**		**2000**				*	*			
							*	*			

MEDIA - MTCA Standard	SOIL Method C												
PATHWAYS HH - Human Health Ecol- Ecological	Soil, Direct Contact Method C-HH, Carcinogen, WAC 173-340-745(5)(b)(iii)(B)(II) Ingestion Only ***CLARC Database*** *EQ. 745-2*	Soil, Direct Contact Method C-HH, Non-carcinogen, WAC 173-340-745(5)(b)(iii)(B)(I) Ingestion Only ***CLARC Database*** *EQ. 745-1*	Soil, Direct Contact Method C-HH, Carcinogen, WAC 173-340-745(5)(b)(iii)(B)(II) Ingestion + Dermal *EQ. 745-5*	Soil, Direct Contact Method C-HH, Non-carcinogen, WAC 173-340-745(5)(b)(iii)(B)(I) Ingestion + Dermal *EQ. 745-4*	Soil, Direct Contact Method C-HH, Petroleum Mixture, WAC 173-340-745(5)(b)(iii)(B)(III) *EQ. 740-3 (4-Phase Model)*	Soil to Method B-HH Groundwater Protection - **NC**, WAC 173-340-740(3)(b)(iii)(A) *EQ. 747-1/ 747-2 CLARC Database Vadose Soil*	Soil to Method B-HH Groundwater Protection -**NC** , WAC 173-340-740(3)(b)(iii)(A) *EQ. 747-1/ 747-2 CLARC Database Saturated Soil*	Soil to Method B-HH Groundwater Protection - **Carc**, WAC 173-340-740(3)(b)(iii)(A) EQ. 747-1/ 747-2 CLARC Database Vadose Soil	Soil to Method B-HH Groundwater Protection - **Carc**, WAC 173-340-740(3)(b)(iii)(A) EQ. 747-1/ 747-2 CLARC Database Saturated Soil	Soil to Method C-HH Groundwater Protection - **NC**, WAC 173-340-740(3)(b)(iii)(A) *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Method C-HH Groundwater Protection - **NC** , WAC 173-340-740(3)(b)(iii)(A) *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Method C-HH Groundwater Protection - **Carc**, WAC 173-340-740(3)(b)(iii)(A) *EQ. 747-1/ 747-2 Vadose Soil*
UNITS	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
pcb mixtures	**65.63**		**1.25**		*			**0.039618668**	**0.001984693**			**0.396186677**
pcb - Aroclor 1016	**245**				*	**0.611759881**	**0.030684267**			**1.33822474**	**0.067121833**	
pcb - Aroclor 1221	**65.6**				*							
pcb - Aroclor 1232	**65.6**				*							
pcb - Aroclor 1242					*							
pcb - Aroclor 1248	**65.6**				*							
pcb - Aroclor 1254	**70**				*	**0.485382421**	**0.024296533**			**1.061774045**	**0.053148667**	
pcb - Aroclor 1260					*							
Total Petroleum Hydrocarbons					*							
Gasoline					*							
Gasoline (w/benzene)					*							
Diesel					*							
Heavy Oil					*							
					*							

MEDIA - MTCA Standard														
PATHWAYS HH - Human Health Ecol- Ecological	Soil to Method C-HH Groundwater Protection - **Carc**, WAC 173-340-740(3)(b)(iii)(A) *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Sediment Protection Ecology **CSL** WAC 173-340-740(1)(d) *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Sediment Protection Ecology **SQS** WAC 173-340-740(1)(d) *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Sediment Protection Ecology **CSL** WAC 173-340-740(1)(d) *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Sediment Protection Ecology **SQS** WAC 173-340-740(1)(d) *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Acute** *Vadose Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Acute** *Saturated Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Chronic** *Vadose Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Chronic** *Saturated Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Acute** *Vadose Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Acute** *Saturated Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Chronic** *Vadose Soil*	Soil to Surface Water Protection Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Chronic** *Saturated Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Saltwater Acute** *EQ. 747-1/ 747-2 Vadose Soil*
UNITS	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
pcb mixtures	**0.019846933**	**1.305844196**	**0.241078929**	**0.065415923**	**0.012076786**	**1.800848533**	**0.090213333**	**0.01260594**	**0.000631493**	**9.004242667**	**0.451066667**	**0.027012728**	**0.0013532**	
pcb - Aroclor 1016		**1.309661255**	**0.241783616**	**0.065687577**	**0.012126937**									
pcb - Aroclor 1221														
pcb - Aroclor 1232														
pcb - Aroclor 1242														
pcb - Aroclor 1248		**1.305964009**	**0.241101048**	**0.06542445**	**0.01207836**									
pcb - Aroclor 1254		**1.303463228**	**0.240639365**	**0.065246473**	**0.012045503**									
pcb - Aroclor 1260		**1.301264831**	**0.240233507**	**0.065090016**	**0.012016618**									
Total Petroleum Hydrocarbons						**0.000832**	**5.96267E-05**							
Gasoline														
Gasoline (w/benzene)														
Diesel														
Heavy Oil														

MEDIA - MTCA Standard	SOIL PATHWAY EVALUATION												
PATHWAYS HH - Human Health Ecol- Ecological	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Saltwater Acute** *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Saltwater Chronic** *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Saltwater Chronic** *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Freshwater Acute** *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Freshwater Acute** *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Freshwater Chronic** *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC Freshwater Chronic** *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC HH-Consumption; Water & Organisms** *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC HH-Consumption: Water & Organisms** *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC HH-Consumption Organisms** *EQ. 747-1/ 747-2 Vadose Soil*	Soil to Surface Water Protection WAC 173-340-740(1)(d) **NRWQC HH-Consumption Organisms** *EQ. 747-1/ 747-2 Saturated Soil*	Soil to Surface Water Protection Aquatic Life Fresh/Acute, **NTR** - 40 CFR 131.36 *Vadose Soil*	Soil to Surface Water Protection Aquatic Life Fresh/Acute, **NTR** - 40 CFR 131.36 *Saturated Soil*
UNITS	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
pcb mixtures		**0.027012728**	**0.0013532**			**0.01260594**	**0.000631493**	**5.76272E-05**	**2.88683E-06**	**5.76272E-05**	**2.88683E-06**		
pcb - Aroclor 1016													
pcb - Aroclor 1221													
pcb - Aroclor 1232													
pcb - Aroclor 1242													
pcb - Aroclor 1248													
pcb - Aroclor 1254													
pcb - Aroclor 1260													
Total Petroleum Hydrocarbons													
Gasoline													
Gasoline (w/benzene)													
Diesel													
Heavy Oil													

MEDIA - MTCA Standard													
PATHWAYS HH - Human Health Ecol- Ecological	Soil to Surface Water Protection Aquatic Life Fresh/Chronic, **NTR** - 40 CFR 131.36 Vadose Soil	Soil to Surface Water Protection Aquatic Life Fresh/Chronic, **NTR** - 40 CFR 131.36 Saturated Soil	Soil to Surface Water Protection Aquatic Life Marine/Acute, **NTR** - 40 CFR 131.36 *Vadose Soil*	Soil to Surface Water Protection Aquatic Life Marine/Acute, **NTR** - 40 CFR 131.36 *Saturated Soil*	Soil to Surface Water Protection Aquatic Life Marine/Chronic, **NTR** - 40 CFR 131.36 *Vadose Soil*	Soil to Surface Water Protection Aquatic Life Marine/Chronic, **NTR** - 40 CFR 131.36 *Saturated Soil*	Soil to Surface Water Protection HH - Fresh Water **Water & Organism Consumption NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk *Vadose Soil*	Soil to Surface Water Protection HH - Fresh Water **Water & Organism Consumption NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk *Saturated Soil*	Soil to Surface Water Protection HH - Fresh Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk *Vadose Soil*	Soil to Surface Water Protection HH - Fresh Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk *Saturated Soil*	Soil Protective of Vapor, Direct Contact, WAC 173-340-740(3)(b)(iii)C	Soil Protective of Vapor, Indoor/Ambient Exposure WAC 173-340-740(3)(c)(iv)(B)	CERCLA EPA Regional Screening Level (RSL; May, 2010) ***Residential***
UNITS	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
pcb mixtures							**0.000153072**	**7.66813E-06**	**0.000153072**	**7.66813E-06**			**0.22**
pcb - Aroclor 1016	**0.007646999**	**0.000383553**			**0.016386425**	**0.0008219**							**3.9**
pcb - Aroclor 1221	**0.002949131**	**0.000148633**			**0.006319565**	**0.0003185**							**0.14**
pcb - Aroclor 1232	**0.002949131**	**0.000148633**			**0.006319565**	**0.0003185**							**0.14**
pcb - Aroclor 1242	**0.000181685**	**1.02881E-05**			**0.000389324**	**0.000022046**							**0.22**
pcb - Aroclor 1248	**0.012348437**	**0.000618613**			**0.026460936**	**0.0013256**							**0.22**
pcb - Aroclor 1254	**0.021235481**	**0.001062973**			**0.045504602**	**0.0022778**							**0.22**
pcb - Aroclor 1260	**0.058016334**	**0.002902013**			**0.124320715**	**0.0062186**							**0.22**
Total Petroleum Hydrocarbons													
Gasoline													
Gasoline (w/benzene)													
Diesel													
Heavy Oil													

MEDIA - MTCA Standard	SOIL POTENTIAL ARAR's									Always Applicable			EPA METHOD
PATHWAYS HH - Human Health Ecol- Ecological	CERCLA EPA Regional Screening Level (RSL; May, 2010) ***Industrial***	CERCLA - National Oil & Hazardous Substances Pollution Contingency Plan (NCP) - 40 CFR 300 Preliminary Remediation/ Cleanup Goals (PRG's) (2007)	Soil Protection of Surface Water HH – **Organoleptic Effects** CWA §304 **NRWQC** *Vadose Soil*	Soil Protection of Surface Water HH – **Organoleptic Effects** CWA §304 **NRWQC** *Saturated Soil*	CA EPA OEHHA HH-Direct Exposure **Residential** Screening Levels	CA EPA OEHHA HH-Direct Exposure **Industrial** Screening Levels	Soil - Toxics Substances Control Act **(TSCA)** 40 CFR 761.61	CERCLA EPA Regional Screening Level (RSL; May, 2010) **Potable *Groundwater Protection (Risk Based)*** *Saturated Soil*	EPA LDW Plant 2 TMCL's ***Groundwater Protection (Risk Based)***	Natural **Background** Levels Ch. 173-340 WAC	Applicable **DL (MDL)** Ch. 173-340 WAC	Applicable **PQL** Ch. 173-340 WAC	Analytical Method
UNITS	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	
pcb mixtures	**0.74**				**0.089**	**0.3**	**1**	**0.00012**	**6.03617E-05**				**8082**
pcb - Aroclor 1016	**21**							**0.092**	**6.14091E-05**		**0.00202**	**0.1**	**8082**
pcb - Aroclor 1221	**0.54**							**0.00012**	**3.97083E-06**		**0.033**	**0.1**	**8082**
pcb - Aroclor 1232	**0.54**							**0.00012**			**0.033**	**0.1**	**8082**
pcb - Aroclor 1242	**0.74**							**0.0053**	**3.61618E-05**		**0.033**	**0.1**	**8082**
pcb - Aroclor 1248	**0.74**							**0.0052**	**0.22**		**0.0033**	**0.1**	**8082**
pcb - Aroclor 1254	**0.74**							**0.0088**	**1.43548E-05**		**0.00209**	**0.1**	**8082**
pcb - Aroclor 1260	**0.74**							**0.024**	**0.000161595**		**0.00234**	**0.1**	**8082**
Total Petroleum Hydrocarbons													
Gasoline													
Gasoline (w/benzene)													
Diesel											**1.6**	**10**	
Heavy Oil											**3.19**	**25**	

MEDIA - MTCA Standard	GW Method A									GW Method B							
PATHWAYS HH - Human Health Ecol- Ecological	Ground Water, Method A-HH, **Potable (Table 720-1)** WAC 173-340-720(3)(b)(i)	Ground Water Method A - HH **Potable ARAR's** WAC 173-340-720(3)(b)(ii)	Groundwater State Quality Criteria WAC 173-340-720(3)(b)(ii); *WAC 173-200-040(3)* ***Table 9.1***	Ground Water Method A-HH-Potable Safe Drinking Water Act, 40 CFR 141: WAC 173-290-310; WAC 173-340-720(3)(b)(ii)(A) **MCL**	Ground Water Safe Drinking Water Act, 40 CFR 141: WAC 173-290-310; WAC 173-340-720(3)(b)(ii)(B) **MCLG (Non-Zero Goals)**	Ground Water State Board Health, Ch. 246-290 WAC: WAC 173-340-720(3)(b)(ii)(C) **MCL**	Ground Water State Board Health, Ch. 246-290 WAC: WAC 173-340-720(3)(b)(ii)(C) **MCG**	Ground Water Method A - **Potable** No Table Values WAC 173-340-720(3)(b)(iii)	Ground Water, Method A-HH, Potable/Protect Surface Water WAC 173-340-720(3)(b)(iv)	Ground Water Method B - HH Potable ARAR's WAC 173-340-720(4)(b)(i) *Safe Drinking Water Standards* - ***MCLs***	Ground Water Method B - HH Potable ARAR's WAC 173-340-720(4)(b)(i) *Safe Drinking Water Standards* - ***MCGs***	Ground Water Method B - HH Potable ARAR's WAC 173-340-720(4)(b)(i) *State Department of Health Stanadrds* - ***MCLs***	Ground Water Method B - HH Potable ARAR's WAC 173-340-720(4)(b)(i) *State Department of Health Stanadrds* - ***MCGs***	Ground Water, Method B-HH, Non-carcinogenic/ Potable WAC 173-340-720(4)(b)(iii)(A) *CLARC Database*	Ground Water, Method B-HH, Carcinogen/Potable WAC 173-340-720(4)(b)(iii)(B) *CLARC Database*	Ground Water, Method B-HH, Potable, Petroleum Mixture WAC 173-340-720(4)(b)(iii)(C) *EQ. 720-3 (4-Phase Model)*	Ground Water Method C - HH Potable ARAR's WAC 173-340-720(5)(b)(i)
UNITS	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
pcb mixtures	**0.1**	*	**0.01**	**0.5**		**0.5**	***0**	*	*	**0.5**		**0.5**	***0**		**0.044**	*	*
pcb - Aroclor 1016		**0.5**						*	*					**1.12**		*	*
pcb - Aroclor 1221		*						*	*							*	*
pcb - Aroclor 1232		*						*	*							*	*
pcb - Aroclor 1242		*						*	*							*	*
pcb - Aroclor 1248		*						*	*							*	*
pcb - Aroclor 1254		**0.1**						*	*					**0.32**		*	*
pcb - Aroclor 1260		*						*	*							*	*
Total Petroleum Hydrocarbons		*						*	*							*	*
Gasoline	**1000**	*						*	*							*	*
Gasoline (w/benzene)	**800**	*						*	*							*	*
Diesel	**500**	*						*	*							*	*
Heavy Oil	**500**	*						*	*							*	*
		*						*	*							*	*

MEDIA - MTCA Standard	GW Method C				GW PATHWAY EVALUATION				ARAR's	ARAR's (Not Applied)	Always Applicable			EPA Method	POTABLE GW MOST STRINGENT
PATHWAYS HH - Human Health Ecol- Ecological	Ground Water, Method C-HH, Protect Surface Water Highest Beneficial Use WAC 173-340-720(5)(b)(ii)	Ground Water, Method C-HH, Non-carcinogenic/ Potable WAC 173-340-720(5)(b)(iii)(A) *CLARC Database*	Ground Water, Method C-HH, Carcinogen/ Potable WAC 173-340-720(5)(b)(iii)(B) *CLARC Database*	Ground Water, Method C-HH, Potable, Petroleum Mixture WAC 173-340-720(5)(b)(iii)(C) *EQ. 720-3 (4-Phase Model)*	Ground Water, Method B-HH, Potable/Protect Surface Water WAC 173-340-720(4)(b)(ii)	Ground Water, Non-Potable, Surface Water Protection WAC 173-340-720(6)	Groundwater to Sediment Protection Ecology **CSL** WAC 173-340-720(1)(c)	Groundwater to Sediment Protection Ecology **SQS** WAC 173-340-720(1)(c)	EPA RCRA Plant 2 TMCLs	EPA Tap Water Residential Screening Levels (RSL's, 5/2010)	Natural **Background** Levels Ch. 173-340 WAC	Applicable **DL (MDL)** Ch. 173-340 WAC	Applicable **PQL (RL)** Ch. 173-340 WAC	Analytical Methods	Screening Levels
UNITS	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**		**µg/L**
pcb mixtures	*		**0.44**	*	**0.000064**	*	**1.450892857**	**0.267857143**	**2.30915E-05**			**0.1**	**0.01**	**8082/8270/1668**	**2.30915E-05**
pcb - Aroclor 1016	*	**2.45**		*		*	**2.398523985**	**0.442804428**	**0.0000641**	**0.96**		**0.0036**	**0.01**	**8082**	**0.0000641**
pcb - Aroclor 1221	*			*		*			**2.30915E-05**	**0.0068**			**0.01**	**8082**	**2.30915E-05**
pcb - Aroclor 1232	*			*		*							**0.01**	**8082**	
pcb - Aroclor 1242	*			*		*			**2.30915E-05**	**0.034**			**0.01**	**8082**	**2.30915E-05**
pcb - Aroclor 1248	*			*		*	**1.480637813**	**0.273348519**	**2.30915E-05**	**0.034**		**0.1**	**0.01**	**8082**	**2.30915E-05**
pcb - Aroclor 1254	*	**0.7**		*		*	**0.85978836**	**0.158730159**	**5.49145E-06**	**0.034**		**0.1**	**0.01**	**8082**	**5.49145E-06**
pcb - Aroclor 1260	*			*		*	**0.314009662**	**0.057971014**	**2.30915E-05**	**0.034**		**0.0046**	**0.01**	**8082**	**2.30915E-05**
Total Petroleum Hydrocarbons	*			*		*								**NWTPH-Dx**	
Gasoline	*			*		*								**NWTPH-G**	**1000**
Gasoline (w/benzene)	*			*		*								**NWTPH-G**	**800**
Diesel	*			*		*						**40**	**100**	**NWTPH-D**	**500**
Heavy Oil	*			*	**500**	*						**90**	**100**	**NWTPH-Dx**	**500**
	*			*		*									

MEDIA - MTCA Standard	
PATHWAYS HH - Human Health Ecol- Ecological	POTABLE GROUNDWATER (Screening Levels Include Potable Groundwater Regulations, When Applicable & Highlighted Below)
UNITS	**Regulatory Framework For Most Stringent Criteria**
pcb mixtures	HH - Tribal Fish (w/o Salmon) Consumption, Carc - Adult, EPA RCRA
pcb - Aroclor 1016	Protection -Groundwater to Sediment {Ecology SQS}; WAC 173-340-720(1)(c)
pcb - Aroclor 1221	HH - Tribal Fish (w/o Salmon) Consumption, Carc - Adult, EPA RCRA
pcb - Aroclor 1232	
pcb - Aroclor 1242	HH - Tribal Fish (w/o Salmon) Consumption, Carc - Adult, EPA RCRA
pcb - Aroclor 1248	HH - Tribal Fish (w/o Salmon) Consumption, Carc - Adult, EPA RCRA
pcb - Aroclor 1254	HH - Tribal Fish (w/o Salmon) Consumption, Carc - Adult, EPA RCRA
pcb - Aroclor 1260	HH - Tribal Fish (w/o Salmon) Consumption, Carc - Adult, EPA RCRA
Total Petroleum Hydrocarbons	
Gasoline	HH -Method A Potable (Table 720-1) WAC 173-340-720(3)(b)(i)
Gasoline (w/benzene)	HH -Method A Potable (Table 720-1) WAC 173-340-720(3)(b)(i)
Diesel	HH -Method A Potable (Table 720-1) WAC 173-340-720(3)(b)(i)
Heavy Oil	HH -Method A Potable (Table 720-1) WAC 173-340-720(3)(b)(i)

MEDIA - MTCA Standard	SW Method A						SW Method B												
PATHWAYS HH - Human Health Ecol- Ecological	Surface Water, Method A - HH ARAR's WAC 173-340-730(2)(b)(i) **[See Required ARAR's]**	Surface Water, Method A - WAC 173-340-730(2)(b)(i)(A) **[See Required ARAR's]**	Surface Water, Method A - HH/ Aquatic Organisms: CWA §304 WAC 173-340-730(2)(b)(i)(B) **[See Required ARAR's]**	Surface Water, Method A - HH NTR - 40 CFR 131 WAC 173-340-730(2)(b)(i)(C) **[See Required ARAR's]**	Surface Water, Method A - HH Potability WAC 173-340-730(2)(b)(ii) **[See Required ARAR's]**	Surface Water, Method A - HH No Table Values WAC 173-340-730(2)(b)(iii) **[See applicable SW background or PQL values]**	Surface Water, Method B - HH ARAR's WAC 173-340-730(3)(b)(i) [See **Required ARAR's]**	Surface Water, Method B - WA WQS:Ch. 173-2101 A WAC 173-340-730(3)(b)(i)(A) **[See Required ARAR's]**	Surface Water, Method B - HH/ Aquatic Organisms: CWA §304 WAC 173-340-730(3)(b)(i)(B) **[See Required ARAR's]**	Surface Water, Method B - HH NTR - 40 CFR 131 WAC 173-340-730(3)(b)(i)(C) **[See Required ARAR's]**	Surface Water, Method B, Environmental Effects, WAC 173-340-730(3)(b)(ii) **[WET TESTING]**	Surface Water, Method B-HH, Non-carcinogen, Fish Consumption WAC 173-340-730(3)(b)(iii)(A) ***EQ. 730-1*** *CLARC Database*	Surface Water, Method B-HH, Non-carcinogen, Fish Consumption WAC 173-340-730(3)(c) ***EQ. 730-1 MOD - Tribal Adult***	Surface Water, Method B-HH, Non-carcinogen, Fish Consumption WAC 173-340-730(3)(c) ***EQ. 730-1 MOD - Tribal Child***	Surface Water, Method B-HH, Carcinogen, Fish Consumption WAC 173-340-730(3)(b)(iii)(B) ***EQ. 730-2*** *CLARC Database*	Surface Water, Method B-HH, Carcinogen, Fish Consumption WAC 173-340-730(3)(b)(iii)(B) ***EQ. 730-2 MOD - Tribal Adult***	Surface Water, Method B-HH, Carcinogen, Fish Consumption WAC 173-340-730(3)(b)(iii)(B) ***EQ. 730-2 MOD - Tribal Child***	Surface Water, Method B-HH Petroleum Mixture WAC 173-340-730(3)(b)(iii)(C)	Surface Water, Method B-HH Potability WAC 173-340-730(3)(b)(iv)
UNITS	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
pcb mixtures	*	*	*	*	*	*	*	*	*	*	*				**0.00010387**	**1.58209E-05**	**7.22806E-05**		*
pcb - Aroclor 1016	*	*	*	*	*	*	*	*	*	*	*	**0.005816714**	**0.001890068**	**0.000867367**	**0.002967711**	**0.000452025**	**0.00206516**		*
pcb - Aroclor 1221	*	*	*	*	*	*	*	*	*	*	*								*
pcb - Aroclor 1232	*	*	*	*	*	*	*	*	*	*	*								*
pcb - Aroclor 1242	*	*	*	*	*	*	*	*	*	*	*								*
pcb - Aroclor 1248	*	*	*	*	*	*	*	*	*	*	*								*
pcb - Aroclor 1254	*	*	*	*	*	*	*	*	*	*	*	**0.001661918**	**0.00054002**	**0.000247819**	**0.00010387**	**1.58209E-05**	**7.22806E-05**		*
pcb - Aroclor 1260	*	*	*	*	*	*	*	*	*	*	*								*
Total Petroleum Hydrocarbons	*	*	*	*	*	*	*	*	*	*	**0.7**								*
Gasoline	*	*	*	*	*	*	*	*	*	*	*								*
Gasoline (w/benzene)	*	*	*	*	*	*	*	*	*	*	*								*
Diesel	*	*	*	*	*	*	*	*	*	*	*								*
Heavy Oil	*	*	*	*	*	*	*	*	*	*	*							**500**	*
	*	*	*	*	*	*	*	*	*	*	*								*

MEDIA - MTCA Standard	SW Method C						SW MCTA Method A,B,C Required ARAR's												
PATHWAYS HH - Human Health Ecol- Ecological	Surface Water, Method C - HH ARAR's WAC 173-340-730(4)(b)(i) **[See Required ARAR's]**	Surface Water, Method C, Environmental Effects, WAC 173-340-730(4)(b)(ii) **[WET TESTING]**	Surface Water, Method C, Non-carcinogen, Fish Consumtion WAC 173-340-730(4)(b)(iii)(A) **EQ. 730-1** *CLARC Database*	Surface Water, Method C, Carcinogen, Fish Consumption WAC 173-340-730(4)(b)(iii)(B) **EQ. 730-2** *CLARC Database*	Surface Water, Method C, Petroleum Mixture WAC 173-340-730(4)(b)(iii)(C)	Surface Water, Method C-HH Potability WAC 173-340-730(4)(b)(iv)	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Acute**	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Fresh - Chronic**	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Acute**	Surface Water Aquatic Life **SWQS**:RCW 90-48; Ch. 173-201A-240 per MTCA WAC 173-340-730(2)(b)(i)(A) **Marine - Chronic**	Surface Water HH - **Consumption; Water + Organism (Fresh)** CWA §304 **NRWQC**	Surface Water HH – **Consumption; Organism Only (Marine)** CWA §304 **NRWQC**	Surface Water HH – **Organoleptic Effects** CWA §304 **NRWQC**	Surface Water Aquatic Life Fresh/Acute, CWA §304, **NRWQC**	Surface Water Aquatic Life Fresh/Chronic, CWA §304, **NRWQC**	Surface Water Aquatic Life Marine/Acute, CWA §304, **NRWQC**	Surface Water Aquatic Life Marine/Chronic, CWA §304, **NRWQC**	Surface Water Aquatic Life Fresh/Acute, **NTR** - 40 CFR 131.36	Surface Water Aquatic Life Fresh/Chronic, **NTR** - 40 CFR 131.36
UNITS	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
pcb mixtures	*	*	**2.077397911**		*	*	**2**	**0.014**	**10**	**0.03**	**0.000064**	**0.000064**			**0.014**		**0.03**		
pcb - Aroclor 1016	*	*	**0.014541785**		*	*													**0.014**
pcb - Aroclor 1221	*	*			*	*													**0.014**
pcb - Aroclor 1232	*	*			*	*													**0.014**
pcb - Aroclor 1242	*	*			*	*													**0.014**
pcb - Aroclor 1248	*	*			*	*													**0.014**
pcb - Aroclor 1254	*	*	**0.004154796**		*	*													**0.014**
pcb - Aroclor 1260	*	*			*	*													**0.014**
Total Petroleum Hydrocarbons	*	*			*	*	**0.208**												
Gasoline	*	*			*	*													
Gasoline (w/benzene)	*	*			*	*													
Diesel	*	*			*	*													
Heavy Oil	*	*			*	*													
	*	*			*	*													

MEDIA - MTCA Standard						Surface Water ARAR									Always Applicable			EPA Method	ALWAYS APPLICABLE
PATHWAYS HH - Human Health Ecol- Ecological	Surface Water Aquatic Life Marine/Acute, **NTR** - 40 CFR 131.36	Surface Water Aquatic Life Marine/Chronic, **NTR** - 40 CFR 131.36	Surface Water HH -Fresh Water **Water & Organism Consumption NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk	Surface Water HH - Fresh Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk	Surface Water HH - Marine Water **Organism Consumption Only NTR** - 40 CFR 131.36 (WAC 173-201A-040[5]) HH - 10^{-6} Carc Risk	Surface Water Discharge (**NPDES**) 40 CFR 122,125/ RCW 90-48; WAC 173-216, -220, -122	Waste Water - Toxics Substances Control Act **(TSCA)** 40 CFR 761.61	Shoreline Management Act RCW 90-58; WAC 173-16; King County/City Seattle Shoreline Master Plans (KCC Title 25;SMC 23.60)	Groundwater to Sediment Protection Ecology **CSL** WAC 173-340-730(1)(d)	Groundwater to Sediment Protection Ecology **SQS** WAC 173-340-730(1)(d)	Surface Water HH - **Adult** Non-Carcinogen Tribal Fish Consumption w/o Salmon **EPA RCRA** (using **EQ 730-1**)	Surface Water HH - **Child** Non-Carcinogen Tribal Fish Consumption w/o Salmon **EPA RCRA** (using **EQ 730-1**)	Surface Water HH - **Adult** Carcinogen Tribal Fish Consumption w/o Salmon **EPA RCRA** (using **EQ 730-2**)	Surface Water HH - **Child** Carcinogen Tribal Fish Consumption w/o Salmon **EPA RCRA** (using **EQ 730-2**)	Natural **Background** Levels Ch. 173-340 WAC	Applicable **DL (MDL)** Ch. 173-340 WAC	Applicable **PQL(RL/RDL)** Ch. 173-340 WAC	Analytical Method	Natural **Background** Levels Ch. 173-340 WAC **LDW**
UNITS	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**		**µg/L**
pcb mixtures			**0.00017**	**0.00017**	**0.00017**		**0.5**		**1.450892857**	**0.267857143**			**2.30352E-05**	**0.000112758**	**0.00033**		**0.01**	*	**0.00153**
pcb - Aroclor 1016		**0.03**							**2.398523985**	**0.442804428**	**0.002948507**	**0.001353093**	**0.000658149**	**0.003221649**				*	**0.00153**
pcb - Aroclor 1221		**0.03**											**2.30352E-05**	**0.000112758**				*	**0.00153**
pcb - Aroclor 1232		**0.03**																*	**0.00153**
pcb - Aroclor 1242		**0.03**											**2.30352E-05**	**0.000112758**				*	**0.00153**
pcb - Aroclor 1248		**0.03**							**1.480637813**	**0.273348519**			**2.30352E-05**	**0.000112758**				*	**0.00153**
pcb - Aroclor 1254		**0.03**							**0.85978836**	**0.158730159**	**0.000200579**	**9.20471E-05**	**5.48457E-06**	**2.68471E-05**				*	**0.00153**
pcb - Aroclor 1260		**0.03**							**0.314009662**	**0.057971014**			**2.30352E-05**	**0.000112758**				*	**0.00153**
Total Petroleum Hydrocarbons																		*	
Gasoline						**1000**												*	
Gasoline (w/benzene)																		*	
Diesel						**10000**												*	
Heavy Oil						**10000**												*	
																		*	

MEDIA - MTCA Standard	SEDIMENT Required ARAR (Marine Waters)				SEDIMENT Apparent Effect Thresholds (Marine Waters)											SEDIMENT AET's (Fresh Water)	Puget Sound Dredge Disposal Analysis						
PATHWAYS HH - Human Health Ecol- Ecological	SMS **SQS** WAC 173-340-760	SMS **SQS** WAC 173-340-760	SMS **CSL** WAC 173-340-760	SMS **CSL** WAC 173-340-760	Amphipod	Oyster	Benthic	Microtox	*LAETs Normalized to DW*	Amphipod	Oyster	Benthic	Microtox	SMS LAET WAC 173-340-760	SMS 2LAET WAC 173-340-760	Ecology (2003, Draft Freshwater)	PSDDA Screening Level	PSDDA Bioaccum-ulation Trigger	PSDDA Maximum Level	CERCLA/MTCA HH Risk Based Threshold Concentrations 40 CFR 160 **LDW**	CERCLA HH Risk Based Threshold Concentrations 40 CFR 160 **Lockheed West**	CERCLA HH Risk Based Threshold Concentrations 40 CFR 160 **Hylebos Waterway**	MTCA Sediment to protect Surface Water Upriver Dam PCB Site **Spokane River**
UNITS	**mg/kg OC**	**mg/kg Dw (2%)**	**mg/kg OC**	**mg/kg Dw (2%)**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg OC**	**mg/kg OC**	**mg/kg OC**	**mg/kg OC**	**mg/kg OC**	**mg/kg OC**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW (OC% ?)**	**mg/kg DW**
pcb mixtures	**12**	**0.24**	**65**	**1.3**	**2.5**	**1.1**	**1.1**	**0.13**	**0.13**	**190**	**46**	**65**	**12**	**12**	**24**		**130**	**38**	**3100**	**0.5**	**0.00011**	**0.13**	**0.048**
pcb - Aroclor 1016	**12**	**0.24**	**65**	**1.3**																			
pcb - Aroclor 1221																							
pcb - Aroclor 1232																							
pcb - Aroclor 1242																							
pcb - Aroclor 1248	**12**	**0.24**	**65**	**1.3**																			
pcb - Aroclor 1254	**12**	**0.24**	**65**	**1.3**																			
pcb - Aroclor 1260	**12**	**0.24**	**65**	**1.3**																			
Total Petroleum Hydrocarbons																							
Gasoline																							
Gasoline (w/benzene)																							
Diesel																							
Heavy Oil																							

MEDIA - MTCA Standard	SEDIMENT POTENTIAL ARAR's							Always Applicable			EPA Method	SEDIMENT MOST STRINGENT	SEDIMENT MOST STRINGENT
PATHWAYS HH - Human Health Ecol- Ecological	CERCLA SMS/SQS ARAR WAC 173-340-760 **T-117**	CERCLA Sediment Screening Level **T-117**	CERCLA Sediment Screening Level - *Recreational Scenario* **T-117**	**"Bold Study"** (EPA OSV Bold Survey, 2009, conducted by DMMP agencies)	**"Elliot Bay"** (Ecology, 2009, combined 2007 data from Basin, Urban, and Harbor areas in Bay)	CERCLA HH Risk Based Threshold Concentrations 40 CFR 160	CERCLA Ecol Risk Based Threshold Concentrations 40 CFR 160	Natural **Background** Levels Ch. 173-340 WAC	Applicable **DL (MDL)** Ch. 173-340 WAC	Applicable **PQL (RL)** Ch. 173-340 WAC	Analytical Methods	Screening Levels (Marine Waters)	Screening Levels (Marine Waters)
UNITS	**mg/kg DW (1.55%)**	**mg/kg DW (1.55%)**	**mg/kg DW (1.55%)**	**mg/kg DW**	**mg/kg DW**	**mg/kg**	**mg/kg**	**mg/kg DW**	**mg/kg DW**	**mg/kg DW**		**mg/kg DW**	**mg/kg OC**
pcb mixtures	**0.19**	**0.22**	**0.19**	**0.0014**	**0.048**	*	*	**0.002**	**0.067**	**0.0022**	**8082**	**0.00011**	**12**
pcb - Aroclor 1016						*	*					**0.24**	**12**
pcb - Aroclor 1221						*	*						
pcb - Aroclor 1232						*	*						
pcb - Aroclor 1242						*	*						
pcb - Aroclor 1248						*	*					**0.24**	**12**
pcb - Aroclor 1254						*	*					**0.24**	**12**
pcb - Aroclor 1260						*	*					**0.24**	**12**
Total Petroleum Hydrocarbons	**5.7**					*	*					**5.7**	
Gasoline						*	*						
Gasoline (w/benzene)						*	*						
Diesel						*	*						
Heavy Oil						*	*						
						*	*						

MEDIA - MTCA Standard	AIR Method B						AIR Method C											
PATHWAYS HH - Human Health Ecol- Ecological	Air, Method B-HH, ARAR's WAC 173-340-750(3)(b)(i)	Air, Method B-HH, Carcinogen WAC 173-340-750(3)(b)(ii)(B)	Air, Method B-HH, Carcinogen WAC 173-340-750(3)(b)(ii)(B)	Air, Method B-HH, Non-carcinogen WAC 173-340-750(3)(b)(ii)(A)	Air, Method B-HH, Non-carcinogen WAC 173-340-750(3)(b)(ii)(A)	Air, Method B-HH, Petroleum Mixture WAC 173-340-750(3)(b)(ii)(C)	Air, Method C-HH, ARAR's WAC 173-340-750(4)(b)(i)	Air, Method C-HH, Carcinogen WAC 173-340-750(4)(b)(ii)(B)	Air, Method C-HH, Carcinogen WAC 173-340-750(4)(b)(ii)(B)	Air, Method C-HH, Non-carcinogen WAC 173-340-750(4)(b)(ii)(A)	Air, Method C-HH, Non-carcinogen WAC 173-340-750(4)(b)(ii)(A)	Air, Method C-HH, Petroleum Mixture WAC 173-340-750(4)(b)(ii)(C)	Air, Lower Explosive Limit (LEL) WAC 173-340-750(4)(b)(iii)	Air, Ambient, Puget Sound Clean Air Authority (PSCAA) Ch. 70.94 RCW	J&E Less Protective	J&E Best Protective	J&E More Protective	CA EPA OEHHA HH-Indoor Air **Residential** Screening Levels
UNITS	**ppbv**	**µg/m³**	**ppbv**	**µg/m³**	**ppbv**	**ppbv**	**ppbv**	**µg/m³**	**ppbv**	**µg/m³**	**ppbv**	**ppbv**	**ppbv**	**ppbv**	**ppbv**	**ppbv**	**ppbv**	**mg/m³**
pcb mixtures						*						*		**2000**				
pcb - Aroclor 1016						*						*						
pcb - Aroclor 1221						*						*						
pcb - Aroclor 1232						*						*						
pcb - Aroclor 1242						*						*						
pcb - Aroclor 1248						*						*						
pcb - Aroclor 1254						*						*						
pcb - Aroclor 1260						*						*						
Total Petroleum Hydrocarbons						*						*						
Gasoline						*						*	**14000000**					
Gasoline (w/benzene)						*						*						
Diesel						*						*						
Heavy Oil						*						*						
						*						*						

MEDIA - MTCA Standard	AIR Potential ARAR's														
PATHWAYS HH - Human Health Ecol- Ecological	CA EPA OEHHA HH-Indoor Air **Commercial/ Industrial** Screening Levels	CA EPA OEHHA HH-Indoor Air **Residential** Screening Levels	CA EPA OEHHA HH-Indoor Air **Commercial/ Industrial** Screening Levels	CA EPA OEHHA HH-Shallow Soil Gas (Vapor Intrusion) **Residential** Screening Levels	CA EPA OEHHA HH-Shallow Soil Gas (Vapor Intrusion) **Residential** Screening Levels	CA EPA OEHHA HH-Shallow Soil Gas (Vapor Intrusion) **Commercial/Industrial** Screening Levels	CA EPA OEHHA HH-Shallow Soil Gas (Vapor Intrusion) **Commercial/Industrial** Screening Levels	CERCLA EPA Regional Screening Level (RSL; May, 2010) ***Residential (mixed Carc & NC)***	CERCLA EPA Regional Screening Level (RSL; May, 2010) ***Residential (mixed Carc & NC)***	CERCLA EPA Regional Screening Level (RSL; May, 2010) ***Industrial (mixed Carc & NC)***	CERCLA EPA Regional Screening Level (RSL; May, 2010) ***Industrial (mixed Carc & NC)***	NIOSH PEL **TWA**	NIOSH PEL **STEL**	American Conference Of Governmental Industrial Hygenists (ACGIH) Threshold Limit Values **TLV**	EPA National Ambient Air Quality Standards (NAAQS) Clean Air ACT 40 CFR part 50
UNITS	**mg/m^3**	**ppbv**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**ppbv**	**ppbv**	**mg/m^3**	**ppbv**
pcb mixtures								**0.0043**	**0.000291233**	**0.021**	**0.001422299**				
pcb - Aroclor 1016								**0.12**	**0.011376503**	**0.61**	**0.057830554**				
pcb - Aroclor 1221								**0.0043**	**0.000523842**	**0.021**	**0.002558296**				
pcb - Aroclor 1232								**0.0043**	**0.000452778**	**0.021**	**0.00221124**				
pcb - Aroclor 1242								**0.0043**	**0.000394503**	**0.021**	**0.001926642**				
pcb - Aroclor 1248								**0.0043**	**0.00035045**	**0.021**	**0.0017115**				
pcb - Aroclor 1254								**0.0043**	**0.000320534**	**0.021**	**0.001565396**				
pcb - Aroclor 1260								**0.0043**	**0.000293919**	**0.021**	**0.001435421**				
Total Petroleum Hydrocarbons															
Gasoline															
Gasoline (w/benzene)															
Diesel														**100**	
Heavy Oil															

MEDIA - MTCA Standard							Conversion Tables		Always Applicable				EPA Method	AIR MOST STRINGENT
PATHWAYS HH - Human Health Ecol- Ecological	Air, L&I-DOSH Worker Safety (PEL's) 29 CFR/Ch. 296-841 WAC TWA	Air, L&I-DOSH Worker Safety (PEL's) 29 CFR/Ch. 296-841 WAC TWA	Air, L&I-DOSH Worker Safety (PEL's) 29 CFR/Ch. 296-841 WAC TWA - **LESS**	Air, L&I-DOSH Worker Safety (PEL's) 29 CFR/Ch. 296-841 WAC TWA - **LESS**	Air, L&I-DOSH Worker Safety (PEL's) 29 CFR/Ch. 296-841 WAC **TWA**	Air, L&I-DOSH Worker Safety (PEL's) 29 CFR/Ch. 296-841 WAC **STEL**	Molecular Weight	Convert µg/m^3 or mg/m^3 to ppbv	Natural **Background** Levels Ch. 173-340 WAC	Applicable **DL (MDL)** Ch. 173-340 WAC	Applicable **RL (MRL/PQL)** Ch. 173-340 WAC	Applicable **RL (MRL/PQL)** Ch. 173-340 WAC	Analytical Method	Screening Levels
UNITS	**mg/m^3**	**ppbv**	**mg/m^3**	**ppbv**	**ppbv**	**ppbv**	**Unitless**	**Unitless**	**ppbv**	**ppbv**	**ug/m^3**	**ppbv**		**ppbv**
pcb mixtures	**0.5**	**33.86426593**	**1.5**	**101.5927978**			**361**							**0.000291233**
pcb - Aroclor 1016							**257.9**							
pcb - Aroclor 1221							**200.7**							
pcb - Aroclor 1232							**232.2**							
pcb - Aroclor 1242							**266.5**							
pcb - Aroclor 1248							**300**							
pcb - Aroclor 1254							**328**							
pcb - Aroclor 1260							**357.7**							
Total Petroleum Hydrocarbons										**235.32**			**WA APH**	
Gasoline					**300000**	**500000**								**300000**
Gasoline (w/benzene)														
Diesel														
Heavy Oil														

Chemical Units	BCF*** L/kg	RfD*** mg/kg-day	BCF[$$$] L/kg	RfD[$$$] mg/kg-day	Non-Carc SW CUL* µg/L	Mod (Tribal Adult - w/o Salmon) Non-Carc** µg/L	Mod (Tribal Child - w/o Salmon) Non-Carc** µg/L	EPA Tribal Adult w/o Salmon [$$$] µg/L	EPA Tribal Child w/o Salmon [$$$] µg/L
Acetone		0.1	3.16	0.9				239932.7328	110107.0077
Acenaphthene	242	0.06	201	0.06	642.7915519	208.8670622	95.85072847	251.4717863	115.4023696
Acenaphthylene									
Anthracene	30	0.3	582	0.3	25925.92593	8424.30484	3865.979381	434.2425175	199.2772877
Benzene	5.2	0.004	8.26	0.004	1994.301994	648.0234493	297.3830293	407.9566509	187.2144979
Benzo(g,h,i)perylene									
Benzo(a)anthracene	30		4886						
Benzo(a)pyrene	30		8317						
Benzo(b)fluoranthene	30		10400						
Benzo(k)fluoranthene	30		9930						
bis(2-Ethylhexyl)phthalate	130	0.02	53.3	0.02	398.8603989	129.6046899	59.47660587	316.1089996	145.0648924
Butyl benzyl phthalate	414	0.2	1183	0.2	1252.46019	406.9712483	186.762289	142.4227361	65.35890755
Carbon Tetrachloride	18.75	0.0007	28.6	0.004	96.79012346	31.45073807	14.43298969	117.8224453	54.0696417
Chlorobenzene		0.02	28.6	0.02				589.1122266	270.3482085
Chloroethane			2.39						
Chloroform	3.75	0.01	6.92	0.01	6913.580247	2246.481291	1030.927835	1217.385093	558.6675407
Chloromethane	3.75		3.16						
Chrysene	30		4890						
Dibenz[a,h]anthracene	30		20183						
Dibenzofuran		0.002							
Di-n-butylphthalate	89	0.1	830	0.1	2913.025385	946.5511057	434.3797058	101.4976487	46.57806484
1,2-Dichlorobenzene	55.6	0.09	79.9	0.09	4196.642686	1363.646467	625.7880294	948.9204451	435.4670142
1,3-Dichlorobenzene									
1,4-Dichlorobenzene	55.6								
1,1-Dichloroethane		0.2	4.86	0.2				34667.92115	15909.38017
1,2-Dichloroethane	1.2	0.02	2.85	0.02	43209.87654	14040.50807	6443.298969	5911.79287	2712.967987
1,1-Dichloroethene	5.6	0.05	8.26	0.05	23148.14815	7521.70075	3451.767305	5099.458136	2340.181224
diethyl phthalate	73	0.8	16.8		28411.97362	9232.114894	4236.689733		
dimethyl phthalate	36	1	3.17		72016.46091	23400.84678	10738.83162		
di-n-octyl phthalate		0.02	63.5						
Ethylbenzene	37.5	0.1	48.6	0.1	6913.580247	2246.481291	1030.927835	1733.396058	795.4690085
Fluoranthene	1150	0.04	1410	0.04	90.17713366	29.30192988	13.44688481	23.89873714	10.96731739
Fluorene	30	0.04	342	0.04	3456.790123	1123.240645	515.4639175	98.52988117	45.21613312
hexachlorobenzene	8700	0.0008			0.238399319	0.077464872	0.035549236		
Hexachlorobutadiene	2.8	0.0002			185.1851852	60.173606	27.61413844		
Indeno(1,2,3-cd)pyrene	30		24100						
MEK (Methyl Ethyl Ketone;2-Butanone)		0.6	3.16	0.6				159955.1552	73404.6718
Methylene Chloride	0.9	0.06	2	0.06	172839.5062	56162.03227	25773.19588	25272.91452	11597.93814
2-Methylnaphthalene		0.004		0.004					
MIBK (M-Isobutyl-K;4-M,2-Pentanone)		0.08							
Naphthalene	10.5	0.02	69	0.02	4938.271605	1604.629493	736.377025	244.182749	112.0573734
nitrosodiphenylamine, N-	136		118						
Polychlorinated biphenyls (PCBs)	31200		20000						
Aroclor 1016	31200	0.00007	20000	0.00007	0.005816714	0.001890068	0.000867367	0.002948507	0.001353093
Aroclor 1221			20000						
Aroclor 1232									
Aroclor 1242			20000						
Aroclor 1248			20000						
Aroclor 1254	31200	0.00002	84000	0.00002	0.001661918	0.00054002	0.000247819	0.000200579	9.20471E-05
Aroclor 1260			20000						
Phenanthrene			582						

Chemical Units	BCF*** L/kg	RfD*** mg/kg-day	BCF[$$$] L/kg	RfD[$$$] mg/kg-day	Non-Carc SW CUL* µg/L	Mod (Tribal Adult - w/o Salmon) Non-Carc** µg/L	Mod (Tribal Child - w/o Salmon) Non-Carc** µg/L	EPA Tribal Adult w/o Salmon [$$$] µg/L	EPA Tribal Child w/o Salmon [$$$] µg/L
Pyrene		0.03	1180	0.03				21.41772417	9.828761139
Tetrachloroethene	31	0.01	82.8	0.01	836.3201912	271.751769	124.7090123	101.7428121	46.69057224
1,2,4-Trichlorobenzene	114	0.01	240	0.01	227.4204029	73.89741088	33.91209984	35.10127017	16.10824742
1,1,1-Trichloroethane	5.6	2	16.8	2	925925.9259	300868.03	138070.6922	100289.3433	46023.56406
1,1,2-Trichloroethane	4.5	0.004	6.92	0.004	2304.526749	748.8270969	343.6426117	486.954037	223.4670163
Trichloroethene	11	0.0003	14	0.0003	70.70707071	22.97537684	10.54358013	18.0520818	8.284241532
1,3,5-Trimethylbenzene		0.05	85.5	0.01				98.52988117	45.21613312
Toluene	10.7	0.08	23.9	0.08	19383.86985	6298.545675	2890.451874	2819.850993	1294.051676
Vinyl Chloride	1.17	0.003	2.4	0.003	6647.673314	2160.078164	991.2767645	1053.038105	483.2474227
Xylene		0.2	49	0.2				3438.491772	1577.950768
benzoic acid		4							
Benzyl Alcohol		0.3							
2,4-Dimethylphenol	93.8	0.02	11.8	0.02	552.7915976	179.6227045	82.430264	1427.848278	655.2507426
2-Methylphenol (o-cresol)		0.05	6.33	0.05				6654.269226	3053.696194
4-Methylphenol (p-cresol)		0.005	5.79	0.005				727.4874646	333.8496875
Pentachlorophenol	11	0.03			7070.707071	2297.537684	1054.358013		
Total Phenol	1.4	0.6	2.85	0.3	1111111.111	361041.636	165684.8306	88676.89306	40694.5198
Styrene		0.2							
Tributyltin		0.00003							
2,4,6-Trichlorophenol	150								
Aluminum									
Antimony	1	0.0004	40	0.0004	1037.037037	336.9721936	154.6391753	8.42430484	3.865979381
Arsenic (III)									
Arsenic (V)									
Arsenic	44	0.0003	114	0.0003	17.67676768	5.743844209	2.635895033	2.216922326	1.017362995
Barium		0.2	633	0.2				266.170769	122.1478478
Beryllium	19	0.002	62	0.002	272.9044834	88.67689306	40.6945198	27.1751769	12.47090123
Cadmium	64	0.0005	907	0.001	20.25462963	6.581488157	3.020296392	0.928809795	0.42623808
Chromium (VI)	16	0.003	3.2	0.003	486.1111111	157.9557158	72.4871134	789.7785788	362.435567
Chromium									
Cobalt									
Copper	36	0.037	36	0.04	2664.609053	865.8313308	397.3367698	936.0338712	429.5532646
Iron									
Lead			0.09						
Manganese		0.14		0.024					
Mercury		0.0003	5000	0.00016				0.026957775	0.012371134
Mercury (organic)		0.0001	85000	0.0001				0.000991095	0.000454821
Molybdenum		0.005							
Nickel	47	0.02	78	0.02	1103.23089	358.481057	164.5097609	216.0078164	99.12767645
Selenium	4.8	0.005	129	0.005	2700.617284	877.5317542	402.7061856	32.65234434	14.98441621
Silver	0.5	0.005	88	0.005	25925.92593	8424.30484	3865.979381	47.86536841	21.96579194
Tin			10000						
Thallium	116	0.00007			1.56449553	0.508363223	0.233291859		
Vanadium		0.007		0.00007					
Zinc	47	0.3	2059	0.3	16548.46336	5377.215856	2467.646414	122.7436354	56.3280143
LPAH									
HPAH									
Total Petroleum Hydrocarbons									
Gasoline									

Chemical Units	BCF*** L/kg	RfD*** mg/kg-day	BCF[$$$] L/kg	RfD[$$$] mg/kg-day	Non-Carc SW CUL* µg/L	Mod (Tribal Adult - w/o Salmon) Non-Carc** µg/L	Mod (Tribal Child - w/o Salmon) Non-Carc** µg/L	EPA Tribal Adult w/o Salmon [$$$] µg/L	EPA Tribal Child w/o Salmon [$$$] µg/L
Gasoline (w/benzene)									
Diesel									
Heavy Oil									
2,3,7,8-TCDD	5000	1E-09	34400	1.0E-09	5.18519E-07	1.68486E-07	7.73196E-08	2.44893E-08	1.12383E-08
Aldrin	4670	0.00003			0.01665477	0.005411759	0.002483499		
alpha-BHC	130								
beta-BHC	130								
gamma-BHC (Lindane)	130	0.0003			5.982905983	1.944070348	0.892149088		
Chlordane	14100	0.0005			0.091935908	0.029873421	0.013709147		
4,4'-DDT	53600	0.0005			0.024184632	0.007858493	0.003606324		
4,4'-DDE	53600								
4,4'-DDD	53600								
Dieldrin	4670	0.00005			0.027757951	0.009019598	0.004139164		
alpha-Endosulfan (959-98-8)	270	0.006			57.61316872	18.72067742	8.591065292		
beta-Endosulfan (891-86-1)	270	0.006			57.61316872	18.72067742	8.591065292		
Endosulfan Sulfate (1031-07-8)	270	0.006			57.61316872	18.72067742	8.591065292		
Endrin	3970	0.0003			0.195913798	0.063659734	0.02921395		
Endrin Aldehyde	3970	0.0003			0.195913798	0.063659734	0.02921395		
Heptachlor	11200	0.0005			0.115740741	0.037608504	0.017258837		
Heptachlor Epoxide	11200	0.000013			0.003009259	0.000977821	0.00044873		
Toxaphene	13100								

Non-Carcinogenic Surface Water Cleanup Level*

* See Surface Water CUL Sheet - Method B, Carc, CLARC Database
** Modified EQ 730-1 parameters to match EPA LDW-Tribal Consumption Rates Using CLARC BCF/Rfd When Available
*** From CLARC (unless not available, then from EPA) $^{\$\$\$}$ BCF/RfD from EPA Plant 2 TMCL Documents

MTCA EQ. 730-1 CUL (ug/L) = (RfD*ABW*AT*HQ*UCF1*UCF2)/(BCF*FCR*FDF*ED)

Parameter	Symbol	Value	Units	Source
Reference Dose(Oral)	*RfD*	*Chemical Specific*	*mg/kg-day*	*Chemical Specific*
Risk	*Risk*	*0.000001*	*unitless*	*MTCA Default*
Average body weight over the exposure duration (Adult)	*ABW*	*70 (81.8) (63)*	*kg*	*MTCA Default (Tribal) (API)*
Average body weight over the exposure duration (Child)	*ABW*	*(15) (15)*	*kg*	*MTCA Default (Tribal) (API)*
Average time	*AT*	*30 (64) (24)*	*years*	*MTCA Default*
Unit Conversion Factor 1	*UCF1*	*1000*	*ug/mg*	*MTCA Eq. 730-2*
Unit Conversion Factor 2	*UCF2*	*1000*	*g/L*	*MTCA Eq. 730-2*
Bioconcentration factor	*BCF*	*Chemical Specific*	*L/kg*	*Chemical Specific*
Fish consumption rate [w/o Salmon](Adult)	*FCR*	*54 (97.1) (57.1)*	*g/day*	*MTCA Default (Tribal) (API)*
Fish consumption rate [w/o Salmon](Child)	*FCR*	*(38.8) (23)*	*g/day*	*MTCA Default (Tribal) (API)*
Fish Diet Fraction	*FDF*	*0.5 (1.0) (1.0)*	*unitless*	*MTCA Default (Tribal) (API)*
Exposure Duration (Adult)	*ED*	*30 (64) (24)*	*years*	*MTCA Default (Tribal) (API)*
Exposure Duration (Child)	*ED*	*(6) (6)*	*years*	*MTCA Default (Tribal) (API)*

(Tribal) = Tulalip Tribe (EPA, 2008)
(API) = Asian & Pacific Islander (EPA, 2005)

Chemical Units	BCF*** L/kg	CPFo kg-day/mg	BCF[$$$] L/kg	CPFo[$$$] mg/kg-day	Carc SW CUL* µg/L	Mod (Tribal Adult - w/o Salmon) Carc** µg/L	Mod (Tribal Child - w/o Salmon) Carc** µg/L	EPA Tribal Adult w/o Salmon [$$$] µg/L	EPA Tribal Child w/o Salmon [$$$] µg/L
Acetone			3.16						
Acenaphthene	242		201						
Acenaphthylene									
Anthracene	30		582						
Benzene	5.2	0.055	8.26	0.055	22.66252266	3.221707489	15.77031216	2.028193577	9.928041555
Benzo(g,h,i)perylene									
Benzo(a)anthracene	30	7.3	4886	0.73	0.029595806	0.004507869	0.02059502	0.000258331	0.001264533
Benzo(a)pyrene	30	7.3	8317	7.3	0.029595806	0.004507869	0.02059502	1.51762E-05	7.42877E-05
Benzo(b)fluoranthene	30	7.3	10400	0.73	0.029595806	0.004507869	0.02059502	0.000121366	0.000594087
Benzo(k)fluoranthene	30	7.3	9930	0.73	0.029595806	0.004507869	0.02059502	0.00012711	0.000622206
bis(2-Ethylhexyl)phthalate	130	0.014	53.3	0.014	3.561253561	0.542430343	2.478191911	1.23480078	6.044370515
Butyl benzyl phthalate	414	0.0019	1183	0.0019	8.239869669	1.255051136	5.733929924	0.409933862	2.006633126
Carbon Tetrachloride	18.75	0.13	28.6	0.13	2.659069326	0.405014656	1.850383294	0.247823653	1.213100936
Chlorobenzene			28.6						
Chloroethane			2.39						
Chloroform	3.75	0.0061	6.92	0.031	283.3434527	43.15729939	197.1719903	4.2952095	21.0251225
Chloromethane	3.75	0.013	3.16	0.013	132.9534663	20.25073279	92.51916468	22.4296091	109.7933125
Chrysene	30	7.3	4890	0.073	0.029595806	0.004507869	0.02059502	0.002581193	0.012634981
Dibenz[a,h]anthracene	30	7.3	20183	0.73	0.029595806	0.004507869	0.02059502	6.25379E-05	0.000306124
Dibenzofuran									
Di-n-butylphthalate	89		830						
1,2-Dichlorobenzene	55.6		79.9						
1,3-Dichlorobenzene									
1,4-Dichlorobenzene	55.6	0.024		0.024	4.857225331	0.739825557	3.380027936		
1,1-Dichloroethane		0.0057	4.86	0.0057				33.26143751	162.8152941
1,2-Dichloroethane	1.2	0.091	2.85	0.091	59.35422602	9.04050571	41.30319852	3.552760138	17.39082043
1,1-Dichloroethene	5.6		8.26						
diethyl phthalate	73		16.8						
dimethyl phthalate	36		3.17						
di-n-octyl phthalate			63.5						
Ethylbenzene	37.5	0.011	48.6	0.011		2.393268421	10.9340831		
Fluoranthene	1150		1410						
Fluorene	30		342						
hexachlorobenzene	8700	1.6	8700	1.6	0.000465624	7.09212E-05	0.000324016	6.61931E-05	0.000324016
Hexachlorobutadiene	2.8	0.078	2.8	0.078	29.67711301	4.520252855	20.65159926	4.218902664	20.65159926
Indeno(1,2,3-cd)pyrene	30	7.3	24100	0.73	0.029595806	0.004507869	0.02059502	5.23736E-05	0.00025637
MEK (Methyl Ethyl Ketone;2-Butanone)			3.16						
Methylene Chloride	0.9	0.0075	2	0.0075	960.2194787	146.2552924	668.1939672	61.42722279	300.6872852
2-Methylnaphthalene									
MIBK (M-Isobutyl-K;4-M,2-Pentanone)									
Naphthalene	10.5		69						
nitrosodiphenylamine, N-	136	0.0049	118	0.0049	9.726112667	1.481427406	6.768171186	1.593580667	7.800604079
Polychlorinated biphenyls (PCBs)	31200	2	20000	2	0.00010387	1.58209E-05	7.22806E-05	2.30352E-05	0.000112758
Aroclor 1016	31200	0.07	20000	0.07	0.002967711	0.000452025	0.00206516	0.000658149	0.003221649
Aroclor 1221		2	20000	2				2.30352E-05	0.000112758
Aroclor 1232		2		2					
Aroclor 1242		2	20000	2				2.30352E-05	0.000112758
Aroclor 1248		2	20000	2				2.30352E-05	0.000112758
Aroclor 1254	31200	2	84000	2	0.00010387	1.58209E-05	7.22806E-05	5.48457E-06	2.68471E-05
Aroclor 1260		2	20000	2				2.30352E-05	0.000112758
Phenanthrene			582						

Chemical Units	BCF*** L/kg	CPFo kg-day/mg	BCF$^{\$\$\$}$ L/kg	CPFo$^{\$\$\$}$ mg/kg-day	Carc SW CUL* µg/L	Mod (Tribal Adult - w/o Salmon) Carc** µg/L	Mod (Tribal Child - w/o Salmon) Carc** µg/L	EPA Tribal Adult w/o Salmon $^{\$\$\$}$ µg/L	EPA Tribal Child w/o Salmon $^{\$\$\$}$ µg/L
Pyrene			1180						
Tetrachloroethene	31	0.54	82.8	0.54	0.387185274	0.058973908	0.269433051	0.02060763	0.100874693
1,2,4-Trichlorobenzene	114		240						
1,1,1-Trichloroethane	5.6		16.8						
1,1,2-Trichloroethane	4.5	0.057	6.92	0.057	25.26893365	3.848823483	17.58405177	2.335991132	11.43471574
Trichloroethene	11	0.089	14	0.089	6.620512238	1.008399615	4.607057486	0.739493051	3.619830882
1,3,5-Trimethylbenzene			85.5						
Toluene	10.7		23.9						
Vinyl Chloride	1.17	1.5	2.4	0.72	3.693151841	0.562520355	2.569976797	0.53322242	2.610132684
Xylene			49						
benzoic acid									
Benzyl Alcohol									
2,4-Dimethylphenol	93.8		11.8						
2-Methylphenol (o-cresol)			6.33						
4-Methylphenol (p-cresol)			5.79						
Pentachlorophenol	11	0.12	11	0.12	4.910213244	0.747896381	3.416900968	0.698036623	3.416900968
Total Phenol	1.4		2.85						
Styrene									
Tributyltin									
2,4,6-Trichlorophenol	150	0.011	150	0.011	3.928170595	0.598317105	2.733520775	0.558429298	2.733520775
Aluminum									
Antimony	1		40						
Arsenic (III)									
Arsenic (V)									
Arsenic	44	1.5	114	1.5	0.098204265	0.014957928	0.068338019	0.005388353	0.026376078
Barium			633						
Beryllium	19		62						
Cadmium	64		907						
Chromium (VI)	16	0.5	3.2	0.5	0.810185185	0.123402903	0.56378866	0.575880214	2.818943299
Chromium									
Cobalt									
Copper	36		36						
Iron									
Lead			0.09						
Manganese									
Mercury			5000						
Mercury (organic)			85000						
Molybdenum									
Nickel	47		78						
Selenium	4.8		129						
Silver	0.5		88						
Tin			10000						
Thallium	116								
Vanadium									
Zinc	47		2059						
LPAH									
HPAH									
Total Petroleum Hydrocarbons									
Gasoline									

Chemical Units	BCF*** L/kg	CPFo kg-day/mg	BCF[$$$] L/kg	CPFo[$$$] mg/kg-day	Carc SW CUL* µg/L	Mod (Tribal Adult - w/o Salmon) Carc** µg/L	Mod (Tribal Child - w/o Salmon) Carc** µg/L	EPA Tribal Adult w/o Salmon [$$$] µg/L	EPA Tribal Child w/o Salmon [$$$] µg/L
Gasoline (w/benzene)									
Diesel									
Heavy Oil									
2,3,7,8-TCDD	5000	150000	34400	1.3E+05	8.64198E-09	1.3163E-09	6.01375E-09	2.06039E-10	1.00857E-09
Aldrin	4670	17			8.1641E-05	1.24351E-05	5.68121E-05		
alpha-BHC	130	6.3			0.007913897	0.001205401	0.005507093		
beta-BHC	130	1.8			0.027698639	0.004218903	0.019274826		
gamma-BHC (Lindane)	130								
Chlordane	14100	0.35			0.00131337	0.000200045	0.000913943		
4,4'-DDT	53600	0.34			0.000355656	5.41716E-05	0.000247493		
4,4'-DDE	53600	0.34			0.000355656	5.41716E-05	0.000247493		
4,4'-DDD	53600	0.24			0.000503847	7.67431E-05	0.000350615		
Dieldrin	4670	16			8.67436E-05	1.32123E-05	6.03628E-05		
alpha-Endosulfan (959-98-8)	270								
beta-Endosulfan (891-86-1)	270								
Endosulfan Sulfate (1031-07-8)	270								
Endrin	3970								
Endrin Aldehyde	3970								
Heptachlor	11200	4.5			0.000128601	1.95878E-05	8.94903E-05		
Heptachlor Epoxide	11200	9.1			6.35938E-05	9.68626E-06	4.42534E-05		
Toxaphene	13100	1.1			0.000449791	6.85096E-05	0.000312999		

Carcinogenic Surface Water Cleanup Level*

* See Surface Water CUL Sheet - Method B, Carc, CLARC Database
** Modified EQ 730-2 parameters to match EPA LDW-Tribal Consumption Rates Using CLARC BCF/CPFo when available
*** From CLARC (unless not available, then from EPA) $$$ BCF/CPFo from EPA Plant 2 TMCL Documents (10/2010)

MTCA EQ. 730-2 CUL (ug/L) = (Risk*ABW*AT*UCF1*UCF2)/(CPF*BCF*FCR*FDF*ED)

Parameter	Symbol	Value	Units	Source
Cancer Potency Factor (Oral)	*CPFo*	*Chemical Specific*	*kg-day/mg*	*Chemical Specific*
Risk	*Risk*	*0.000001*	*unitless*	*MTCA Default*
Average body weight over the exposure duration (Adult)	*ABW*	*70 (81.8) (63)*	*kg*	*MTCA Default (Tribal) (API)*
Average body weight over the exposure duration (Child)	*ABW*	*(15) (15)*	*kg*	*MTCA Default (Tribal) (API)*
Average time	*AT*	*75 (70) (70)*	*years*	*MTCA Default*
Unit Conversion Factor 1	*UCF1*	*1000*	*ug/mg*	*MTCA Eq. 730-2*
Unit Conversion Factor 2	*UCF2*	*1000*	*g/L*	*MTCA Eq. 730-2*
Bioconcentration factor	*BCF*	*Chemical Specific*	*L/kg*	*Chemical Specific*
Fish consumption rate [w/o Salmon](Adult)	*FCR*	*54 (97.1) (57.1)*	*g/day*	*MTCA Default (Tribal) (API)*
Fish consumption rate [w/o Salmon](Child)	*FCR*	*(38.8) (23)*	*g/day*	*MTCA Default (Tribal) (API)*
Fish Diet Fraction	*FDF*	*0.5 (1.0) (1.0)*	*unitless*	*MTCA Default (Tribal) (API)*
Exposure Duration (Adult)	*ED*	*30 (64) (24)*	*years*	*MTCA Default (Tribal) (API)*
Exposure Duration (Child)	*ED*	*(6) (6)*	*years*	*MTCA Default (Tribal) (API)*

(Tribal) = Tulalip Tribe (EPA, 2008)
(API) = Asian & Pacific Islander (EPA, 2005)

Chemical	GW/SW CUL	Koc***	Koc$^{\$\$\$}$	Koc**	Kd	Henry's Law***	Henry's Law$^{\$\$\$}$	VADOSE Soil to Water Protection (mg/kg)	SATURATED Soil to Water Protection (mg/kg)
		L/kg	L/kg	L/kg	ml/g	Dimensionless	Dimensionless		
Acetone			2.364	1.981	0.001981	0.001623835	0.00159	0	0
Acenaphthene		**4898**	5027	6123	6.123	0.004225243	0.00636	0	0
Acenaphthylene			2759	6123	6.123	0.00511283	0.00451	0	0
Anthracene		**23000**	16360	20400	20.4	0.002274187	0.00267	0	0
Benzene		**62**	145.8	165.5	0.1655	0.227009649	0.228	0	0
Benzo(g,h,i)perylene				2676000	2676	1.35388E-05		0	0
Benzo(a)anthracene		**357537**	176900	426600	426.6	1.73836E-05	0.00014	0	0
Benzo(a)pyrene		**968774**	587400	786800	786.8	1.86925E-05	0.000046	0	0
Benzo(b)fluoranthene		**1200000**	599400	803100	803.1	2.6873E-05	0.0046	0	0
Benzo(k)fluoranthene			587400	786800	786.8	2.38871E-05	0.000034	0	0
bis(2-Ethylhexyl)phthalate		**111123**	119600	165400	165.4	1.10437E-05	0.00000418	0	0
Butyl benzyl phthalate		**13746**	7155	9359	9.359	5.15373E-05	0.0000517	0	0
Carbon Tetrachloride		**152**	43.89	48.64	0.04864	1.3	1.2	0	0
Chlorobenzene		**224**	233.9	268	0.268	0.127207209	0.152	0	0
Chloroethane			21.73	23.74	0.02374	0.454019298	0.3608	0	0
Chloroform		**53**	31.82	35.04	0.03504	0.150112687	0.15	0	0
Chloromethane			13.22	14.3	0.0143	0.36076128	0.3608	0	0
Chrysene			180500	236100	236.1	0.000213921	0.0039	0	0
Dibenz[a,h]anthracene		**1789101**	1912000	2622000	2622	5.03102E-06	0.0000006	0	0
Dibenzofuran			9161	11290	11.29	0.008712262		0	0
Di-n-butylphthalate		**1600**	1157	1460	1.46	7.40338E-05	3.85E-08	0	0
1,2-Dichlorobenzene		**379**	382.9	443.1	0.4431	0.078533068	0.0779	0	0
1,3-Dichlorobenzene								0	0
1,4-Dichlorobenzene		**616**		434	0.434	0.099		0	0
1,1-Dichloroethane		**53**	31.82	35.04	0.03504	0.229872834	0.23	0	0
1,2-Dichloroethane		**38**	39.6	43.79	0.04379	0.048265115	0.0401	0	0
1,1-Dichloroethene		**65**	31.82	35.04	0.03504	1.06755889	1.07	0	0
diethyl phthalate		**82**	104.9	126.2	0.1262	0.000025	0.0000185	0	0
dimethyl phthalate								0	0
di-n-octyl phthalate		**1567**			**1.567**	0.0027		0	0
Ethylbenzene		**204**	446.1	517.8	0.5178	0.322312799	0.323	0	0
Fluoranthene		**49096**	55450	70850	70.85	0.000362397	0.00066	0	0
Fluorene		**7707**	9160	11290	11.29	0.003934834	0.00261	0	0
hexachlorobenzene		**80000**		3380	3.38	0.07		0	0
Hexachlorobutadiene				993.5	0.9935	42.12971863		0	0
Indeno(1,2,3-cd)pyrene		**3,500,000**	1951000	2676000	2676	1.42341E-05	0.000066	0	0
MEK (Methyl Ethyl Ketone;2-Butanone)			4.51				0.002296	0	0
Methylene Chloride		**10**	21.73	23.74	0.02374	0.211875672	0.0898	0	0
2-Methylnaphthalene				2976	2.976	0.021187567		0	0
MIBK (M-Isobutyl-K;4-M,2-Pentanone)								0	0
Naphthalene		**1191**	1544	1837	1.837	0.017997161	0.0198	0	0
nitrosodiphenylamine, N-		**1290**	2632	6154	6.154	0.000049	0.000205	0	0
Polychlorinated biphenyls (PCBs)		**310000**	130500	44820	44.82	0.014		0	0
Aroclor 1016		**107285**	47700	27110	27.11	0.008180528	0.0119	0	0
Aroclor 1221			8397	10330	10.33	0.030104343	0.0119	0	0
Aroclor 1232				10330	10.33	0.030104343	0.0119	0	0
Aroclor 1242			78100	448.2	0.4482	0.007771501	0.0119	0	0
Aroclor 1248				43900	43.9	0.017997161	0.0119	0	0
Aroclor 1254			130500	75640	75.64	0.011575447	0.0119	0	0
Aroclor 1260		**822422**	349700	207000	207	0.013743287	0.0119	0	0
Phenanthrene				20830	20.83	0.001730182		0	0
Pyrene		**67992**	54340	69410	69.41	0.000486741	0.000451	0	0
Tetrachloroethene		**265**	94.94	106.8	0.1068	0.723976718	0.754	0	0
1,2,4-Trichlorobenzene		**1659**		67.7	0.0677	0.0337		0	0
1,1,1-Trichloroethane		**135**	43.89	48.64	0.04864	0.703525398	0.705	0	0
1,1,2-Trichloroethane		**75**	60.7	67.7	0.0677	0.033703775	0.037	0	0
Trichloroethene		**94**	60.7	67.7	0.0677	0.402890999	0.422	0	0
1,3,5-Trimethylbenzene			602.1	703	0.703	0.358716148	0.32	0	0
Toluene		**140**	233.9	268	0.268	0.211875672	0.272	0	0

Insert GW or SW screening criteria to determine vadose soil concentration that is protective**

** Note that the EPA Koc values (column D), not MTCA(column C), are default values used to determine Kd

*** From CLARC (unless not available, then from EPA)

$^{\$\$\$}$ From EPA Plant 2 TMCL Documents

MTCA EQ. 747-1

$$C_s = C_w (UCF) DF * \left[K_d + \frac{(\theta_w + \theta_a H_{cc})}{\rho_b} \right]$$

MTCA EQ. 747-2

$$K_d = K_{oc} \, x \, f_{oc}$$

(For NonIonic & Ionizing Organic Substances)

Parameter	Symbol	Value	Units	Source
Soil concentration	C_S	Calculated Value	mg/kg	Calculated Value
Groundwater/Surfacewater screening level	*Cw*	Chemical Specific	ug/l	Pathway Specific
UCF	*Unit coversion factor*	0.001	mg/ug	MTCA
Dilution faction	*DF*	**20***	dimensionless	**Vadose Soil**
Distribution coefficient	*Kd*	Chemical Specific	L/kg	Chemical Specific
Soil organic carbon-water partitioning coefficient	*Koc*	Chemical Specific	ml/g	Chemical Specific
Soil fraction of organic carbon - for silty sands	*foc*	0.001	g/g	Site Specific -**Default**
Water-filled soil porosity	*θw*	**0.3*****	ml water/ml soil	Site Specific -**Default**
Air-filled soil porosity	*θa*	**0.13*****	ml air/ml soil	Site Specific -**Default**
Henry's law constant	*Hcc*	Chemical Specific	dimensionless	Chemical Specific
Dry soil bulk density	*ρb*	1.5	kg/L	Site Specific -**Default**

*** The dilution factor is 20 for Vadose soil, or 1 for Saturated Soil**

***** The Default Porosity for Water/Air Fill is 0.3/0.13 for Vadose Soil & 0.43/0 Saturated Soils**

Chemical	GW/SW CUL	Koc***	Koc^{SSS}	Koc**	Kd	Henry's Law***	Henry's Law^{SSS}	VADOSE Soil to Water Protection (mg/kg)	SATURATED Soil to Water Protection (mg/kg)
		L/kg	L/kg	L/kg	ml/g	Dimensionless	Dimensionless		
Vinyl Chloride		**19**	21.73	23.74	0.02374	1.137093377	1.11	0	0
Xylene		**241**	375.3	443.1	0.4431	0.132933578	0.301	0	0
benzoic acid		**0.6**			**0.0006**	0.000063		0	0
Benzyl Alcohol				15.66	0.01566	1.37842E-05		0	0
2,4-Dimethylphenol			491.8	717.6	0.716	0.000039	0.000082	0	0
2-Methylphenol (o-cresol)			306.5	91	0.091	0.000049	0.0000492	0	0
4-Methylphenol (p-cresol)			300.4				0.0000324	0	0
Pentachlorophenol		**592**		3380	3.38	1.00211E-06		0	0
Total Phenol		**29**	187.2	18.1	0.0181	0.000323131	0.0000163	0	0
Styrene		**912**		517.8	0.5178	0.112482258		0	0
Tributyltin								0	0
2,4,6-Trichlorophenol		**381**		1186	1.186	0.000106347		0	0
								0	0
Aluminum								0	0
Antimony					45	0		0	0
Arsenic (III)								0	0
Arsenic (V)								0	0
Arsenic					29	0		0	0
Barium					41	0		0	0
Beryllium					790	0		0	0
Cadmium					6.7	0		0	0
Chromium (VI)					19	0		0	0
Chromium					1000	0		0	0
Cobalt								0	0
Copper					22	0		0	0
Iron								0	0
Lead					10000	0		0	0
Manganese					65			0	0
Mercury					52	0	0.47	0	0
Mercury (organic)								0	0
Molybdenum								0	0
Nickel					65	0		0	0
Selenium					5	0		0	0
Silver					8.3	0		0	0
Tin								0	0
Thallium					71	0		0	0
Vanadium					1000			0	0
Zinc					62	0		0	0
								0	0
LPAH								0	0
HPAH		**157213**		157.213				0	0
Total Petroleum Hydrocarbons								0	0
Gasoline								0	0
Gasoline (w/benzene)								0	0
Diesel								0	0
Heavy Oil								0	0
								0	0
2,3,7,8-TCDD				146300	146.3	0.002045132		0	0
								0	0
Aldrin		**48685**		96000	**48.685**	0.00697		0	0
alpha-BHC		**1762**		3800	**1.762**	0.000435		0	0
beta-BHC		**2139**		3800	**2.139**	0.0000305		0	0
gamma-BHC (Lindane)		**1352**		1080	**1.352**	0.000574		0	0
Chlordane		**51310**		21305	**51.31**	0.00199		0	0
4,4'-DDT		**677934**		243000	**677.934**	0.000332		0	0
4,4'-DDE		**86405**		440000	**86.405**	0.000861		0	0
4,4'-DDD		**45800**		770000	**45.8**	0.000164		0	0
Dieldrin		**25546**		10700	**25.546**	0.000619		0	0
alpha-Endosulfan (959-98-8)		**2040**		8168	**2.04**	0.000459		0	0
beta-Endosulfan (891-86-1)		**2040**		8031	**2.04**	0.000459		0	0

Chemical	GW/SW CUL	Koc*** L/kg	Koc^{SSS} L/kg	Koc** L/kg	Kd ml/g	Henry's Law*** Dimensionless	Henry's Law^{SSS} Dimensionless	VADOSE Soil to Water Protection (mg/kg)	SATURATED Soil to Water Protection (mg/kg)
Endosulfan Sulfate (1031-07-8)		**2040**		10038	**2.04**	0.000459		0	0
Endrin		**10811**		9157	**10.811**	0.000308		0	0
Endrin Aldehyde		**10811**			**10.811**	0.000308		0	0
Heptachlor		**9528**		12000	**9.528**	0.0447		0	0
Heptachlor Epoxide		**83200**		220	**83.2**	0.00039		0	0
Toxaphene								0	0
								0	0

Chemical	GW Screening Level	Koc	Kd	Henry's Law	Most Stringent VADOSE Soil to Water Protection (mg/kg)	Most Stringent SATURATED Soil to Water Protection (mg/kg)
	ug/l	L/kg	ml/g	Dimensionless		
Acetone	800	1.981	0.001981	0.001623835	3.233947718	0.2309
Acenaphthene	2.614379085	6123	6.123	0.004225243	0.330633526	0.017132026
Acenaphthylene	10.78431373	6123	6.123	0.00511283	1.363879887	0.070669608
Anthracene	10.78431373	20400	20.4	0.002274187	4.443179766	0.224637255
Benzene	0.795	165.5	0.1655	0.227009649	0.006124269	0.000473423
Benzo(g,h,i)perylene	0.011584454	2676000	2676	1.35388E-05	0.620046338	0.031004981
Benzo(a)anthracene	0.000112155	426600	426.6	1.73836E-05	0.000957358	4.78937E-05
Benzo(a)pyrene	6.5888E-06	786800	786.8	1.86925E-05	0.000103708	5.1869E-06
Benzo(b)fluoranthene	5.26914E-05	803100	803.1	2.6873E-05	0.00084654	4.23391E-05
Benzo(k)fluoranthene	5.51854E-05	786800	786.8	2.38871E-05	0.000868618	4.34436E-05
bis(2-Ethylhexyl)phthalate	0.284848485	165400	165.4	1.10437E-05	0.943418187	0.047236424
Butyl benzyl phthalate	0.523504274	9359	9.359	5.15373E-05	0.100083594	0.005124583
Carbon Tetrachloride	0.247823653	48.64	0.04864	1.3	0.001790807	0.000118618
Chlorobenzene	100	268	0.268	0.127207209	0.95804925	0.0698
Chloroethane		23.74	0.02374	0.454019298		
Chloroform	4.3	35.04	0.03504	0.150112687	0.02133228	0.001999672
Chloromethane	3.37	14.3	0.0143	0.36076128	0.016551147	0.001497291
Chrysene	0.001120636	236100	236.1	0.000213921	0.005296124	0.000265064
Dibenz[a,h]anthracene	2.71511E-05	2622000	2622	5.03102E-06	0.001423913	7.12019E-05
Dibenzofuran	1.327433628	11290	11.29	0.008712262	0.305064294	0.015557522
Di-n-butylphthalate	46.57806484	1460	1.46	7.40338E-05	1.54639773	0.088032543
1,2-Dichlorobenzene	5.191873589	443.1	0.4431	0.078533068	0.067484617	0.004533025
1,3-Dichlorobenzene						
1,4-Dichlorobenzene	7.142857143	434	0.434	0.099	0.091797143	0.006171429
1,1-Dichloroethane	2.4	35.04	0.03504	0.229872834	0.012238191	0.001116096
1,2-Dichloroethane	0.48	43.79	0.04379	0.048265115	0.002380541	0.000227419
1,1-Dichloroethene	0.729	35.04	0.03504	1.06755889	0.004775851	0.000339014
diethyl phthalate	484.1269841	126.2.	0.1262	0.000025	3.158465423	0.269271429
dimethyl phthalate	142.8571429				0.571428571	0.061428571
di-n-octyl phthalate	0.295918367		1.567	0.0027	0.01045914	0.000590949
Ethylbenzene	700	517.8	0.5178	0.322312799	10.44027286	0.66346
Fluoranthene	2.256699577	70850	70.85	0.000362397	3.206771516	0.160857546
Fluorene	2.03539823	11290	11.29	0.003934834	0.467748395	0.023854867
hexachlorobenzene	0.112426036	3380	3.38	0.07	0.008063345	0.000428343
Hexachlorobutadiene	0.9	993.5	0.9935	42.12971863	0.087205361	0.00128115
Indeno(1,2,3-cd)pyrene	2.27382E-05	2676000	2676	1.42341E-05	0.00121704	6.08572E-05
MEK (Methyl Ethyl Ketone;2-Butanone)						
Methylene Chloride	5	23.74	0.02374	0.211875672	0.024210256	0.0022687
2-Methylnaphthalene	18.18181818	2976	2.976	0.021187567	1.15557682	0.061927273
MIBK (M-Isobutyl-K;4-M,2-Pentanone)						
Naphthalene	53.80434783	1837	1.837	0.017997161	2.193667561	0.121974457
nitrosodiphenylamine, N-	1.593580667	6154	6.154	0.000049	0.202512367	0.010492135
Polychlorinated biphenyls (PCBs)	2.30915E-05	44820	44.82	0.014	2.07922E-05	1.04489E-06
Aroclor 1016	0.0000641	27110	27.11	0.008180528	3.50123E-05	1.76531E-06
Aroclor 1221		10330	10.33	0.030104343		
Aroclor 1232		10330	10.33	0.030104343		
Aroclor 1242		448.2	0.4482	0.007771501		
Aroclor 1248	2.30915E-05	43900	43.9	0.017997161	2.03674E-05	1.02365E-06
Aroclor 1254	5.49145E-06	75640	75.64	0.011575447	8.32954E-06	4.17734E-07
Aroclor 1260	2.30915E-05	207000	207	0.013743287	9.56918E-05	4.78988E-06
Phenanthrene	4.807692308	20830	20.83	0.001730182	2.022129803	0.102211538
Pyrene	9.8	69410	69.41	0.000486741	13.64356827	0.684432
Tetrachloroethene	0.020523086	106.8	0.1068	0.723976718	0.000151684	1.10168E-05
1,2,4-Trichlorobenzene	1.128133705	67.7	0.0677	0.0337	0.006105926	0.000561472
1,1,1-Trichloroethane	200	48.64	0.04864	0.703525398	1.238448805	0.095728

MTCA EQ. 747-1 $$C_s = C_w (UCF) DF \left[K_d + \frac{(\theta_w + \theta_a H_{cc})}{\rho_b} \right]$$

MTCA EQ. 747-2 $$K_d = K_{oc} \; x \; f_{oc}$$ *(For NonIonic & Ionizing Organic Substances)*

Parameter	Symbol	Value	Units	Source
Soil concentration	C_S	Calculated Value	mg/kg	Calculated Value
Groundwater/Surfacewater screening level	*Cw*	Chemical Specific	ug/l	Pathway Specific
UCF	*Unit coversion factor*	0.001	mg/ug	MTCA
Dilution faction	*DF*	**20***	dimensionless	**Vadose Soil**
Distribution coefficient	*Kd*	Chemical Specific	L/kg	Chemical Specific
Soil organic carbon-water partitioning coefficient	*Koc***	Chemical Specific	ml/g	Chemical Specific
Soil fraction of organic carbon - for silty sands	*foc*	0.001	g/g	Site Specific -**Default**
Water-filled soil porosity	*θw*	**0.3*****	ml water/ml soil	Site Specific -**Default**
Air-filled soil porosity	*θa*	**0.13*****	ml air/ml soil	Site Specific -**Default**
Henry's law constant	*Hcc*	Chemical Specific	dimensionless	Chemical Specific
Dry soil bulk density	*ρb*	1.5	kg/L	Site Specific -**Default**

*** The dilution factor is 20 for Vadose soil, or 1 for Saturated Soil**

** Note that the EPA Koc values, not MTCA Tables, maybe default values used to determine Kd

***** The Default Porosity for Water/Air Fill is 0.3/0.13 for Vadose Soil & 0.43/0 Saturated Soils**

Chemical	GW Screening Level	Koc	Kd	Henry's Law	Most Stringent VADOSE Soil to Water Protection (mg/kg)	Most Stringent SATURATED Soil to Water Protection (mg/kg)
	ug/l	L/kg	ml/g	Dimensionless		
1,1,2-Trichloroethane	**0.768**	67.7	0.0677	0.033703775	0.004156738	0.000382234
Trichloroethene	**0.11**	67.7	0.0677	0.402890999	0.000665758	0.000054747
1,3,5-Trimethylbenzene	**45**	703	0.703	0.358716148	0.84067986	0.050985
Toluene	**1000**	268	0.268	0.211875672	9.727251165	0.698
Vinyl Chloride	**0.016**	23.74	0.02374	1.137093377	0.000103132	7.25984E-06
Xylene	**1000**	443.1	0.4431	0.132933578	13.0924182	0.8731
benzoic acid	**2242.926156**		0.0006	0.000063	8.998864665	0.965804003
Benzyl Alcohol	**181.9923372**	15.66	0.01566	1.37842E-05	0.784973697	0.081106705
2,4-Dimethylphenol	**2.020624303**	717.6	0.716	0.000039	0.037017974	0.002315635
2-Methylphenol (o-cresol)	**7.110609481**	91	0.091	0.000049	0.041384351	0.003704628
4-Methylphenol (p-cresol)	**77.18894009**				0.30875576	0.033191244
Pentachlorophenol	**0.729**	3380	3.38	1.00211E-06	0.052196401	0.00277749
Total Phenol	**78.35820896**	18.1	0.0181	0.000323131	0.341842395	0.035112313
Styrene	**1.46**	517.8	0.5178	0.112482258	0.021244415	0.001383788
Tributyltin						
2,4,6-Trichlorophenol	**3**	1186	1.186	0.000106347	0.083160553	0.004848
Aluminum	**50**				0.2	0.0215
Antimony	**3.865979381**	NA	45	0	3.494845361	0.175631443
Arsenic (III)						
Arsenic (V)						
Arsenic	**0.0583**	NA	29	0	0.0340472	0.001715769
Barium	**2**	NA	41	0	1.648	0.08286
Beryllium	**4**	NA	790	0	63.216	3.16172
Cadmium	**0.21**	NA	6.7	0	0.02898	0.0014973
Chromium (VI)	**0.58**	NA	19	0	0.22272	0.0112694
Chromium	**100**	NA	1000	0	2000.4	100.043
Cobalt						
Copper	**1.3**	NA	22	0	0.5772	0.029159
Iron	**300**				1.2	0.129
Lead		NA	10000	0		
Manganese	**50**				0.2	0.0215
Mercury	**0.005161594**	NA	52	0	0.005388704	0.000270622
Mercury (organic)						
Molybdenum	**40**				0.16	0.0172
Nickel	**8.2**	NA	65	0	10.6928	0.536526
Selenium	**5**	NA	5	0	0.52	0.02715
Silver	**1.532250723**	NA	8.3	0	0.260482623	0.013376549
Tin						
Thallium	**0.47**	NA	71	0	0.66928	0.0335721
Vanadium	**245**				0.98	0.10535
Zinc	**32.56745762**	NA	62	0	40.51391728	2.033186379
LPAH	**NA**					
HPAH	**NA**	157213	157.213			
Total Petroleum Hydrocarbons						
Gasoline	**1000**					
Gasoline (w/benzene)	**800**					
Diesel	**500**					
Heavy Oil	**500**					
2,3,7,8-TCDD	**2.06039E-10**	146300	146.3	0.002045132	6.03696E-10	3.02322E-11
Aldrin	**0.002573529**	**48685**	**48.685**	0.00697	0.00251617	0.000126399
alpha-BHC	**0.013888889**	**1762**	**1.762**	0.000435	0.00054501	3.04444E-05

Chemical	GW Screening Level	Koc	Kd	Henry's Law	Most Stringent VADOSE Soil to Water Protection (mg/kg)	Most Stringent SATURATED Soil to Water Protection (mg/kg)
	ug/l	L/kg	ml/g	Dimensionless		
beta-BHC	0.048611111	2139	2.139	0.0000305	0.00227403	0.000124882
gamma-BHC	0.0002	1352	1.352	0.000574	6.2082E-06	3.564E-07
Chlordane	0.002	51310	51.31	0.00199	0.002060407	0.00010348
4,4'-DDT	0.257352941	677934	677.934	0.000332	3.490395734	0.17457897
4,4'-DDE	0.257352941	86405	86.405	0.000861	0.445761413	0.022347243
4,4'-DDD	0.364583333	45800	45.8	0.000164	0.33541677	0.016854687
Dieldrin	0.00546875	25546	25.546	0.000619	0.002815975	0.000142056
alpha-Endosulfan	96	2040	2.04	0.000459	4.300876378	0.23712
beta-Endosulfan	96	2040	2.04	0.000459	4.300876378	0.23712
Endosulfan Sulfate	96	2040	2.04	0.000459	4.300876378	0.23712
Endrin	0.002	10811	10.811	0.000308	0.000440441	0.000022482
Endrin Aldehyde	0.002	10811	10.811	0.000308	0.000440441	0.000022482
Heptachlor	0.0004	9528	9.528	0.0447	7.7855E-05	3.9832E-06
Heptachlor Epoxide	0.0002	83200	83.2	0.00039	0.0003336	0.000016726
Toxaphene						

Chemical	SW Screening Level	Koc	Kd	Henry's Law	Most Stringent VADOSE Soil to Water Protection (mg/kg)	Most Stringent SATURATED Soil to Water Protection (mg/kg)
	ug/l	L/kg	ml/g	Dimensionless		
Acetone	**110107.0077**	1.981	0.001981	0.001623835	445.1003828	1.536344357
Acenaphthene	**2.614379085**	6123	6.123	0.004225243	0.330633526	28.51850296
Acenaphthylene	**10.78431373**	6123	6.123	0.00511283	1.363879887	0.069123856
Anthracene	**10.78431373**	20400	20.4	0.002274187	4.443179766	0.223091503
Benzene	**2.028193577**	165.5	0.1655	0.227009649	0.015624156	0.000917082
Benzo(g,h,i)perylene	**0.011584454**	2676000	2676	1.35388E-05	0.620046338	0.031003321
Benzo(a)anthracene	**0.000258331**	426600	426.6	1.73836E-05	0.00220511	0.000110278
Benzo(a)pyrene	**1.51762E-05**	786800	786.8	1.86925E-05	0.000238873	1.1945E-05
Benzo(b)fluoranthene	**0.000121366**	803100	803.1	2.6873E-05	0.001949861	9.75036E-05
Benzo(k)fluoranthene	**0.00012711**	786800	786.8	2.38871E-05	0.002000713	0.000100047
bis(2-Ethylhexyl)phthalate	**0.284848485**	165400	165.4	1.10437E-05	0.943418187	0.047195596
Butyl benzyl phthalate	**0.409933862**	9359	9.359	5.15373E-05	0.078371192	0.003954085
Carbon Tetrachloride	**0.247823653**	48.64	0.04864	1.3	0.001790807	8.30969E-05
Chlorobenzene	**20**	268	0.268	0.127207209	0.19160985	0.011093333
Chloroethane	**34**	23.74	0.02374	0.454019298	0.178900071	0.010553827
Chloroform	**4.2952095**	35.04	0.03504	0.150112687	0.021308514	0.001381798
Chloromethane	**20.25073279**	14.3	0.0143	0.36076128	0.09945782	0.006094796
Chrysene	**0.002581193**	236100	236.1	0.000213921	0.012198717	0.00061016
Dibenz[a,h]anthracene	**6.25379E-05**	2622000	2622	5.03102E-06	0.00327974	0.000163992
Dibenzofuran	**1.327433628**	11290	11.29	0.008712262	0.305064294	0.015367257
Di-n-butylphthalate	**46.57806484**	1460	1.46	7.40338E-05	1.54639773	0.081356353
1,2-Dichlorobenzene	**5.191873589**	443.1	0.4431	0.078533068	0.067484617	0.003788856
1,3-Dichlorobenzene	**960**				3.84	0.2752
1,4-Dichlorobenzene	**0.739825557**	434	0.434	0.099	0.009507942	0.000533168
1,1-Dichloroethane	**33.26143751**	35.04	0.03504	0.229872834	0.16960826	0.010700426
1,2-Dichloroethane	**3.552760138**	43.79	0.04379	0.048265115	0.01761977	0.001174033
1,1-Dichloroethene	**3.2**	35.04	0.03504	1.06755889	0.020963953	0.001029461
diethyl phthalate	**484.1269841**	126.2.	0.1262	0.000025	3.158465423	0.199879894
dimethyl phthalate	**142.8571429**				0.571428571	0.040952381
di-n-octyl phthalate	**0.295918367**		1.567	0.0027	0.01045914	0.000548534
Ethylbenzene	**2.393268421**	517.8	0.5178	0.322312799	0.035694822	0.001925305
Fluoranthene	**2.256699577**	70850	70.85	0.000362397	3.206771516	0.160534086
Fluorene	**2.03539823**	11290	11.29	0.003934834	0.467748395	0.023563127
hexachlorobenzene	**6.61931E-05**	3380	3.38	0.07	4.74746E-06	2.42708E-07
Hexachlorobutadiene	**3.923541247**	993.5	0.9935	42.12971863	0.380170923	0.005022787
Indeno(1,2,3-cd)pyrene	**5.23736E-05**	2676000	2676	1.42341E-05	0.002803243	0.000140167
MEK (Methyl Ethyl Ketone;2-Butanone)	**73404.6718**				293.6186872	21.04267258
Methylene Chloride	**61.42722279**	23.74	0.02374	0.211875672	0.297433756	0.019067419
2-Methylnaphthalene	**18.18181818**	2976	2.976	0.021187567	1.15557682	0.059321212
MIBK (M-Isobutyl-K;4-M,2-Pentanone)						
Naphthalene	**53.80434783**	1837	1.837	0.017997161	2.193667561	0.1142625
nitrosodiphenylamine, N-	**1.481427406**	6154	6.154	0.000049	0.188259921	0.00954138
Polychlorinated biphenyls (PCBs)	**1.58209E-05**	44820	44.82	0.014	1.42455E-05	7.13627E-07
Aroclor 1016	**0.000452025**	27110	27.11	0.008180528	0.000246903	1.2384E-05
Aroclor 1221	**2.30352E-05**	10330	10.33	0.030104343	4.85242E-06	2.44557E-07
Aroclor 1232	**0.014**	10330	10.33	0.030104343	0.002949131	0.000148633
Aroclor 1242	**2.30352E-05**	448.2	0.4482	0.007771501	2.98939E-07	1.69278E-08
Aroclor 1248	**2.30352E-05**	43900	43.9	0.017997161	2.03178E-05	1.01785E-06
Aroclor 1254	**5.48457E-06**	75640	75.64	0.011575447	8.31911E-06	4.16425E-07
Aroclor 1260	**2.30352E-05**	207000	207	0.013743287	9.54585E-05	4.77489E-06
Phenanthrene	**4.807692308**	20830	20.83	0.001730182	2.022129803	0.101522436
Pyrene	**9.828761139**	69410	69.41	0.000486741	13.68360955	0.685031889
Tetrachloroethene	**0.02060763**	106.8	0.1068	0.723976718	0.000152309	8.10842E-06
1,2,4-Trichlorobenzene	**1.128133705**	67.7	0.0677	0.0337	0.006105926	0.000399773
1,1,1-Trichloroethane	**46023.56406**	48.64	0.04864	0.703525398	284.9891395	15.43200785

MTCA EQ. 747-1

$$C_s = C_w (UCF) DF \left[K_d + \frac{(\theta_w + \theta_a H_{cc})}{\rho_b} \right]$$

MTCA EQ. 747-2

$$K_d = K_{oc} \; x \; f_{oc}$$

(For NonIonic & Ionizing Organic Substances)

Parameter	Symbol	Value	Units	Source
Soil concentration	C_S	Calculated Value	mg/kg	Calculated Value
Groundwater/Surfacewater screening level	*Cw*	Chemical Specific	ug/l	Pathway Specific
UCF	*Unit coversion factor*	0.001	mg/ug	MTCA
Dilution faction	*DF*	**20***	dimensionless	**Vadose Soil**
Distribution coefficient	*Kd*	Chemical Specific	L/kg	Chemical Specific
Soil organic carbon-water partitioning coefficient	*Koc***	Chemical Specific	ml/g	Chemical Specific
Soil fraction of organic carbon - for silty sands	*foc*	0.001	g/g	Site Specific -**Default**
Water-filled soil porosity	*θw*	**0.3*****	ml water/ml soil	Site Specific -**Default**
Air-filled soil porosity	*θa*	**0.13*****	ml air/ml soil	Site Specific -**Default**
Henry's law constant	*Hcc*	Chemical Specific	dimensionless	Chemical Specific
Dry soil bulk density	*ρb*	1.5	kg/L	Site Specific -**Default**

*** The dilution factor is 20 for Vadose soil, or 1 for Saturated Soil**

** Note that the EPA Koc values, not MTCA Tables, maybe default values used to determine Kd

***** The Default Porosity for Water/Air Fill is 0.3/0.13 for Vadose Soil & 0.43/0 Saturated Soils**

Chemical	SW Screening Level	Koc	Kd	Henry's Law	Most Stringent VADOSE Soil to Water Protection (mg/kg)	Most Stringent SATURATED Soil to Water Protection (mg/kg)
	ug/l	L/kg	ml/g	Dimensionless		
Acetone	**110107.0077**	1.981	0.001981	0.001623835	445.1003828	1.536344357
1,1,2-Trichloroethane	**2.335991132**	67.7	0.0677	0.033703775	0.012643365	0.000827797
Trichloroethene	**0.739493051**	67.7	0.0677	0.402890999	0.004475667	0.000262052
1,3,5-Trimethylbenzene	**45.21613312**	703	0.703	0.358716148	0.84471761	0.0447489
Toluene	**1294.051676**	268	0.268	0.211875672	12.58756567	0.71776733
Vinyl Chloride	**0.53322242**	23.74	0.02374	1.137093377	0.003437025	0.000165516
Xylene	**1577.950768**	443.1	0.4431	0.132933578	20.65919136	1.151535872
benzoic acid	**2242.926156**		0.0006	0.000063	8.998864665	0.64431792
Benzyl Alcohol	**181.9923372**	15.66	0.01566	1.37842E-05	0.784973697	0.055021137
2,4-Dimethylphenol	**2.020624303**	717.6	0.716	0.000039	0.037017974	0.002026013
2-Methylphenol (o-cresol)	**7.110609481**	91	0.091	0.000049	0.041384351	0.00268544
4-Methylphenol (p-cresol)	**77.18894009**				0.30875576	0.022127496
Pentachlorophenol	**0.698036623**	3380	3.38	1.00211E-06	0.049979423	0.002559468
Total Phenol	**78.35820896**	18.1	0.0181	0.000323131	0.341842395	0.02388097
Styrene	**NA**	517.8	0.5178	0.112482258		
Tributyltin	**0.0074**				0.0000296	2.12133E-06
2,4,6-Trichlorophenol	**0.558429298**	1186	1.186	0.000106347	0.015479763	0.00082238
Aluminum	**NA**					
Antimony	**3.865979381**	NA	45	0	3.494845361	0.17507732
Arsenic (III)						
Arsenic (V)						
Arsenic	**0.005388353**	NA	29	0	0.003146798	0.000157807
Barium	**122.1478478**	NA	41	0		
Beryllium	**12.47090123**	NA	790	0	197.090123	9.855586963
Cadmium	**0.25**	NA	6.7	0	0.0345	0.001746667
Chromium (VI)	**0.123402903**	NA	19	0	0.047386715	0.002380031
Chromium	**74**	NA	1000	0	1480.296	74.02121333
Cobalt						
Copper	**3.1**	NA	22	0	1.3764	0.069088667
Iron						
Lead	**0.54**	NA	10000	0	108.00216	5.4001548
Manganese	**100**					
Mercury	**0.005161594**	NA	52	0	0.005388704	0.000269883
Mercury (organic)	**0.000454821**				1.81928E-06	1.30382E-07
Molybdenum	**NA**					
Nickel	**5**	NA	65	0	6.52	0.326433333
Selenium	**5**	NA	5	0	0.52	0.026433333
Silver	**1.532250723**	NA	8.3	0	0.260482623	0.013156926
Tin						
Thallium	**0.233291859**	NA	71	0	0.332207608	0.016630599
Vanadium	**NA**					
Zinc	**32.56745762**	NA	62	0	40.51391728	2.028518377
LPAH	**0.01**					
HPAH	**0.01**	157213	157.213			
Total Petroleum Hydrocarbons	**0.208**				0.000832	5.96267E-05
Gasoline	**1000**					
Gasoline (w/benzene)	**800**					
Diesel	**500**					
Heavy Oil	**500**					
2,3,7,8-TCDD	**2.06039E-10**	146300	146.3	0.002045132	6.03696E-10	3.02026E-11
Aldrin	**1.24351E-05**	**48685**	**48.685**	0.00697	1.2158E-05	6.08968E-07
alpha-BHC	**0.001205401**	**1762**	**1.762**	0.000435	4.73008E-05	2.46946E-06

Chemical	SW Screening Level	Koc	Kd	Henry's Law	Most Stringent VADOSE Soil to Water Protection (mg/kg)	Most Stringent SATURATED Soil to Water Protection (mg/kg)
	ug/l	L/kg	ml/g	Dimensionless		
Acetone	**110107.0077**	1.981	0.001981	0.001623835	445.1003828	1.536344357
beta-BHC	**0.004218903**	**2139**	**2.139**	0.0000305	0.00019736	1.02337E-05
gamma-BHC	**0.063**	**1352**	**1.352**	0.000574	0.001955583	0.000103236
Chlordane	**0.000200045**	**51310**	**51.31**	0.00199	0.000206087	1.03217E-05
4,4'-DDT	**5.41716E-05**	**677934**	**677.934**	0.000332	0.000734712	3.67403E-05
4,4'-DDE	**5.41716E-05**	**86405**	**86.405**	0.000861	9.38307E-05	4.69623E-06
4,4'-DDD	**7.67431E-05**	**45800**	**45.8**	0.000164	7.06037E-05	3.53683E-06
Dieldrin	**1.32123E-05**	**25546**	**25.546**	0.000619	6.80329E-06	3.41309E-07
alpha-Endosulfan	**0.0087**	**2040**	**2.04**	0.000459	0.000389767	0.000020242
beta-Endosulfan	**0.0087**	**2040**	**2.04**	0.000459	0.000389767	0.000020242
Endosulfan Sulfate	**0.0087**	**2040**	**2.04**	0.000459	0.000389767	0.000020242
Endrin	**0.0023**	**10811**	**10.811**	0.000308	0.000506507	2.55246E-05
Endrin Aldehyde	**0.0023**	**10811**	**10.811**	0.000308	0.000506507	2.55246E-05
Heptachlor	**1.95878E-05**	**9528**	**9.528**	0.0447	3.81251E-06	1.92247E-07
Heptachlor Epoxide	**9.68626E-06**	**83200**	**83.2**	0.00039	1.61567E-05	8.08673E-07
Toxaphene	**6.85096E-05**					

APPENDIX C

Soil Analytical Data Table

TABLE C-1
HISTORICAL SOIL PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	Date	Easting	Northing	Begin Depth	End Depth	Analyte Parameter	Results	Units
A1-31	8/25/1997	1273815.4	200999.6	2	2	PCB, total	1.9	mg/kg
A1-31	8/25/1997	1273815.4	200999.6	2	2	PCB, total	3.3	mg/kg
A1-82	8/22/1997	1273831.9	200978.4	4.7	4.7	PCB, total	<0.5 U	mg/kg
A2-82	8/25/1997	1273830.3	200977.5	2.5	2.5	PCB, total	0.022	mg/kg
A2-82	8/25/1997	1273830.3	200977.5	2.5	2.5	PCB, total	1.7	mg/kg
A2-82	8/25/1997	1273830.3	200977.5	2.5	2.5	PCB, total	1.6	mg/kg
A3-33	8/20/1997	1273816.1	200997.2	4	4	PCB, total	20.2	mg/kg
A4-60	8/21/1997	1273822.4	200985.9	2.4	2.4	PCB, total	0.6	mg/kg
A4-60	8/21/1997	1273822.4	200985.9	4.1	4.1	PCB, total	7	mg/kg
AA0-44	8/21/1997	1273823.7	200996.3	2.3	2.3	PCB, total	<0.5 U	mg/kg
AA0-44	8/21/1997	1273823.7	200996.3	3.9	3.9	PCB, total	12.4	mg/kg
AA0-50	8/25/1997	1273825.2	200994.8	4.2	4.2	PCB, total	15.9	mg/kg
AA1-62	8/25/1997	1273828.5	200989.9	3.7	3.7	PCB, total	<0.036 U	mg/kg
AA1-62	8/25/1997	1273828.5	200989.9	3.7	3.7	PCB, total	59.6	mg/kg
AA2-81	8/25/1997	1273834.0	200981.5	4.7	4.7	PCB, total	6.1	mg/kg
AA2-81	8/25/1997	1273834.0	200981.5	4.7	4.7	PCB, total	6.9	mg/kg
B0-31	8/21/1997	1273812.2	200996.6	4	4	PCB, total	3.5	mg/kg
B0-4.1	8/21/1997	1273814.6	200993.4	5	5	PCB, total	<0.5 U	mg/kg
B0-54	8/25/1997	1273819.8	200987.6	4.6	4.6	PCB, total	6.3	mg/kg
B0-54	8/25/1997	1273819.8	200987.6	4.6	4.6	PCB, total	8	mg/kg
B2-10	8/25/1997	1273800.9	201005.3	3.3	3.3	PCB, total	<0.5 U	mg/kg
B2-10	8/25/1997	1273800.9	201005.3	3.3	3.3	PCB, total	0.02	mg/kg
B2-21	8/22/1997	1273808.0	200995.8	4.4	4.4	PCB, total	<0.5 U	mg/kg
B2-21	8/22/1997	1273808.0	200995.8	4.4	4.4	PCB, total	<0.5 U	mg/kg
C0-21	8/21/1997	1273803.7	200995.6	3	3	PCB, total	<0.5 U	mg/kg
C0-21	8/21/1997	1273803.7	200995.6	4.3	4.3	PCB, total	14.3	mg/kg
D1-64	8/22/1997	1273814.3	200978.0	4	4	PCB, total	<0.5 U	mg/kg
D1-70	8/25/1997	1273816.0	200976.2	3.7	3.7	PCB, total	0.063	mg/kg
D1-70	8/25/1997	1273816.0	200976.2	3.7	3.7	PCB, total	1.3	mg/kg
D2-30	8/19/1997	1273802.3	200989.8	4.2	4.2	PCB, total	19.1	mg/kg
D3-63	8/21/1997	1273812.2	200976.4	2.4	2.4	PCB, total	3.4	mg/kg
D4-21	8/25/1997	1273799.2	200993.5	5	5	PCB, total	2.2	mg/kg
D4-21	8/25/1997	1273799.2	200993.5	5	5	PCB, total	4.4	mg/kg
E1-12	8/21/1997	1273794.8	200992.6	2.7	2.7	PCB, total	<0.5 U	mg/kg
E1-12	8/21/1997	1273794.8	200992.6	4.5	4.5	PCB, total	39.6	mg/kg
E2-30	8/19/1997	1273799.5	200987.0	3.5	3.5	PCB, total	162	mg/kg
E2-30	8/19/1997	1273799.5	200987.0	3.5	3.5	PCB, total	217	mg/kg
F0-01	8/25/1997	1273787.5	200996.8	5	5	PCB, total	<0.035 U	mg/kg
F0-01	8/25/1997	1273787.5	200996.8	5	5	PCB, total	<0.5 U	mg/kg
F0-01	8/25/1997	1273787.5	200996.8	5	5	PCB, total	<0.5 U	mg/kg
F0-10	8/20/1997	1273789.9	200993.5	4	4	PCB, total	204	mg/kg

TABLE C-1
HISTORICAL SOIL PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	Date	Easting	Northing	Begin Depth	End Depth	Analyte Parameter	Results	Units
F0-10	8/20/1997	1273789.9	200993.5	4	4	PCB, total	216	mg/kg
F0-70	8/19/1997	1273794.7	200987.2	4.5	4.5	PCB, total	23	mg/kg
F4-70	8/25/1997	1273805.9	200968.1	2	2	PCB, total	<0.035 U	mg/kg
F4-70	8/25/1997	1273805.9	200968.1	2	2	PCB, total	<0.5 U	mg/kg
G0-40	8/19/1997	1273792.4	200982.1	5.2	5.2	PCB, total	1.1	mg/kg
G0-63	8/21/1997	1273803.3	200971.4	2.3	2.3	PCB, total	<0.5 U	mg/kg
G0-72-Sump	8/22/1997	1273760.6	201023.0			PCB, total	5	mg/kg
G1-111	8/26/1997	1273775.2	200995.9	2	2	PCB, total	<0.5 U	mg/kg
G1-111	8/26/1997	1273775.2	200995.9	2	2	PCB, total	0.025	mg/kg
H1-10	8/20/1997	1273781.8	200986.4	3.4	3.4	PCB, total	4150	mg/kg
H1-10	8/20/1997	1273781.8	200986.4	4.9	4.9	PCB, total	1520	mg/kg
H2-12	8/26/1997	1273783.2	200984.0	5.2	5.2	PCB, total	530	mg/kg
H2-12	8/26/1997	1273783.2	200984.0	5.2	5.2	PCB, total	380	mg/kg
HA-10	8/11/1994	1273853.1	201039.3	3	6	PCB, total	1.44	mg/kg
HA-11	8/11/1994	1273788.4	200990.1	3	6	PCB, total	400	mg/kg
HA-2	11/13/1991	1273853.1	201109.2	6.2	6.2	PCB, total	<0.05 U	mg/kg
HA-2	8/11/1994	1273853.1	201109.2	3	6	PCB, total	1	mg/kg
HA-2	9/27/1994	1273853.1	201109.2	3	6	PCB, total	<0.072 U	mg/kg
HA-3	8/11/1994	1273817.0	201081.0	3	6	PCB, total	0.11	mg/kg
HA-4	8/11/1994	1273788.0	201062.7	3	6	PCB, total	<0.077 U	mg/kg
HA-5	8/11/1994	1273760.3	201031.3	3	6	PCB, total	0.142	mg/kg
HA-6	8/11/1994	1273729.4	201006.5	3	6	PCB, total	0.77	mg/kg
HA-9	8/11/1994	1273893.4	201069.8	3	6	PCB, total	<0.078 U	mg/kg
I3-70	8/26/1997	1273794.4	200959.2	3.2	3.2	PCB, total	<0.5 U	mg/kg
I3-70-5.2	8/26/1997	1273794.4	200959.2	5.2	5.2	PCB, total	<0.038 U	mg/kg
I4-220	8/25/1997	1273765.4	200995.6	4.7	4.7	PCB, total	<0.036 U	mg/kg
I4-220	8/25/1997	1273765.4	200995.6	4.7	4.7	PCB, total	<0.5 U	mg/kg
J2-42	8/19/1997	1273781.9	200965.9	4.3	4.3	PCB, total	294	mg/kg
K0-30	8/21/1997	1273776.6	200968.5	4.5	4.5	PCB, total	<0.5 U	mg/kg
K0-30	8/21/1997	1273776.6	200968.5	4.5	4.5	PCB, total	<0.5 U	mg/kg
K2-(-2)	8/22/1997	1273760.6	200988.1	6	6	PCB, total	<0.5 U	mg/kg
K2-113	8/25/1997	1273761.4	200986.8	3.9	3.9	PCB, total	4.7	mg/kg
K2-113	8/25/1997	1273761.4	200986.8	3.9	3.9	PCB, total	5.2	mg/kg
K4-30	8/25/1997	1273774.4	200967.2	4.7	4.7	PCB, total	0.5	mg/kg
L0-32	8/26/1997	1273774.8	200964.5	3.5	3.5	PCB, total	<0.5 U	mg/kg
MW1	11/29/1994	1273787.7	200981.5	3.5	3.5	PCB, total	<9.9 U	mg/kg
MW1	11/29/1994	1273787.7	200981.5	5.5	5.5	PCB, total	<17 U	mg/kg
NBF-SB-01	3/29/2007	1273779.1	201006.9	1	2	PCB, total	0.07	mg/kg
NBF-SB-01	3/29/2007	1273779.1	201006.9	5	6	PCB, total	<0.033 U	mg/kg
NBF-SB-02	3/29/2007	1273786.6	200934.4	1	2	PCB, total	0.12	mg/kg
NBF-SB-02	3/29/2007	1273786.6	200934.4	5	6	PCB, total	<0.033 U	mg/kg

TABLE C-1
HISTORICAL SOIL PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	Date	Easting	Northing	Begin Depth	End Depth	Analyte Parameter	Results	Units
NBF-SB-36	3/29/2007	1273781.1	200976.1	1	2	PCB, total	0.11	mg/kg
NBF-SB-36	3/29/2007	1273781.1	200976.1	5	6	PCB, total	133	mg/kg
P10	6/21/1997	1273798.0	200957.0	0.5	1.5	PCB, total	<0.039 U	mg/kg
P10	6/21/1997	1273798.0	200957.0	3.5	6.5	PCB, total	<0.04 U	mg/kg
P11	6/20/1997	1273801.0	200968.0	3.7	6.7	PCB, total	22	mg/kg
P12	6/20/1997	1273807.0	200978.0	1.5	3.5	PCB, total	3.6	mg/kg
P12	6/20/1997	1273807.0	200978.0	3.5	6.5	PCB, total	9.8	mg/kg
P13	6/20/1997	1273791.0	200971.0	0.7	1.7	PCB, total	6.3	mg/kg
P13	6/20/1997	1273791.0	200971.0	1.7	3.7	PCB, total	120	mg/kg
P13	6/20/1997	1273791.0	200971.0	3.7	6.7	PCB, total	120	mg/kg
P14	6/20/1997	1273783.0	200974.0	1.6	3.1	PCB, total	1.8	mg/kg
P14	6/20/1997	1273783.0	200974.0	3.1	5.6	PCB, total	184	mg/kg
P15	6/20/1997	1273784.0	200980.0	3.6	6.6	PCB, total	630	mg/kg
P16	6/20/1997	1273790.0	200981.0	0.7	1.7	PCB, total	1600	mg/kg
P16	6/20/1997	1273790.0	200981.0	1.7	3.7	PCB, total	150	mg/kg
P16	6/20/1997	1273790.0	200981.0	3.7	6.7	PCB, total	83	mg/kg
P17	6/21/1997	1273828.0	200980.0	0.7	1.7	PCB, total	2.9	mg/kg
P17	6/21/1997	1273828.0	200980.0	1.7	3.7	PCB, total	2.2	mg/kg
P17	6/21/1997	1273828.0	200980.0	3.7	6.7	PCB, total	3.7	mg/kg
P17	6/21/1997	1273828.0	200980.0	0.7	1.7	PCB, total	1.6	mg/kg
P17	6/21/1997	1273828.0	200980.0	3.7	6.7	PCB, total	3.4	mg/kg
P18	6/20/1997	1273787.0	200963.0	1.7	3.7	PCB, total	420	mg/kg
P18	6/20/1997	1273787.0	200963.0	3.7	6.7	PCB, total	270	mg/kg
P18	6/20/1997	1273787.0	200963.0	1.7	3.7	PCB, total	<0.035 U	mg/kg
P18	6/20/1997	1273787.0	200963.0	3.7	6.7	PCB, total	280	mg/kg
P19	6/20/1997	1273775.0	200968.0	0.5	1.5	PCB, total	2.9	mg/kg
P19	6/20/1997	1273775.0	200968.0	4	6	PCB, total	0.53	mg/kg
P21	6/20/1997	1273768.0	200995.0	1.4	3.5	PCB, total	<0.035 U	mg/kg
P21	6/20/1997	1273768.0	200995.0	3.5	6.5	PCB, total	<0.039 U	mg/kg
P22	6/20/1997	1273789.0	200998.0	3.6	6.6	PCB, total	<0.04 U	mg/kg
P23	6/20/1997	1273782.0	201010.0	1.6	2.5	PCB, total	<0.035 U	mg/kg
P24	6/20/1997	1273772.0	201020.0	0.5	1.5	PCB, total	0.02	mg/kg
P24	6/20/1997	1273772.0	201020.0	3.5	6.5	PCB, total	<0.04 U	mg/kg
P25	6/20/1997	1273761.0	201011.0	3.7	6.7	PCB, total	<0.041 U	mg/kg
P27	6/21/1997	1273832.0	200953.0	3.5	6.5	PCB, total	<0.041 U	mg/kg
P29	6/21/1997	1273840.0	200963.0	3.5	5	PCB, total	<0.037 U	mg/kg
P3	6/21/1997	1273790.0	200917.0	4.1	7.1	PCB, total	<0.04 U	mg/kg
P4	6/20/1997	1273765.0	200953.0	0.2	1.2	PCB, total	0.018	mg/kg
P4	6/20/1997	1273765.0	200953.0	3.7	5.7	PCB, total	<0.038 U	mg/kg
P5	6/21/1997	1273735.0	200986.0	0.4	1.4	PCB, total	0.58	mg/kg
P5	6/21/1997	1273735.0	200986.0	1.4	3.4	PCB, total	0.052	mg/kg

TABLE C-1
HISTORICAL SOIL PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	Date	Easting	Northing	Begin Depth	End Depth	Analyte Parameter	Results	Units
P5	6/21/1997	1273735.0	200986.0	3.4	6.4	PCB, total	4	mg/kg
P8	6/21/1997	1273797.0	200942.0	3.7	6.7	PCB, total	<0.041 U	mg/kg
P8	6/21/1997	1273797.0	200942.0	3.7	6.7	PCB, total	<0.042 U	mg/kg
P9	6/21/1997	1273814.0	200953.0	3.6	6.6	PCB, total	<0.045 U	mg/kg
PCBPC-Int	8/26/1997	1273753.2	200986.6			PCB, total	4.5	mg/kg
SB03	11/30/1994	1273887.2	201116.8	3.5	3.5	PCB, total	<0.035 U	mg/kg
SB03	11/30/1994	1273887.2	201116.8	8	8	PCB, total	<0.041 U	mg/kg
SB05	11/29/1994	1273861.9	201045.7	2	2	PCB, total	0.15	mg/kg
SB05	11/29/1994	1273861.9	201045.7	6	6	PCB, total	<0.041 U	mg/kg
SB06	11/30/1994	1273834.9	201074.9	2	2	PCB, total	<0.035 U	mg/kg
SB06	11/30/1994	1273834.9	201074.9	8	8	PCB, total	<0.042 U	mg/kg
SB07	12/1/1994	1273777.7	201050.9	3.5	3.5	PCB, total	<0.036 U	mg/kg
SB07	12/1/1994	1273777.7	201050.9	8	8	PCB, total	<0.042 U	mg/kg
SB08	11/29/1994	1273809.5	201025.2	2	2	PCB, total	0.096	mg/kg
SB08	11/29/1994	1273809.5	201025.2	6	6	PCB, total	0.11	mg/kg
SB08-36	9/18/2008	1273781.3	200975.8	5	6	PCB, total	270	mg/kg
SB09	11/29/1994	1273849.7	200986.8	3.5	3.5	PCB, total	<0.035 U	mg/kg
SB09	11/29/1994	1273849.7	200986.8	8	8	PCB, total	<0.041 U	mg/kg
SB11	11/29/1994	1273794.7	200995.5	2	2	PCB, total	3	mg/kg
SB11	11/29/1994	1273794.7	200995.5	5.5	5.5	PCB, total	<0.042 U	mg/kg
SB12	11/30/1994	1273802.6	200978.5	3	3	PCB, total	0.28	mg/kg
SB12	11/30/1994	1273802.6	200978.5	8	8	PCB, total	1.2	mg/kg
SB14	11/30/1994	1273772.9	200971.0	1	1	PCB, total	1.4	mg/kg
SB14	11/30/1994	1273772.9	200971.0	6	6	PCB, total	<0.041 U	mg/kg
SB15	11/30/1994	1273772.9	200954.0	3	3	PCB, total	0.32	mg/kg
SB15	11/30/1994	1273772.9	200954.0	8	8	PCB, total	<0.042 U	mg/kg
SB17	12/1/1994	1273789.9	201025.2	1	1	PCB, total	<0.035 U	mg/kg
SB17	12/1/1994	1273789.9	201025.2	6	6	PCB, total	<0.041 U	mg/kg
SB18	11/30/1994	1273834.9	201137.3	2	2	PCB, total	0.08	mg/kg
SB18	11/30/1994	1273834.9	201137.3	6	6	PCB, total	0.024	mg/kg
SB20	11/30/1994	1273849.3	201078.8	1	1	PCB, total	<0.034 U	mg/kg
SB20	11/30/1994	1273849.3	201078.8	6	6	PCB, total	0.03	mg/kg
SB21	12/1/1994	1273746.3	200985.4	1	1	PCB, total	<0.036 U	mg/kg
W End 8"	8/21/1997	1273775.9	200934.9	0	1.6	PCB, total	<0.5 U	mg/kg
WF-2	5/18/2004	1273717.0	200960.8	4	5	PCB, total	0.33	mg/kg

U = Indicates the compound was undetected at the reported concentration.

mg/kg = milligrams per kilogram.

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	LAI-SB56(0-2)	LAI-SB56(2-4)	LAI-SB56(4-6)	LAI-SB56(6-8)	LAI-SB57(0-2)	LAI-SB57(2-4)	LAI-SB57(4-6)	LAI-SB57(6-8)
Lab ID	RM76J	RM76K	RM76L	RN28O	RM76M	RM76N	RM76O	RN28P
Sample Date	09/14/2010	09/14/2010	09/14/2010	09/16/2010	09/14/2010	09/14/2010	09/14/2010	09/16/2010
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Aroclor 1242	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Aroclor 1248	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Aroclor 1254	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Aroclor 1260	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Aroclor 1221	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Aroclor 1232	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U
Total PCBs	0.031 U	0.033 U	0.031 U	0.032 U	0.031 U	0.033 U	0.032 U	0.032 U

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	LAI-SB58(0-2)	LAI-SB58(2-4)	LAI-SB58(4-6)	LAI-SB58(6-8)	LAI-SB59(0-2)	LAI-SB59(2-4)	LAI-SB59(4-6)	LAI-SB59(6-8)
Lab ID	RM76P	RM76Q	RM76R	RN29B	RM77G	RM77H	RM77I	RN29A
Sample Date	09/14/2010	09/14/2010	09/14/2010	09/16/2010	09/14/2010	09/14/2010	09/14/2010	09/16/2010
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Aroclor 1242	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Aroclor 1248	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Aroclor 1254	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Aroclor 1260	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Aroclor 1221	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Aroclor 1232	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U
Total PCBs	0.033 U	0.031 U	0.033 U	0.031 U	0.032 U	0.033 U	0.031 U	0.031 U

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	LAI-SB60(0-2)	LAI-SB60(2-4)	LAI-SB60(4-6)	LAI-SB60(6-8)	LAI-SB61(0-2)	LAI-SB61(2-4)	LAI-SB61(4-6)	LAI-SB61(6-8)
Lab ID	RM77D	RM77E	RM77F	RN28L	RM77A	RM77B	RM77C	RN28M
Sample Date	09/14/2010	09/14/2010	09/14/2010	09/16/2010	09/14/2010	09/14/2010	09/14/2010	09/16/2010
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.032 U	0.033 U	0.033 U	0.031 U	0.031 U	0.031 U	0.032 U	2.3 U
Aroclor 1242	0.032 U	0.033 U	0.033 U	0.031 U	0.031 U	0.031 U	0.032 U	2.3 U
Aroclor 1248	0.032 U	0.033 U	0.033 U	0.031 U	0.031 U	0.031 U	0.032 U	34 U
Aroclor 1254	0.032 U	0.033 U	0.033 U	0.031 U	**0.045**	0.031 U	0.032 U	**20** J
Aroclor 1260	0.032 U	0.033 U	0.033 U	0.031 U	**0.08**	0.031 U	0.032 U	2.3 U
Aroclor 1221	0.032 U	0.033 U	0.033 U	0.031 U	0.031 U	0.031 U	0.032 U	2.3 U
Aroclor 1232	0.032 U	0.033 U	0.033 U	0.031 U	0.031 U	0.031 U	0.032 U	2.3 U
Total PCBs	0.032 U	0.033 U	0.033 U	0.031 U	**0.125**	0.031 U	0.032 U	**20** J

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	LAI-SB62(0-2)	LAI-SB62(2-4)	LAI-SB62(4-6)	LAI-SB62(6-8)	LAI-SB63(0-2)	LAI-SB63(2-4)	LAI-SB63(4-6)	LAI-SB63(6-8)
Lab ID	RM77M	RM77N	RM77O	RN28N	RM77J	RM77K	RM77L	RN28Q
Sample Date	09/14/2010	09/14/2010	09/14/2010	09/16/2010	09/14/2010	09/14/2010	09/14/2010	09/16/2010
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.032 U	0.03 U	0.032 U	0.032 U	0.028 U	0.14 U	0.12 U	0.032 U
Aroclor 1242	0.032 U	0.03 U	0.032 U	0.032 U	0.028 U	0.14 U	0.12 U	0.032 U
Aroclor 1248	0.032 U	0.03 U	0.032 U	0.032 U	0.028 U	0.42 U	0.92 U	0.032 U
Aroclor 1254	0.032 U	0.03 U	0.032 U	0.032 U	**0.053**	**2.4**	**3.5**	0.032 U
Aroclor 1260	**0.037**	0.03 U	0.032 U	0.032 U	**0.12**	**0.46**	**0.41**	0.032 U
Aroclor 1221	0.032 U	0.03 U	0.032 U	0.032 U	0.028 U	0.14 U	0.12 U	0.032 U
Aroclor 1232	0.032 U	0.03 U	0.032 U	0.032 U	0.028 U	0.14 U	0.12 U	0.032 U
Total PCBs	**0.037**	0.03 U	0.032 U	0.032 U	**0.173**	**2.86**	**3.91**	0.032 U

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	LAI-SB64(0-2)	LAI-SB64(2-4)	LAI-SB64(4-6)	LAI-SB64(6-8)	LAI-SB93(0-2)	LAI-SB93(2-4)	LAI-SB93(4-6)	LAI-SB93(6-8)
Lab ID	RN28D	RN28E	RN28F	RN28G	RO00E	RO00F	RO00G	RO00H
Sample Date	09/16/2010	09/16/2010	09/16/2010	09/16/2010	09/22/2010	09/22/2010	09/22/2010	09/22/2010
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.031 U	0.033 U	0.032 U	0.033 U	0.031 U	0.03 U	0.031 U	0.033 U
Aroclor 1242	0.031 U	0.033 U	0.032 U	0.033 U	0.031 U	0.03 U	0.031 U	0.033 U
Aroclor 1248	0.038 U	0.033 U	0.032 U	0.033 U	0.046 U	0.03 U	0.031 U	0.033 U
Aroclor 1254	**0.069**	0.033 U	0.032 U	0.033 U	**0.16**	0.03 U	0.031 U	0.033 U
Aroclor 1260	**0.036**	0.033 U	0.032 U	0.033 U	0.031 U	0.03 U	0.031 U	0.033 U
Aroclor 1221	0.031 U	0.033 U	0.032 U	0.033 U	0.031 U	0.03 U	0.031 U	0.033 U
Aroclor 1232	0.031 U	0.033 U	0.032 U	0.033 U	0.031 U	0.03 U	0.031 U	0.033 U
Total PCBs	**0.105**	0.033 U	0.032 U	0.033 U	**0.16**	0.03 U	0.031 U	0.033 U

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	NGW516(0-2)	NGW516(2-4)	NGW516(4-6)	NGW516(6-8)	NGW516(8-10)	NGW516(10-12)	NGW516(12-14)	NGW516(14-15)
Lab ID	SF54E	SF54F	SF54G	SF54H	SF54I	SF54J	SF54K	SF54L
Sample Date	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.032 U	0.032 U	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U
Aroclor 1242	0.032 U	0.032 U	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U
Aroclor 1248	0.032 U	0.032 U	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U
Aroclor 1254	**0.26**	**0.095**	0.032 U	0.033 U	0.032 U	**0.033**	0.032 U	0.032 U
Aroclor 1260	**0.18**	**0.036**	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U
Aroclor 1221	0.032 U	0.032 U	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U
Aroclor 1232	0.032 U	0.032 U	0.032 U	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U
Total PCBs	**0.44**	**0.131**	0.032 U	0.033 U	0.032 U	**0.033**	0.032 U	0.032 U

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	NGW517(0-2)	NGW517(2-4)	NGW517(4-6)	NGW517(6-8)	NGW517(8-10)	NGW517(10-12)	NGW517(12-14)	NGW517(14-15)
Lab ID	SF52I	SF52J	SF52K	SF52L	SF52M	SF52N	SF52O	SF52P
Sample Date	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.064 U	0.032 U	0.032 U	38 U	3.8 U	3.9 U	1 U	0.042 U
Aroclor 1242	0.064 U	0.032 U	0.032 U	38 U	3.8 U	3.9 U	1 U	0.042 U
Aroclor 1248	0.064 U	0.032 U	0.032 U	75 U	77 U	58 U	20 U	3.1 U
Aroclor 1254	0.096 U	**0.052**	**0.1**	**140**	48 U	3.9 U	10 U	1 U
Aroclor 1260	**0.2**	**0.054**	**0.035**	38 U	**9.5** J	**8.2**	**3.4**	**0.48**
Aroclor 1221	0.064 U	0.032 U	0.032 U	38 U	3.8 U	3.9 U	1 U	0.042 U
Aroclor 1232	0.064 U	0.032 U	0.032 U	38 U	3.8 U	3.9 U	1 U	0.042 U
Total PCBs	**0.2**	**0.106**	**0.135**	**140**	**9.5** J	**8.2**	**3.4**	**0.48**

TABLE C-2
2010 SOIL INVESTIGATION PCB DATA
IN AREA OF 3-333 BUILDING EXCAVATION
NORTH BOEING FIELD SITE

Sample ID	NGW518(0-2)	NGW518(2-4)	NGW518(6-7)	NGW518(7-9)	NGW518(9-11)	NGW518(11-12)	NGW518(12-14)	NGW518(14-15)
Lab ID	SF52A	SF52B	SF52C	SF52D	SF52E	SF52F	SF52G	SF52H
Sample Date	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011	01/20/2011
PCBs (mg/kg) Method SW8082								
Aroclor 1016	0.032 U	0.031 U	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Aroclor 1242	0.032 U	0.031 U	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Aroclor 1248	0.032 U	0.031 U	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Aroclor 1254	**0.13**	**0.086**	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Aroclor 1260	**0.15**	**0.057**	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Aroclor 1221	0.032 U	0.031 U	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Aroclor 1232	0.032 U	0.031 U	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U
Total PCBs	**0.28**	**0.143**	0.033 U	0.033 U	0.032 U	0.032 U	0.032 U	0.033 U

U = Indicates the compound was undetected at the reported concentration.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

Bold = Detected compound.

APPENDIX D

Groundwater Analytical Data Table

TABLE D-1
PCB ANALYTICAL RESULTS FOR GROUNDWATER
NORTH BOEING FIELD

Sample ID	NGW501-GW	Dup of NGW501-GW	Settled NGW501-GW	Settled Dup of NGW501-GW	NGW502-GW	Settled NGW502-GW	NGW503-GW	Settled NGW503-GW	NGW504-GW	Settled NGW504-GW	NGW505	NGW506	NGW507	Dup of NGW507 NGW599	NGW508	NGW509
Lab ID	RL22A	NGW5011-GW RL22E	NGW501-GW RL22G	NGW5011-GW RL22K	RL22B	RL22H	RL22C	RL22I	RL22D	RL22J	SG78A	SG78C	SG78B	SG78H	SG95A	SG78G
Sample Date	08/30/2010	08/30/2010	08/30/2010	08/30/2010	08/30/2010	08/30/2010	08/30/2010	08/30/2010	08/30/2010	08/30/2010	01/27/2011	01/27/2011	01/27/2011	01/27/2011	01/30/2011	01/27/2011
PCBs (µg/L) Method SW8082																
Aroclor 1016	0.10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.20 U	0.20 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1242	**0.94** J	0.01 UJ	**0.4** J	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.2 U	0.01 U	0.01 U	**0.022**	**0.015**	0.01 U	0.01 U
Aroclor 1248	0.10 UJ	**0.073** J	0.01 UJ	**0.071** J	**8.1**	**7.4**	**0.088**	**0.072**	**2**	**2.4**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1254	**1.4** J	0.052 UJ	0.39 U	0.053 U	2.7 U	2.1 U	0.059 U	0.052 U	1.2 U	1.3 U	0.01 U	0.01 U	**0.01**	0.01 U	0.01 U	0.01 U
Aroclor 1260	0.10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.20 U	0.20 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1221	0.10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.20 U	0.20 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1232	0.10 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.20 U	0.20 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Total PCBs	**2.34**	**0.073**	**0.4**	**0.071**	**8.1**	**7.4**	**0.088**	**0.072**	**2**	**2.4**	0.01 U	0.01 U	**0.032**	**0.015**	0.01 U	0.01 U

Sample ID	NGW510	NGW511	NGW512	NGW513	NGW514	NGW515	NGW515	Filtered NGW515	NGW516	NGW516	Filtered NGW516	NGW517	NGW517	Filtered NGW517	NGW518	NGW519
Lab ID	SG78F	SG78D	SG78E	SG41A	SG41B	SG41C	SM11A	SM11H	SG95B	SM11B	SM11I	SG95C	SM11C	SM11J	SG95D	SG95E
Sample Date	01/27/2011	01/27/2011	01/27/2011	01/26/2011	01/26/2011	01/26/2011	3/8/2011	3/8/2011	01/30/2011	3/8/2011	3/8/2011	01/30/2011	3/8/2011	3/8/2011	01/30/2011	01/30/2011
PCBs (µg/L) Method SW8082																
Aroclor 1016	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.010 U	0.010 U	0.01 U	0.010 U	0.010 U	1.00 U	0.10 U	0.10 U	0.01 U	0.01 U
Aroclor 1242	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.010 U	0.010 U	0.01 U	0.010 U	0.012 U	1 U	0.10 U	0.10 U	0.01 U	0.01 U
Aroclor 1248	0.01 U	0.01 U	0.01 U	0.01 U	0.019 U	0.01 U	0.075 U	0.050 U	0.08 U	0.010 U	0.010 U	40 U	12 U	2.5 U	0.02 U	0.02 U
Aroclor 1254	0.01 U	0.01 U	0.01 U	0.01 U	0.015 U	**0.03**	**0.30**	0.040 U	**0.028**	0.010 U	0.010 U	**18**	5.0 U	0.50 U	0.01 U	0.01 U
Aroclor 1260	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.044**	0.010 U	0.01 U	0.010 U	0.010 U	**2.80**	**0.76**	0.10 U	0.01 U	0.01 U
Aroclor 1221	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.010 U	0.010 U	0.01 U	0.010 U	0.010 U	1.00 U	0.10 U	0.10 U	0.01 U	0.01 U
Aroclor 1232	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.010 U	0.010 U	0.01 U	0.010 U	0.010 U	1.00 U	0.10 U	0.10 U	0.01 U	0.01 U
Total PCBs	0.01 U	0.01 U	0.01 U	0.01 U	0.019 U	**0.03**	**0.344**	0.010 U	**0.028**	0.010 U	0.010 U	**20.8**	**0.76**	0.10 U	0.01 U	0.01 U

U = Indicates the compound was undetected at the reported concentration.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.
Bold = Detected compound.

APPENDIX E

Health and Safety Plan

HEALTH AND SAFETY PLAN SUMMARY

SITE NAME:	North Boeing Field (NBF)
LOCATION:	NBF is located east of East Marginal Way South adjacent to the King County International Airport (KCIA) and the City of Seattle (City) Georgetown Steam Plant (GTSP)
CLIENT:	The Boeing Company (Boeing)
PROPOSED DATES OF ACTIVITIES:	2011 Summer Construction Season
TYPE OF FACILITY:	Industrial/Aerospace Manufacturer
LAND USE OF AREA NEAR FACILITY:	Industrial, Commercial, and Residential
SITE ACTIVITIES:	Soil excavation, including: - Soil excavation and backfilling to be conducted with construction excavation equipment - Utility (including storm drain line) replacement and repair in excavation areas (as required) - Coordination with the City for the concurrent GTSP planned excavation - Surface regrading and repaving with asphalt-concrete
POTENTIAL SITE HAZARDS:	Dermal exposure, incidental ingestion, and/or inhalation of contaminants; heat stress; slips, trips, and falls; drowning; work near heavy equipment and machinery; noise; storms; and potentially explosive vapors.
POTENTIAL SITE CONTAMINANTS:	Polychlorinated biphenyls (PCBs) and diesel- and motor oil-range petroleum hydrocarbons .
ROUTES OF ENTRY:	Skin contact with, or incidental ingestion of, potentially contaminated soil or water; and inhalation of airborne droplets, dusts, or vapors.
PROTECTIVE MEASURES:	Protective clothing (including hardhat, steel-toed boots, safety glasses, gloves, coveralls); (stand-by) air purifying respirators; lifejackets (when over water); dust control; and sample vapor monitoring.
MONITORING EQUIPMENT:	Field detectors including: - Photoionization detector (PID)

TABLE OF CONTENTS

FORMS

TABLES

1.0 INTRODUCTION

This site-specific Health and Safety Plan (HASP) presents the procedures and protocols that will be followed to provide worker safety during excavation, removal, handling, and disposal of contaminated soil and debris, to be conducted as part of implementation of the Fenceline Excavation Interim Action project at the North Boeing Field (NBF) site in Seattle, Washington. This HASP presents the project health and safety organization, safety rules and procedures, potential site hazards, description of levels of personal protection and required equipment, emergency response information, training requirements, and requirements for routine health care and health monitoring. This HASP is based on the most current knowledge of site conditions.

1.1 APPLICABILITY AND ADHERENCE

This HASP will apply to all individuals involved in intrusive field activities on this project, and is focused on activities typically performed by Landau Associates' personnel, including sampling of potentially contaminated media and observation of various remedial construction activities. Individuals performing activities associated with soil excavation at NBF must read, understand, and comply with this HASP prior to participating in soil excavation and material handling activities. If any information presented in this HASP is unclear, the reader should contact the Project Health & Safety Coordinator or Site Safety Officer for clarification prior to participating in any site activity. After the information has been read and understood, the individual must sign the Acknowledgement (Form E-1), which will then be placed in the project file. The Contractor and its subcontractors will be required to develop their own, equally protective, HASP and submit the plan to Boeing and the City for review and general concurrence prior to commencement of field work.

Activities conducted as part of this interim action will be conducted without creating health and safety risks for nearby workers or the public. All onsite personnel will be attentive to the potential for release of contaminated materials associated with site activities and will immediately bring all such matters to the attention of the appropriate Site Safety Officer. Decontamination procedures and other elements of the planned remedial construction activities (e.g., access to/from work areas by heavy equipment) have been developed to be protective of both worker and public health and safety.

Health and safety procedures associated with the Contractor's work and operation of heavy construction equipment are not specifically addressed, and will be addressed in a separate plan provided by the Contractor. The Contractor will be required to prepare and implement its own site-specific HASP to address the Work under the Contract to be performed by its workers and by its subcontractors, and to promote the health and protection of all onsite personnel and the environment. Landau Associates will

provide health and safety site monitoring for contaminants and will inform the Contractor on contaminant levels and subsequent upgrades to required Personal Protective Equipment (PPE).

1.2 PURPOSE AND REGULATORY COMPLIANCE

This HASP addresses procedures to be followed to minimize the risk of chemical exposures and physical accidents to onsite workers, and to minimize the risk of environmental contamination. This HASP complies with, but does not replace, Washington State Health and Safety Regulations as set forth in WAC 296-62 Part P. Requirements outlined in this HASP are considered the minimum health and safety requirements for PCB and TPH soil excavation activities. All excavation activities will be performed in accordance with this HASP and the Occupational Safety and Health Administration (OSHA) Standard 29 C.F.R. 1910.120, which regulates hazardous waste site operations.

This plan is flexible and allows unanticipated site-specific problems to be addressed, while providing adequate and suitable worker protection. This plan may be modified at any time, based on the judgment of the Project Health & Safety Coordinator or the Corporate Health & Safety Officer, as appropriate. Minor modifications to the plan regarding day-to-day activities may be made by the Project Health & Safety Coordinator. Substantive changes to procedures (e.g., changes in action levels) must receive the concurrence of both the Project Health & Safety Coordinator and the Corporate Health & Safety Officer. Modifications will be discussed with the onsite team during a safety briefing and posted in a designated area (e.g., at the site trailer) using the attached HASP modification form (Form E-2).

1.3 RESPONSIBLE INDIVIDUALS

Safety during the soil excavation and backfilling activities will be the responsibility of the Boeing Project Manager, the designated Site Safety Officer (lead for the Contractor), or Project Health & Safety Coordinator (Landau Associates' designated field oversight personnel). The Site Safety Officer, or equivalent designee, will be present at the site at all times during intrusive site activities related to the soil excavation interim action. The Boeing Project Manager, Site Safety Officer, and Project Health & Safety Coordinator will be identified prior to the initiation of site activities.

1.4 SITE ORGANIZATION AND OPERATION

Each work area will consist of an exclusion zone, a contamination reduction zone, and a support zone, as follows:

- **Exclusion Zone**: The exclusion zone will be defined as the area within 25 ft of an open soil excavation area. Only authorized site personnel will be allowed in each exclusion zone. The initial level of protection required in the exclusion zone may be adjusted as conditions change. The limits of the exclusion zone will be clearly marked for protection of non-

excavation personnel and the public. Levels of protection are discussed in more detail in Section 4.0.

- **Contamination Reduction Zone**: A contamination reduction zone will consist of a boot wash and an area to remove disposable PPE. Personnel in the exclusion zone will be required to wash their boots upon leaving the exclusion zone. The contamination reduction zone may also be used for decontamination of soil excavation equipment or a separate area may be set up for this task.
- **Support Zone**: The support zone will be outside the exclusion zone and the contamination reduction zone. All non-contaminated support equipment will be located in this area. Normal work clothes are appropriate for this zone. The location of this zone depends on factors such as accessibility, wind direction (upwind of work area), and resources (i.e., roads, shelter, utilities, etc.).

Each zone in each work area will be established on an activity-by-activity basis prior to initiation of work and will be clearly identified to all site personnel.

1.5 SITE SECURITY

Excavation activities will be occurring in a restricted-access industrial area. The work area will be blocked off to prevent non-trained personnel from entering the exclusion zone. Excavation activities will require removal of the NBF/GTSP fenceline during the coordinated construction activities to be performed by Boeing and the City. Temporary fencing will be placed around the entire excavation area to prevent un-authorized access to both the excavation area and other areas of the Boeing facility.

2.0 SAFETY RULES AND PROCEDURES

Safety is the responsibility of every individual involved in project efforts. Whether in the office or in the site, properly followed procedures are essential for personal safety and to minimize injuries or accidents involving equipment. Potential hazards while working at the site include, but are not limited to:

- Exposure to toxic and/or hazardous chemicals
- Physical hazards associated with excavation and construction machinery
- Physical hazards associated with working conditions (e.g., heat stress, hypothermia).

2.1 SAFETY RULES

All personnel working at the site will follow the rules and procedures listed below:

- All personnel will conduct themselves in a professional manner at all times.
- No personnel will be admitted into an operational exclusion zone without safety equipment in proper working condition and requisite training.
- All personnel must comply with the established safety procedures. Anyone working onsite for or under contract with Boeing who does not comply with this HASP or other approved HASP may be immediately dismissed from the site.
- Working while under the influence of intoxicants, narcotics, or controlled substances is prohibited. Personnel should not take prescription drugs if the potential for contact with toxic substances exists, unless approved in writing by a physician.
- Firearms, ammunition, fireworks, and explosives are prohibited.
- Climbing or standing on machinery (other than service trucks) or equipment is prohibited unless authorized by the Site Safety Officer.
- Long hair must be contained inside a hard hat or tied back and tucked under clothing. Facial hair that interferes with proper operation and fit of respiratory protection gear is not allowed.
- Eating, drinking, chewing gum, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in an exclusion zone. Boeing facilities are considered tobacco free areas, no smoking or chewing is allowed on the premises.
- Disposable clothing will be used whenever necessary and appropriate to minimize the risk of cross-contamination.
- The number of personnel and the amount of equipment in contaminated areas will be minimized to allow for efficient site operations.
- Only trained and authorized personnel will perform excavation activities.
- Contact with contaminated or potentially contaminated material should be avoided. Efforts will be made to stage site activity upwind of removal equipment, activities, and materials if dust is present.
- Proper decontamination procedures must be followed before leaving an exclusion zone and the site, unless medical emergencies dictate otherwise (Section 4.2.1.2). All decontamination

residual materials, and any other potentially contaminated materials, will be handled properly and kept onsite or at a designated secure area.

- Only approved work clothes or equipment will be allowed within the exclusion zones.
- Exchange of PPE will not be allowed.

2.2 SAFETY PROCEDURES

Site personnel are required to follow certain safety procedures when performing excavation activities. These safety procedures are described below:

- All activities performed in the exclusion zone will be conducted at a minimum of Level D (modified) (see Section 6.0).
- Whenever possible, personnel will be stationed upwind of site activities capable of creating airborne contamination.
- If any physical discomfort is experienced (e.g., abnormalities, nausea, lightheadedness), immediately stop work, tell the other team members, and leave the area.
- If any PPE fails, immediately leave the area.

2.2.1 WORK AREA DECONTAMINATION

All personnel must be properly decontaminated before entering a support zone from an exclusion zone.

2.2.1.1 Routine Decontamination

A decontamination area will be set up in the contamination reduction zone at the border of each exclusion zone. Prior to leaving the contamination reduction zone:

- Tyvek and gloves will be removed and placed in a trash bag or other container.
- Boots will be washed as described in this HASP.

2.2.1.2 Emergency Decontamination

In case of an emergency, cross-contamination procedures will be speedily implemented, if possible. If a life-threatening injury occurs and the injured person cannot undergo decontamination procedures without incurring additional injuries or risk, he or she will be transported wrapped in plastic sheeting if time allows and if consistent with the injury. The medical facility will be: 1) informed that the injured person has not been decontaminated, and 2) given information regarding the most probable contaminants.

2.2.1.3 Equipment Decontamination

Decontamination of excavation and construction equipment will occur in the contamination reduction zone or another area designated for decontamination of equipment. Equipment decontamination will follow the procedures described in this HASP.

2.2.2 MANAGEMENT OF WORK-DERIVED WASTES

Equipment and materials used for decontamination or personal protection will be cleaned or collected for appropriate disposal. Non-disposable equipment will be decontaminated onsite. Disposables will be containerized. Investigation-derived wastewater will be collected and stored in accordance with this HASP.

2.2.3 HOUSEKEEPING

Work areas will be kept as clean and orderly as possible at all times. Ordinary refuse and lightly soiled disposable protective clothing will be placed in suitable rubbish bins or trash containers at the site. The storage or introduction of extraneous materials will be minimized in the exclusion zone to minimize the decontamination load and reduce possibilities for cross-contamination. Prevention of surface water runoff to the storm drain system, cleaning of the concrete surfaces, etc., will be conducted in accordance with the procedures described in this HASP.

2.2.4 VISITORS

Authorized visitors will only be allowed to observe operations from the support zone or beyond, and must obey all instructions of the Site Safety Officer and/or Boeing's representative.

3.0 POTENTIAL SITE HAZARDS, RISKS, AND PROTECTIVE MEASURES

For excavation activities, two types of hazard categories exist. These categories are

- Chemical
- Physical.

The risks associated with each type of hazard and the protective measures to be implemented to minimize the risks are discussed below.

3.1 CHEMICAL

PCBs are identified as the primary contaminant of concern in Section 2.1 of the 2011 Fenceline Area Soil Excavation Interim Action Work Plan. TPH is identified as the secondary contaminant of concern.

PCBs have been detected in soil at concentrations up to 520 milligrams per kilogram (mg/kg) during NBF soil investigation activities conducted in 2010 and 2011. City data indicate PCBs in soil at concentrations up to 3,800 mg/kg near the fenceline between NBF and the GTSP property. PCBs have been detected in groundwater at concentrations up to 8.1 micrograms per liter (µg/L). The level of contamination to be encountered during the fenceline area excavation activities is not expected to represent a significant concern if the provisions of this HASP are appropriately implemented. If required, water will be used to minimize the amount of dust generated and the lateral migration of any airborne particles, if dust is generated.

While total petroleum hydrocarbons (TPHs) have not been widely identified as a contaminant of concern in the fenceline area at NBF, there is possible TPH contamination in the northern fenceline area near the GTSP property. Available data from the NBF site indicate gasoline is not present at concentrations above the laboratory reporting limits in the area near the GTSP TPH excavation; however, if gasoline-range petroleum is detected in the excavation samples, then the HASP will be modified to include appropriate vapor monitoring and establish action levels for PPE upgrade. It is not anticipated that workers will be exposed to elevated concentrations of TPHs during excavation activities; however, air quality monitoring will be conducted during soil removal activities within the TPH excavation area, to ensure that workers are not exposed to elevated concentrations of volatilized TPHs.

3.1.1 RISKS

The potential risks associated with acute exposure to PCBs include irritated eyes, chloroacne, liver damage, and reproduction effect, if inhaled, ingested, or absorbed through the skin. The most conservative OSHA time-weighted average exposure limit for skin is 0.5 milligrams per cubic meter.

Some PCBs are considered to be probable human carcinogens, having demonstrated carcinogenic effects in animal tests; chronic exposure to PCBs could cause cancer in some cases.

The potential risks associated with acute exposure to TPHs include irritated eyes, skin, or mucous membranes, blurred vision, dizziness, and possible liver and kidney damage. The OSHA time-weighted average exposure limit for skin is 100 parts per million (ppm) with an Immediate Danger to Life and Health (IDLH) of 400 ppm for petroleum products with benzene present. TPHs are considered to be probable human carcinogens, having demonstrated carcinogenic effects in animal tests; chronic exposure to TPHs could cause cancer in some cases.

3.1.2 PROTECTIVE MEASURES

Measures that will be implemented to avoid the risks associated with the chemical hazards include:

- Don appropriate PPE (described in Section 4.0).
- Wash hands and face before eating or drinking.
- Avoid contact with potentially contaminated substances.
- Work from clean areas to more contaminated areas (if known) to prevent cross contamination.
- Prevent splashing of contaminated liquids.

3.2 PHYSICAL

The planned activities will involve potential physical hazards inherent with working outside and in the presence of heavy equipment. Each potential hazard, the associated risk, and protective measures to be implemented to minimize each risk are as described below:

- **Soil Excavation Machinery:** Construction equipment may be equipped with various winches, motors, booms, and other machines. These present a general physical hazard from moving parts. Personnel will stand clear of machinery at all times unless specific instructions are given by the rig operator or other person in authority. Personnel will stand clear of the swing ratios and avoid pinch points between equipment. Personnel will stand in areas where the rig operator can make eye contact, whenever possible. Hard hats, steel-toed shoes/boots, and a highly visible safety vest will be worn at all times in the exclusion zone. When possible, appropriate guards should be in place during equipment use. Lifting equipment used to raise and lower sampling equipment may also present a physical hazard. Field personnel should be careful to keep loose clothing, hands, and feet away from winches and capstones.
- **Excavation:** Excavations greater than 4 ft in depth will not be entered without adequate shoring or sloping. Personnel will avoid standing along the edge of the excavation to minimize the risk of sidewall collapse. The Contractor will remove overhanging material to minimize the risk of falling debris. Part of the excavation is anticipated to extend below the

shallow groundwater table. Care to prevent falling into the excavation will be a priority and require personnel to remain vigilant.

- **Vehicular Traffic:** The presence of vehicular traffic associated with Boeing's daily work activities at the NBF facility is considered a potential hazard. Site safety vests worn by each worker and the attentiveness of each worker will be used as protective measures to minimize the risks associated with vehicular traffic.
- **Slips, Trips, and Falls:** Caution will be exercised to prevent slips on wet surfaces, stepping on sharp objects, etc. Work should not be performed on elevated platforms without fall protection. Recognize and avoid areas with low traction (e.g., muddy areas or slick metal surfaces), ground surface obstructions, or unguarded areas elevated above ground surface.
- **Noise:** Appropriate hearing protection [ear muffs or ear plugs with a noise reduction rating of at least 20 decibals(Accoustic) (dBA)] will be used if individuals work near high-noise generating equipment (>85 dBA).
- **Heat Stress:** See Section 8.2.2.
- **Cold Stress**: See Section 8.2.3

4.0 PERSONAL SAFETY EQUIPMENT

PPE is required within work areas where there is a potential for exposure to hazardous substances and physical hazard. Descriptions of the levels of protection and the required safety equipment for each level are provided in the following sections.

4.1 LEVELS OF PROTECTION

Levels of protection have been defined by the U.S. Environmental Protection Agency (EPA) in the EPA *Standard Operating Guide* (1984):

- Level A requires a fully encapsulating suit and full-face self-contained breathing apparatus (SCBA) with a 5-minute supplied air escape pack for the highest level of respiratory, skin, and eye protection. Level A is not anticipated at NBF and, therefore, is not discussed further.
- Level B requires maximum respiratory protection by the use of supplied air or a positive pressure SCBA. A 5-minute supplied air escape pack is required while in Level B. Dermal protection is selected on the basis of anticipated hazards. Level B is not anticipated at NBF and, therefore, is not discussed further.
- Level C requires an air-purifying respirator that is specific to the contaminants of concern. The degree of dermal protection depends on anticipated hazards.
- Level D is the basic work uniform, modified for soil excavation work at NBF, as described in Section 4.2.

4.2 REQUIRED EQUIPMENT

The level of protection designated Level D is recommended for all soil excavation activities. However, the PPE required has been modified based on the tasks that are being performed. When soil excavation activities are occurring in areas where PCBs have been detected in soil at concentrations greater than or equal to 50 mg/kg and/or TPH in air within the excavation is found to exceed exposure limits (see Section 4.4), the following PPE is required:

- One-piece disposable Tyvek coveralls
- Half- or full-faced respirator with HEPA/OV cartridges. Cartridges will be replaced daily, at a minimum, and should be changed more frequently if chemical vapors are detected inside the respirator or other symptoms of breakthrough are noted (irritation, dizziness, breathing difficulty, etc.).
- Nitrile inner-disposable gloves.
- Leather, neoprene, and/or nitrile outer gloves when performing hand work within the excavation.
- Neoprene steel-toed and steel-shank, chemically resistant, impermeable outer boots or disposable boot covers.
- Safety glasses (or face shield when performing tasks where liquid splashes or sprays are to be encountered).

- Safety vest.
- Ear protection when operating noisy equipment.

The minimum PPE to be worn during all other soil excavation activities includes:

- Hardhat
- Safety glasses with side shields
- Steel-toed boots
- Ear protection in the vicinity of noisy equipment
- Work gloves and/or chemical-resistant gloves
- Safety vest in the vicinity of high traffic areas.

4.3 SAFETY EQUIPEMENT

The following safety equipment must be available onsite during sediment remediation activities:

- First aid kit
- Eye wash kit
- Fire Extinguisher
- Mobile telephone.

4.4 AIR MONITORING

Air monitoring will be conducted during activities in the TPH excavation area to ensure that field personnel exposure levels are controlled. Exposure monitoring for volatile organics will be conducted in the workers' breathing zone before beginning work and every 15 minutes thereafter using a photoionization detector (PID). The PID will be calibrated at the beginning and end of each work shift. All PID readings will be recorded in a field notebook.

If air concentrations of organic vapors in the breathing zone are greater than 10 ppm above background volatile organic concentrations for 5 consecutive minutes, workers conducting intrusive field activities will be required to upgrade to Level C PPE, including the use of air-purifying respirators. If concentrations are greater than 25 ppm above background volatile organic concentrations, the work area will be evacuated and the Corporate Health and Safety Officer will be contacted.

Visual observations of dust will be made during field activities. If dust is visible, engineering controls will be implemented, such as increased frequency of housekeeping activities.

5.0 TRAINING REQUIREMENTS

Personnel conducting intrusive field activities during soil excavation, removal, handling, and disposal will maintain appropriate training and approval for environmental field work. Records describing their training will be kept in Landau Associates' project files. Training will include, as appropriate, the following:

- Current medical approval to conduct environmental field work and wear a respirator
- Current fit test approval for respirator use; fit test must be conducted every 12 months.
- Completion of training as required by Title 29 Code of Federal Regulations (CFR) 1910.120
  - 40 hours of health and safety at hazardous waste site training
  - Subsequent to the 40-hour training, a yearly 8-hour hazardous waste site refresher training.
- CPR training refreshed yearly and First Aid training refreshed every 3 years.

6.0 DECONTAMINATION

Decontamination is necessary to limit the migration of contaminants from the exclusion and contamination reduction zone(s) into the surrounding environment. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Boot and glove wash bucket and rinse bucket
- Scrub brushes - long handled
- Spray rinse applicator
- Plastic garbage bags
- 5-gallon container with soap solution.

Proper decontamination procedures will be employed to ensure that contaminated materials do not contact individuals and are not spread around or from the site. These procedures will also ensure that contaminated materials generated during site remedial operations and during decontamination are managed appropriately. All nondisposable equipment will be decontaminated in the contamination reduction zone.

Personnel working in exclusion zones will perform a limited decontamination in the contamination reduction zone prior to changing respirator cartridges (if worn), taking rest breaks, drinking liquids, etc. They will decontaminate fully before eating lunch or leaving the site. The following describes the procedures for limited and full decontamination activities.

6.1 LIMITED DECONTAMINATION PROCEDURE FOR PERSONNEL

1. In the contamination reduction zone, outer gloves and boots will be washed and rinsed in portable buckets.
2. If a protective outer suit is worn, it will be inspected for severe contamination, rips, or tears.
3. If a protective suit is highly contaminated or damaged, full decontamination as outlined in Section 7.2 will be performed.
4. Outer gloves will be removed.
5. If a respirator is worn, it will be removed and cleaned using pre-moistened towelettes. Used cartridges will be placed in a plastic bag.
6. Cartridges and outer gloves will be replaced and the employee will return to work.

6.2 FULL DECONTAMINATION PROCEDURE FOR PERSONNEL

1. Outer gloves, rain gear, and boots will be washed and rinsed in the contamination reduction zone.

2. Boots and outer gloves will be removed and placed in individual plastic bags for further decontamination and later reuse, as appropriate.
3. Disposable protective suits will be removed and deposited in a labeled container for disposal.
4. Respirators will be removed and placed in bags for offsite cleaning with warm soapy water and disinfectant.
5. Inner gloves will be removed and discarded into a labeled container for disposable clothing.
6. Personnel should shower as soon after the work shift as possible.

6.3 DECONTAMINATION PROCEDURES FOR SAMPLING EQUIPMENT

- Disposable sampling equipment will be deposited in a labeled container for disposal.
- Non-disposable sampling equipment will be decontaminated between sampling intervals by removing the cross contamination, followed by a tap water and alconox soap mixture wash, followed by a tap water rinse and a final distilled water rinse.
- If contamination is still observed, the process will be repeated.
- All generated decontamination water will be stored in a labeled container for disposal or treatment processing.
- Decontamination Procedures for Construction Equipment
- Once equipment has entered the exclusion zone, it will be decontaminated prior to leaving the area
- The tops of truck beds will be swept to remove soil prior to leaving the excavation area. The trucks will pass through a wheel wash area prior to leaving the exclusion zone. A high-pressure washer will also be available at the truck wash area to help remove contamination, as needed.
- Excavation equipment will be swept at the excavation area to remove any gross contamination. Prior to leaving the exclusion zone, the equipment will be routed through the wheel wash area and the pressure washer will be used to decontaminate the equipment. If contamination is still observed, the process will be repeated.
- All generated decontamination water will be stored in labeled containers for disposal or treatment prior to discharge to the sanitary sewer system.

6.4 DISPOSAL OF CONTAMINATED MATERIALS

All disposable sampling and PPE will be rinsed to remove gross contamination and placed inside of a 10 mil polyethylene bag or other appropriate containers. These disposable supplies and containers will be removed from the site and disposed at an appropriate upland landfill facility by the Contractor, unless visibly contaminated with hazardous substances. In such cases, the Project Manager and/or the Owner will determine the need for special handling and disposal, according to applicable regulations.

7.0 SPILL CONTAINMENT

It is not anticipated that bulk chemicals subject to spillage will be used by Landau Associates' personnel on this project. Accordingly, spill containment provisions are not included as part of this HASP. The Contractor will be required to prepare a site-specific Spill Prevention and Pollution Control Plan to address potential spills that may occur during interim action construction activities.

8.0 EMERGENCY RESPONSE PLAN

This emergency response plan outlines the steps necessary for appropriate response to emergency situations. The following summarizes the key emergency response plan procedures for this project. Each contractor vehicle associated with soil excavation activities will be provided with a Boeing-supplied Dash-Board Safety Card, which will summarize the emergency procedures described below.

8.1 NOTIFICATION AND REPORTING

The Site Safety Officer is to be notified immediately. If the situation is life-threatening and notification of the Site Safety Officer would delay emergency response, site personnel may initiate the appropriate emergency contacts prior to notifying the Site Safety Officer. The Site Safety Officer will then initiate contacts as follows:

1. Call Boeing Emergency Dispatch (Table E-1) and provide the following information:
   - Name and location of person reporting
   - Location of accident/incident
   - Name and affiliation of injured party
   - Description of injuries
   - Status of medical aid effort
   - Details of any chemicals involved
   - Summary of the accident, including the suspected cause and the time it occurred
   - Temporary control measures taken to minimize further risk.

   Note: This information is not to be released to parties other than the Site Safety Officer, Boeing personnel, contractor personnel, and bona fide emergency response team members.
2. Call the Boeing Project Manager and provide information noted in Item 1 above.
3. Call Landau Associates' Corporate Health and Safety Manager and the Project Manager with information in Item 1 above.
4. The Site Safety Officer will complete a written accident/incident report, using Form E-3, within 24 hours, sending copies to Boeing's Project Manager.

Resources to be used in cases of emergency include:

- List of Emergency Contacts: Table E-1 includes both the appropriate emergency services (top of table) and the appropriate project contacts (bottom of table).
- Nearest Phone: Telephones are located inside buildings. Boeing and Landau Associates' site personnel also possess cellular phones.
- Onsite Emergency Equipment: An industrial first aid kit, a 20-lb type ABC portable fire extinguisher, and an eyewash kit accompany each site vehicle.

- Offsite Emergency Services: Phone numbers for offsite emergency services are listed in Table E-1. Copies of this table must be located in each vehicle.
- Hospital Route: To Harborview Medical Center: (Map included as Attachment E-1)
  - North on East Marginal Way South
  - Turn right onto Corson Avenue South
  - Turn right onto South Bailey Street
  - Turn left to enter the Interstate 5 North ramp (toward Vancouver, B.C.)
  - Merge onto I-5 North
  - Take Exit 164A (the Dearborn Street/James Street/I-90 East/Madison Street exit)
  - Turn right onto James Street
  - Turn right onto 9th Avenue. Hospital is at 9th Avenue and Jefferson Street.

8.2 EMERGENCY SITUATIONS AND PROCEDURES

Emergency procedures to be used in emergency situations for injuries and heat and cold stress are described in the following sections.

8.2.1 INJURIES

In emergency situations for injuries that are not life-threatening (e.g., a broken leg), normal decontamination procedures should be followed when possible. However, decontamination procedures may be modified according to the specific circumstances. Outer protective clothing should be removed if doing so would not cause delays or aggravate the injury.

Bodily injuries that occur as a result of an accident during operations at NBF will be handled in the following manner:

- The victim will be administered to by an individual who holds current first aid and/or CPR certification, as necessary
- The local first aid squad/rescue unit and the local hospital will be notified, as appropriate, depending on the nature of the emergency.

8.2.2 HEAT STRESS

Heat stress can occur at any time when impermeable protective clothing is worn. The degree of risk associated with working in these garments is directly related to numerous factors: ambient temperature, length of time in the suits, availability of shade, acclimatization of personnel, adequate fluids intake by workers, and length of rest periods. Workers wearing semi-permeable or impermeable encapsulating clothing should have their heart rate (pulse rate) monitored prior to and throughout any work period that includes sustained moderate to heavy work in protective clothing when the temperature

in the work area is above approximately 70°F. If such conditions exist, the following procedures will be carried out to reduce heat stress:

- Acclimatization
- Work/rest cycles
- Heat stress monitoring
- Liquids that replace electrolytes/salty foods available during rest
- Use of buddy system.

Each employee should check his/her pulse rate at the beginning of each break period. The pulse rate should be taken at the wrist for 30 seconds, and multiplied by 2. If the pulse rate exceeds 110 beats per minute, the length of the next work period should be reduced by one-third (the rest period need not be lengthened). A pulse rate in excess of 150 beats per minute may indicate heat exhaustion, although this rate will vary among workers. All personnel will know what their baseline pulse rate is before working in elevated temperatures, so as to monitor themselves. Personnel should follow appropriate guidelines if any personnel exhibit these symptoms:

- Heat Rash – Redness of skin. Frequent rest and change of clothing.
- Heat Cramps – Painful muscle spasms in hands, feet, and/or abdomen. Administer lightly-salted water by mouth, unless there are medical restrictions.
- Heat Exhaustion – Clammy, moist, pale skin, along with dizziness, nausea, rapid pulse, fainting. Remove to cooler area and administer fluids.
- Heat Stroke – Hot dry skin; red, spotted, or bluish; high body temperature of 104° F; mental confusion; loss of consciousness; convulsions; or coma. Immediately cool victim by immersion in cool water. Wrap with wet sheet while fanning; sponge with cool liquid while fanning; treat for shock. DO NOT DELAY TREATMENT. COOL BODY WHILE AWAITING AMBULANCE.

The Site Safety Officer will be trained in monitoring, treating, and recognizing the signs of heat stress. If heat stress occurs, decontamination should be minimized and treatment begun immediately.

8.2.3 COLD STRESS

It is not anticipated that soil excavation activities will occur in the winter months when site personnel may be subject to low temperatures, rain, and winds, proper protective clothing must be worn.

Cold stress can be manifested as both hypothermia and frostbite:

- Hypothermia is a cold-induced decrease in the core body temperature that can increase the safety hazards associated with investigation activities that require maximum attentiveness and manual dexterity. Hypothermia produces shivering, numbness, drowsiness, muscular weakness, and, if severe enough, death.

- Frostbite results from the constriction of blood vessels in the extremities, and decreasing the supply of warming blood to these areas. This drop in blood supply may result in the formation of ice crystals in the tissues, causing tissue damage. The symptoms of frostbite are white or grayish skin, blisters, or numbness.

Site personnel should review the information provided in their first aid training for response to cold stress problems.

8.3 FIRE

Fire extinguishers (ABC-type) will be kept in each site vehicle. In the event of major fires, explosions, or fire/explosion hazard conditions, all personnel will immediately evacuate the area. The Site Safety Officer will evaluate the need for further evacuation and/or emergency services.

8.4 SITE EVALUATION AND EVACUATION

The Site Safety Officer will be responsible for determining if circumstances exist that require further evaluation and/or evacuation. The Site Safety Officer should always assume worst-case conditions until proven otherwise.

TABLE E-1
EMERGENCY SERVICES

Service	Name/Location	Phone Number
Ambulance	---/---	206-655-2222 from Boeing property
Fire	---/---	206-655-2222 from Boeing property
Police	---/---	206-655-2222 from Boeing property
Hospital	Harborview Medical Center 325 Ninth Avenue Seattle, WA 98104	206-744-3000

CONTACT INFORMATION

Boeing Environmental Affairs		
Carl Bach Site Supervisor	206-898-0438 (cell)	Seattle, WA
Boeing Emergency Dispatch	206-655-2222	
Landau Associates		
Kristy Hendrickson Project Manager	425-778-0907 (office) 206-910-1378 (cell)	Edmonds, WA

FORM E-1
ACKNOWLEDGMENT

I have read the attached Health and Safety Plan for the interim action soil excavation work at North Boeing Field, Seattle, Washington. I have discussed any questions that I have regarding these materials with my supervisor, and I understand the requirements of the health and safety plan.

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Employee _____ Date _____

Site Safety Officer _____ Date _____

FORM E-2
MODIFICATION TO HEALTH AND SAFETY PLAN

DATE ___/___/___

Modification: _____

_____

_____

_____

Reasons for Modification: _____

_____

_____

_____

Site Personnel Briefed:

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Approvals:

Site Safety Officer: _____

Manager: _____

Others: _____

FORM E-3
EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT

(Use additional page if necessary)

Date:_____ Time:_____

Name:_____ Employer:_____

Site Name and Location:_____

Site Weather (clear, rain, snow, etc.):_____

Nature of Illness/Injury:_____

_____

Symptoms:_____

Action Taken: Rest:_____ First Aid:_____ Medical_____

Transported by:_____

Witnessed by:_____

Hospital's Name:_____

Treatment:_____

Comments:_____

_____

What was the person doing at the time of the accident/incident?_____

_____

Personal Protective Equipment Worn:_____

_____

Cause of Accident/Incident:_____

_____

What immediate action was taken to prevent recurrence?_____

_____

Additional comments

Employee's Signature/Date:

_____

Supervisor's Signature/Date

_____

Site Safety Representative's Signature/Date

_____

ATTACHMENT E-1

ROUTE TO HOSPITAL

Route to Harborview Medical Center Hospital

DIRECTIONS

1. Start out going SOUTHEAST on E MARGINAL WAY S toward S NORFOLK ST.
2. Turn LEFT onto S BOEING ACCESS RD.
3. Merge onto I-5 N toward SEATTLE.
4. Take the DEARBORN ST. / JAMES ST. exit- EXIT 164A- toward MADISON ST
5. Take the JAMES ST exit.
6. Turn RIGHT onto JAMES ST.
7. Turn right on Boren Avenue and drive 3 blocks to Broadway
8. Turn right, and then make a quick right turn onto Alder St
9. Continue for three blocks to 8th Avenue