COMPREHENSIVE EVALUATION OF EXISTING DATA
FORMER SCOTT PAPER MILL SITE
ANACORTES, WASHINGTON

Prepared for

Kimberly-Clark Corporation

Port of Anacortes

MJB Properties, Inc.

Prepared by

Anchor Environmental, L.L.C.

1411 4 th Avenue, Suite 1210

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Landau Associates, Inc.

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1 INTRODUCTION

1.1 Background and Objectives

The former Scott Paper Mill Site ("Site") consists of upland properties formerly owned by Scott Paper and aquatic lands within and adjacent to the former Scott Paper Mill in Anacortes, Washington (Figure 1). The former mill facility was constructed in approximately 1924, and operated up to 1978, when the plant was closed. Scott subsequently sold portions of the Site to other parties. Currently, the properties that comprise the former mill Site are owned by the Port of Anacortes ("Port"), Shared Healthcare Systems, Inc. ("SHS"; also referred to as Port Parcel 2), and MJB Properties, Inc. ("MJB"; referred to as the MJB North Area), as depicted on Figure 1. The remaining assets of Scott Paper Company were later sold to Kimberly-Clark, Inc. ("K-C") in December 1995.

Metal and organic chemicals have previously been detected at the Site at concentrations that may trigger actions under the Washington State Model Toxics Control Act ("MTCA"; Chapter 173-340 WAC; RCW 70.105D). Portions of the Mill Site were listed in 1995 (MJB) and 1997 (Parcels 1, 2, and Seafarers' Memorial Park) by the Washington Department of Ecology ("Ecology") as a site known to be contaminated by hazardous substances.

The MTCA regulations require Potentially Liable Parties to characterize the nature and extent of hazardous and deleterious substances at the Site, and to compile this information into a remedial investigation (RI) for Ecology review. For sites that exceed screening levels, the PLPs will develop and evaluate cleanup alternatives and identify a preferred alternative in a Feasibility Study (FS). The selected remedy for the site under MTCA will be set forth in a Cleanup Action Plan (CAP).

With oversight by Ecology under the MTCA Voluntary Cleanup Program (VCP), SHS previously prepared a RI/FS and CAP for upland soils at the SHS/Port Parcel 2 property (ThermoReTec 1999a, 1999b, 1999c, 2000). Remedial actions described in the Parcel 2 CAP and Interim Action Work Plan, including Addendum 1 and Addendum 2 (Landau 1999a,b,c) and the Parcel 2 CAP were subsequently implemented by SHS in 1999, and included removal/off-site disposal of petroleum contaminated soil, soil capping, and institutional controls to prevent future exposure to subsurface soil at the property and to

restrict groundwater use for drinking water. A project completion report for the Parcel 2 property was prepared in 2000 (ThermoReTec 2000). Ecology subsequently issued a no-further-action letter (Ecology 2000).

In addition to the remedial actions at Parcel 2, further characterization of the nature and extent of contamination remaining at the Site has been undertaken by the Port, MJB, K-C, and EPA. These additional efforts included sampling and analysis of MJB North Area property uplands and sediments by the EPA (E & E 2000), and supplemental sampling implemented jointly by K-C and MJB in 2001 and 2002. The Port also undertook independent investigation actions on their properties. Collectively, a considerable amount of data are available that can be used in a characterization of the nature and extent of contamination at the Site.

In 2001, the Port initiated negotiations with Ecology to enter into a MTCA Consent Decree to complete a RI/FS for Port Parcels 1 and 3, as well as remaining groundwater characterization elements on Port Parcel 2. The Port also proposed an expedited soils-only cleanup action on Parcel 1 and Ecology requested inclusion of draft and final CAPs for the areas being addressed. In addition, MJB (working with K-C) submitted a VCP application to Ecology to address that portion of the Site not covered under the Port's Consent Decree. The intent of these separate efforts was to provide to Ecology the substantive equivalent of a site-wide RI/FS while also allowing each of the current property owner's (e.g., the Port and MJB) to manage activities on their respective properties.

In January 2002, Ecology, the Port/SHS, MJB, and K-C met to discuss an appropriate path forward to accomplish the site-wide RI/FS objective. All parties agreed to the following three primary deliverables and action plans:

1. K-C, the Port, and MJB would work together to draft a comprehensive evaluation of the available Site characterization data, and would present the report to Ecology for review. The effort, led by K-C, would also include a preliminary approach for completing a site-wide RI, should data gaps in individual areas of the Site be identified from the review.

2. The Port would complete remaining RI/FS activities on its properties under a Consent Decree with Ecology. Detailed RI Work Plans for Port properties, including Sampling and Analysis Plans (SAPs) and Quality Assurance Project Plans (QAPPs), would be developed, approved, and implemented under the terms of the Consent Decree. The Port would prepare RI Reports for Parcels 1and 3 soils, Parcels 1, 2, and 3 groundwater, and Port marine areas, building on the previously completed Parcel 2 uplands RI/FS and CAP (ThermoReTec 1999a; 1999b, 2000) and other documents. The Port would subsequently prepare FS reports for its properties, and would work with K-C to coordinate this information with work in the MJB North Area, as appropriate, based on the findings of the RI(s). The Port may expedite cleanup of Parcel 1 soils, if appropriate. Section 6.1 of this report provides additional details on the approach to Port future work.

3. K-C and MJB would complete remaining RI/FS activities on MJB North Area properties, as needed, under an Agreed Order with Ecology, leading to completion of the RI and preparation of a focused FS Report for the MJB North Area property. K-C would also work with the Port and/or MJB to ensure coordination of work efforts, as appropriate based on the findings of the RI(s).

This Comprehensive Evaluation of Existing Data: Former Scott Paper Mill Site report addresses the first of the three agreed-upon deliverables discussed above. The evaluations and recommendations contained in this report will form the basis for the development of more detailed RI/FS Work Plans, as appropriate.

1.2 Report Organization

The remainder of this report is organized as follows:

- Section 2 – Site Description and History
- Section 3 – Data Compilation and Quality Assurance
- Section 4 – Chemicals of Potential Concern
- Section 5 – Conceptual Site Model
- Section 6 – Approach for Future Work
- Section 7 – References

Tables and figures that compile and illustrate the data are presented at the end of this document.

Appendix A provides the site characterization database in CD-ROM format.

2 SITE DESCRIPTION

This section provides a site description and summarizes site historical operations and current land use.

2.1 Historical Operations

The Scott Paper Company Mill was located in Anacortes, Washington on the west shore of Fidalgo Bay. The development of the shoreline as an industrial area began in the late 1800s with the construction of a timber mill. Prior to development, the area was largely a shallow tideland.

A pulp mill was first constructed in 1924, and was purchased by Scott Paper in 1940. Process improvements by Scott Paper included the conversion to an ammonium sulfite process in 1951, the construction of a 16-inch effluent pipeline to Guemes Channel and an onsite surge pond for the pipeline in 1952, and the addition of pulp bleaching facilities in 1955. Effluent was discharged directly into Fidalgo Bay from 1925 to 1952. A knots and tailings pond was constructed in 1959 to reduce settleable solids in the plant effluent. The facility closed in 1978.

Materials utilized at the Mill Site included petroleum, sulfur, anhydrous ammonia, ammonium hydroxide, and chlorine. Bunker C and diesel fuels were used to generate power and operate equipment. By the 1970's approximately 90,000 gallons of petroleum were stored onsite on a standby basis to power the mill's boilers (ThermoReTec 1999a). The history of the former Mill Site, including ownership and plant operations has been described in detail in other documents (Huckell/Weinman et al. 1996; Dingfield 1996; AGI 1987; ThermoReTec 1999a; E&E 2000).

The former Mill Site operations were bounded by Cap Sante Marina to the north, Fidalgo Bay to the east, and Q Avenue to the west. To the south, the maximum extent of Mill Site operations was 20th Street. Site boundaries are depicted on Figure 2.

2.2 Current Conditions

Following closure and subsequent sale of the Mill Site properties in the 1970s, the site was redeveloped over several periods into its current use. Initial redevelopment activities

included demolition of building and wharf structures, and removal of wastewater treatment facilities. In 1982, most of the accumulated wood debris and geotechnically unsuitable fill materials within the MJB North Area were excavated and disposed off-site (AGI 1987). Structurally suitable fill materials were subsequently imported onto the Site and placed within the excavation areas.

In 1999, SHS excavated petroleum-containing wood debris and soils from two areas within Port Parcel 2. Work also included the installation of a sheet pile wall along the shoreline (ThermoReTec 2000). Excavation areas were then backfilled with structural fill. An indicator layer, clean soil cap, and runoff controls were installed over the entire Parcel 2 property. The SHS campus/office park was subsequently developed on Port Parcel 2 in 2000.

Seafarers' Memorial Park, formerly known as South Harbor Park, was developed on Port Parcel 3 in 1994. Parcel 3 redevelopment activities included construction of public park structures and landscaping. A portion of the shoreline in this area has been armored with riprap materials to control erosion.

The area of the former Mill Site currently supports multiple uses including a park, office space, light industry including boat repair and construction, and modular home manufacturing. The Port, SHS, and MJB currently own the property on which the former Mill Site was located (Figure 2). The Port owns two portions of the former Mill Site: Parcel 1 at the northwest corner and Parcel 3 (Seafarers' Memorial Park) in the northeast corner. Former Port Parcel 2 was developed by SHS in 1999 to 2000 into an office park consisting of an office building and parking lots.

As part of the development of the SHS office park at Parcel 2, infiltration controls and biofiltration swales were constructed. A clay lined ditch runs along the boundary with the MJB land (ThermoReTec 2000). Surface water runoff collected from Parcel 1 and the SHS campus discharges to Fidalgo Bay via the City of Anacortes (City) storm sewer system. Drains either connected to the City storm sewer system, or which discharge directly into Fidalgo Bay, control surface water runoff from Parcel 3.

The MJB North Area is the southern portion of the former Mill Site operations area; the southern boundary is 20th Street (Figure 2). The MJB site is a 70-acre upland parcel of primarily unvegetated, developed land with several warehouse buildings leased to companies conducting small boat repair, boat construction, and modular home fabrication (E&E 2000). The MJB Central and South Areas (from 20th Street to 29th Street) surround the Anacortes Marina and include the site of the former Hansen Pile Driving Company Yard and S L Resources (E&E 2000).

The MJB Central and South Areas are beyond the former Mill Site and are not addressed in this report.

3 DATA COMPILATION AND QUALITY ASSURANCE

This section provides a brief description of the site investigations that have taken place to date at the Mill Site and surrounding areas. The data quality review selection process for screening relevant data is discussed below in Section 3.6. Investigations of upland areas that were not part of the Mill Site are not included in this data evaluation. Information from individual site investigations is also discussed in the identification of chemicals of potential concern (Section 4) and in the site conceptual model (Section 5).

3.1 Summary of Site Investigations

Previous investigations at the former Mill Site have assessed, to varying degrees, soil, groundwater, shoreline seep, sediment, and biological media present at the Site. The prior assessments have primarily had the goal of characterizing the nature and extent of chemicals of potential concern within certain areas of the Site, and have typically also included characterization of the associated geologic/geotechnical and hydrogeologic environments. A summary of site investigations reviewed for this data evaluation is provided in Table 1 and Figure 2.

The following discussions present an overview of the physical, chemical, and biological information available for use in this data evaluation. Prior to use in this evaluation, data available from these studies were evaluated for data quality, the results of which are presented below in Section 3.6. In general, studies conducted before 1991 were qualified for use and employed in this evaluation only if more recent data for the area were not available. If recent information met the data quality objectives for this data evaluation, they were accepted for site characterization uses. Specific data deemed acceptable for use in this data evaluation are discussed below.

3.2 Soil and Groundwater Data Summary

3.2.1 Geologic/Geotechnical Studies

Previous geotechnical work at the Site includes investigations by:

- Roger Lowe Associates (Lowe 1980) of the MJB Properties North Area
- Applied Geotechnology, Inc. (AGI 1987) of the MJB Properties North, Central, and South Areas

Each of these investigations is briefly outlined below. Additional geologic/geotechnical studies performed concurrently with soil and groundwater investigations are discussed in Section 3.2.2.

The purpose of the Lowe (1980) investigations of the MJB Properties North Area was the evaluation of subsurface conditions at the Site for the construction of a proposed pit for a barge loading facility. The report provides detailed information regarding the subsurface conditions at the site, and summarizes the five primary strata encountered: granular fill, wood debris, stiff clayey silt, silty sand, and hard silt. The study included information for 12 test pits and 14 test borings. A map of the sampling locations was provided and the data were summarized by depth intervals.

AGI (1987) conducted an environmental evaluation of the MJB North Area and adjacent land. AGI reported that most of the wood debris and geotechnically unsuitable fill materials historically present at the site were removed during site redevelopment in 1982, except for in a triangular area in the northeastern portion of the North Area that abuts Port Parcel 2. Newer, structurally suitable fill materials were placed within the excavation areas as part of the 1982 redevelopment activity.

3.2.2 Upland Soil and Groundwater Investigations

Numerous investigations at the former Mill Site have been performed to characterize the nature and extent of chemicals of potential concern in upland soils. More limited groundwater data have been obtained. Previous investigations of upland soil or groundwater quality include studies by:

- Hart Crowser (1989) of the Port Parcel 2
- A-1 Pump (1992, in ThermoReTec 1999a) of the Port Parcel 3
- ENSR (1993) of the Log Sort Yard, Port Parcels 1 and2
- Advanced Soil Mechanics (1994) of the Port Parcel 3
- Hart Crowser (1995) of the Port Parcel 3
- Earth Tech (1999b) of the Port Parcel 3
- Earth Tech (1999c) of the Port Parcel 1

- ThermoReTec (1999a and 2000) of the Port Parcel 2
- Ecology and Environment (2000) of the MJB Properties North, Central, and South Areas
- URS (2001) of the MJB Properties North Area

Each of these investigations is briefly outlined below.

Port Parcels 1, 2, and 3

A-1 Pump (data provided in ThermoReTec 1999a) collected four surface soil samples in 1992 in the Port Parcel 3 area. The area where these samples were obtained was subsequently capped and developed.

Hart Crowser (1989) sampled waste from the former tailings pond located at Parcel 2. Because this material was subsequently removed, these data were not used in this data evaluation.

ENSR (1993) conducted an investigation of Parcels 1 and 2 that included 12 soil borings, six of which were developed as monitoring wells. Analytical data for the ENSR (1993) study were summarized in the ThermoReTec (1999a) report for Parcel 2. Chemical analyses of soil samples collected by ENSR (1993) and available in ThermoReTec (1999a), included metals (12 samples), polynuclear aromatic hydrocarbons (PAHs; 12 samples), semivolatile organic compounds (8 samples) and dioxins/furans (1 sample). Chemical analyses of groundwater samples included petroleum hydrocarbons (6 samples from four wells), dissolved metals (5 samples from three wells), and semivolatile organic compounds (3 samples from two wells).

Advanced Soil Mechanics (1994) advanced two boreholes near the smokestacks in the Port Parcel 3 area. Four subsurface soil samples were analyzed for diesel-range total petroleum hydrocarbons (TPH-D).

Hart Crowser (1995) characterized hydrogen sulfide emissions at Port Parcel 3. Low levels of sulfides were detected in soil samples and in 6 soil vapor monitoring wells. Measured sulfide concentrations were below reported levels of potential concern.

Earth Tech (1999b) performed a limited evaluation of subsurface soils at Port Parcel 3 (Seafarers' Memorial Park). Six test pits were excavated and soils analyzed for TPH-D (2 samples), chlorodibenzodioxins and chlorodibenzofurans (6 samples), and metals (6 samples).

Earth Tech (1999c) investigated subsurface soils at Parcel 1. Ten test pits were excavated and soils evaluated for TPH-D (2 samples), dioxins and furans (10 samples), and metals (10 samples).

ThermoReTec (1999) evaluated soils and groundwater at Parcel 2 prior to the development of the SHS campus. Sampling was conducted in two phases. Phase I test pit investigations included 38 excavations. Phase II test pit investigations included 20 additional excavations. Chemical analyses of soils included selected analyses of TPH, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), dioxins/furans, and metals. Groundwater evaluations included the monitoring of four existing monitoring wells and the installation and development of five additional wells. Analysis of chemicals in groundwater (two wells total) included metals, PAHs, dioxins/furans, PCBs, and total oil and grease.

Excavation of soils and construction of control features occurred in 1999 at Parcel 2, including the removal of petroleum-containing soils from two areas in the vicinity of the former Mill Site tank farm. Work also included the installation of a 200-foot-long sheet piling wall to a depth of 26 feet below ground surface along the shoreline (ThermoReTec 2000). According to ThermoReTec (1999a), 2,467 tons of contaminated material was removed from Area A; 1,002 tons of contaminated material was removed from Area B. Soil quality samples of excavated materials no longer present at the Site were not included in the analytical database developed for this data evaluation.

MJB North Area

Ecology and Environment (2000) conducted a Preliminary Assessment/Site Inspection of the MJB site that included advancing 12 soil borings to collect surface and subsurface soil and groundwater/soil slurry samples. Chemical analyses included SVOCs,

pesticides/PCBs, and target analyte list metals for all groundwater/soil slurry samples (10 total) and soil samples (12 surface and 20 subsurface samples). Dioxin/furan analyses were conducted on 17 soil/sediment samples. Extractable petroleum hydrocarbon concentrations were measured in 10 soil samples and 11 groundwater/soil slurry samples.

URS conducted a soil and groundwater investigation of the MJB Properties North Area in November 2001. URS installed 12 soil borings ranging in depth from 10 to 20 feet below ground surface throughout the North Area. Most of the borings were concentrated in the northwestern portion of the North Area in the vicinity of the former Scott Mill facilities. Soil samples were collected from each of these borings at several depth intervals. Selected soil samples were analyzed for concentrations of diesel- and oil-range TPH (6 surface and 17 subsurface samples), PAHs (5 subsurface samples), SVOCs (2 subsurface samples), priority pollutant metals (8 surface and 17 subsurface samples), hexavalent chromium (2 surface samples), PCBs (5 subsurface samples), total organic carbon (TOC; 3 subsurface samples), and grain size distribution (3 subsurface samples). Groundwater monitoring wells were installed in four of the soil borings. Three new shallow groundwater monitoring wells were installed along the northern portion of the MJB North Area shoreline, and one monitoring well was installed inland near the Parcel 1 boundary. Following well development, groundwater samples were collected from each of these wells during a low tidal stage. All four groundwater samples were analyzed for diesel- and oil-range TPH, PAHs, SVOCs, total and dissolved priority pollutant metals, hexavalent chromium, PCBs, TOC, total suspended solids, and salinity.

3.3 Shoreline Seep Data Summary

Anchor (2001) collected two seep samples from the northern shoreline of the MJB North Area where surface water was visibly discharging to the beach. Samples were collected on November 14, 2001 using stainless steel well points temporarily established at low tide. Samples were analyzed for total and dissolved metals, PAHs, SVOCs, TPH, and PCBs.

3.4 Sediment Data Summary

A considerable number of nearshore and offshore sediment samples have been collected and analyzed for chemicals of potential concern. Previous investigations of sediment quality include studies by:

- Hart Crowser (1989) of sediments within the Port marine area
- Hart Crowser (1996) of sediments within and offshore of the Fidalgo Bay Marina
- Otten (1997) of sediments within the Port marine area
- Pentec (1997) of sediments within and adjacent to MJB North, Central, and South Areas
- Earth Tech (1999c) of sediments within the Port marine area
- Landau (1999) of sediments within the Port marine area
- E&E (2000) of sediments within the MJB North and Central Areas
- Anchor (2001 & 2002) of intertidal and subtidal sediments within the MJB North Area
- National Oceanic and Atmospheric Administration (NOAA), Washington Departments of Ecology (Ecology) and Natural Resources (DNR), Battelle, and others of marine sediments located offshore of the Mill Site, and compiled into the most recent version of Ecology's SEDQUAL database

Each of these investigations is briefly outlined below.

Hart Crowser (1989) collected and analyzed a single surface sediment sample collected within the Port marine area. The sample was a composite of intertidal sediment from the beach and from the harbor, approximately 100 yards from the beach. Analyses included SVOCs, including resin acids and chlorinated guaiacols, priority pollutant metals, and chlorinated dioxins/furans.

Hart Crowser (1996) collected ten subtidal surface sediment samples offshore of the Fidalgo Bay Marina with a modified van Veen sampler in accordance with Puget Sound Estuary Program (PSEP) protocols. This location is approximately one-half mile south of the MJB properties Central Area. Chemical analyses included all SMS parameters, guaiacols, resin acids, TOC, and grain size.

Otten (1997) collected three subtidal surface sediment samples within the Port marine area using a van Veen sampler. Chemical analyses included metals, PAHs, PCBs, dioxins/furans, tributyltin (TBT), volatile organic compounds, TOC, and total solids.

Pentec (1997) collected 10 sediment samples (four surficial grab samples and six core samples) within and adjacent to the MJB Properties North, Central, and South areas. Chemical analyses of the six cores included Puget Sound Dredge Disposal Analysis (PSDDA) conventionals and PSDDA chemicals of potential concern. The four surficial grabs were analyzed for Sediment Management Standards (SMS; Chapter 173-204 WAC) chemicals of potential concern.

Earth Tech (1999c) collected nine intertidal surface sediment samples within the Port marine area. Samples were collected with a manual core soil sampler. Chemical analyses included metals, SVOCs, PCBs (6 samples), dioxins, TOC and total solids.

Landau (1999) collected 12 subtidal samples within the Port marine area for analysis of conventional sediment parameters including total volatile solids (TVS) and TOC.

E&E (2000) collected 13 surface sediment samples from the intertidal zone of the MJB Properties North and Central areas and at a reference area using steel spoons. All samples were analyzed for target analyte list metals, SVOCs, and pesticides/PCBs. Seven samples were also analyzed for dioxins/furans and TOC.

Anchor collected three surface sediment samples from the intertidal zone within the MJB North Area using steel spoons. Samples were analyzed for metals, PAH, SVOCs, PCBs, TOC, and grain size.

Anchor collected nine surface sediment samples from the subtidal zone within the MJB North Area using a hydraulic van Veen sampler. Samples were located to further delineate areas where SQS criteria exceedances had been previously observed. Samples were analyzed for metals, PAHs, PCBs, TOC, and grain size.

Data compiled into Ecology's most recent version of the SEDQUAL database (2001) were used to assess offshore sediment in Fidalgo Bay and Guemes Channel, but excluding sample clusters located within the immediate vicinity of the March Point refineries. Six studies were identified in the query: 2MARINAS, ANCHOR90, BIOEFF97, CUSPLY95, DNRREC91, and PSAMP sampling from 1989 to 1995. 2MARINAS focused on the area of the Cap Sante Marina and included 21 sediment samples. ANCHOR90 evaluated sediment samples collected in Guemes Channel. CUSPLY95 included 12 samples collected at the site of the Anacortes Plywood facility. BIOEFF97 was an investigation of sediment chemistry and toxicity conducted by NOAA and Ecology for north Puget Sound and included 12 stations in greater Fidalgo Bay. DNRREC91 included four samples including one the vicinity of the former Mill Site outfall in Guemes Channel and one south of the Mill Site in Fidalgo Bay. A single PSAMP routine sediment monitoring station is located in Fidalgo Bay near March Point. In addition to the studies above, Ecology has also sampled surface sediments within the inner and outer Fidalgo Bay areas (SEDQUAL Study ID = FIDALGO97); however, only the inner bay data (south of the railroad trestle) were available in report format.

3.5 Biological Data Summary

Focused tissue sampling of bivalves and crab has been performed in the Padilla and Fidalgo Bay area. In 1991, crabs were collected from Fidalgo Bay in an area between Anacortes and the oil refinery piers at March Point (PTI 1991). The Mill Site shoreline is located within approximately 0.7 miles of the PSEP sample location and within the expected home range of Dungeness crab (see below). Chemical analyses conducted were limited to dioxins/furans (PTI 1991).

In 1999, Ecology collected crabs and clams from the west shore of March Point in the southern portion of Fidalgo Bay (Ecology 1999a,b). The sample location was approximately 1.2 miles from the Mill Site shoreline and also within the expected home range of Dungeness crab. Chemical analyses included metals, pesticides, PCBs, PAHs, and dioxins/furans (Ecology 1999a,b).

Qualitative biological surveys of the Guemes Channel in the vicinity of the former Mill Site outfall were conducted in the early 1970s (SML 1974). In 1997, NOAA and Ecology

(BIOEFF97) conducted an investigation of sediment toxicity and benthic infauna abundance at 12 locations within the greater Fidalgo Bay area.

3.6 Data Quality Assessment and Database Management

The following sections present the methods used to screen and manage analytical chemistry data available for the Mill Site area.

3.6.1 Preliminary Data Quality Review

A preliminary data quality review was undertaken to identify those data that are suitable for use in this data evaluation. Project specific data quality objectives (DQOs) were identified and historical data evaluated with respect to the DQOs. Data defined as acceptable for use in the data evaluation were then input into the project database. Project-specific DQOs were defined as follows:

3.6.1.1 Recency

In order to ensure that the data used for the data evaluation are representative of current environmental conditions, only those data collected since 1991 were included in the project database. Data collected prior to 1991 may be of historical interest, but are less likely to be representative of current conditions due to the potential for physical, chemical, and biological transformations and transport.

3.6.1.2 Sample Collection Methods

Only those data that were obtained using standard/accepted methods of sample collection for each type of matrix were included in the project database, ensuring that sample integrity was not compromised during the collection efforts. Acceptable sampling methods included the following:

- Puget Sound Estuary Program (PSEP) guidelines for the collection of marine sediment
- United States Environmental Protection Agency's (US EPA) SW-846 guidelines for the collection of soil and groundwater
- American Society for Testing and Materials (ASTM) standard methods for sample collection

3.6.1.3 Location Quality Assessment

Only those samples for which station locations were surveyed (including GPS methods) were included in the project database. Location control, including sufficient documentation in the original report or in accompanying documentation, was required for this determination. Horizontal station positions that were deemed accurate to within approximately 30 feet of the true location were included in the database.

3.6.1.4 Analytical Methods

Only those samples analyzed using standard analytical methods, such as US EPA's SW-846 Methods, Standard Methods for the Examination of Water and Waste Water, Methods of Soil Analysis, ASTM, and PSEP, were considered acceptable for inclusion into the project database.

3.6.1.5 Detection Limits

For the purposes of this data evaluation, chemical concentrations reported as undetected, and for which the detection limit for that chemical exceeded the corresponding screening criterion (see below), were generally not included in the evaluation. However, these data were retained in the database if lower detection limit data were not available.

3.6.1.6 Data Quality Assessment

For inclusion into the database, the data must have been subjected to at least a Level 3 data validation effort, which consists of the following minimum requirements:

- Comparison of summary data reported by the laboratory for blanks, surrogate spikes, matrix spikes, matrix spike duplicates, matrix duplicates, standard reference materials, and detection limits to the DQOs specified in the study-specific quality assurance plans
- Comparison of the laboratory's summary of calibrations with the limits specified in the study-specific quality assurance plans

3.6.2 Data Validation/Suitability Review

The results of the DQO comparison of all available data collected from the Site area are summarized in Table 2. Of the 22 separate site characterization studies that have been performed in the former Mill Site area since 1991, 20 of these investigations presented chemical sampling data and associated QA/QC documentation required to evaluate data quality. The bulk groundwater/soil slurry samples collected by E&E (2000) within the MJB North Area did not meet the project DQOs. Field sampling methods in this case (collection of water/soil slurry samples directly from boreholes without development) did not utilize standard/accepted methods for groundwater sample collection (EPA 1989), and did not conform to USEPA SW-846 guidelines. Thus, since sample integrity and representativeness was likely compromised in this case, the bulk "groundwater" samples collected by E&E (2000) were rejected for the purpose of this data evaluation. Since other groundwater quality data meeting DQO criteria (i.e., collected from properly developed wells) are available for this area (URS 2001), rejection of the E&E bulk groundwater/soil slurry sample data did not impact the site characterization. Other data may later be determined not to be of adequate quality for use in the RI(s).

3.6.3 Data Retained for Use in this Data Evaluation

Data that met the DQOs identified in Section 3.6.1 were retained in the database for development of this data evaluation. Data sets retained for use in this evaluation are identified in Table 2. Accepted data included 138 soil samples, 17 groundwater samples, and 86 sediment samples. Biological sampling data (tissue chemistry, sediment toxicity, or benthic infauna) available for 9 sampling stations within the Site area, in addition to corresponding reference area data, were also retained for this data evaluation (PTI 1991; Ecology 1999; Long et al. 1999).

3.7 Database Development

Data were compiled as hard copy or received in electronic format and entered into a Microsoft Access relational database. The information in the database includes: inspection report citations, station designations and locations (latitude/longitude), sample types, sample locations including depth, and analytical chemistry results. The database was queried to compare the data to applicable and relevant screening criteria for soils,

groundwater, and sediment, as discussed in Section 4. The database is provided in CD-ROM format in Appendix A.

4 CHEMICALS OF POTENTIAL CONCERN

Site-specific chemicals of potential concern were identified by comparing validated chemical determinations, as compiled into the project database (Section 3; Appendix A), with conservative (protective) chemical screening criteria. The specific screening criteria are discussed and summarized in Section 4.1, followed by comparisons with the project database (Section 4.2). Section 4.3 presents summaries of the Site-wide distributions of chemicals of potential concern within different matrices (e.g., soil, groundwater, and sediment).

4.1 Screening Levels

Analytical chemistry data for soil, groundwater, and sediment matrices were compared to screening levels developed under MTCA and SMS. A summary of screening levels for chemicals detected at the Site is presented in Table 3.

4.1.1 MTCA Soil and Groundwater Screening Levels

Screening levels are identified in this Comprehensive Evaluation for the particular hazardous substances at the Site and the areas (upland or marine) where they are located. Screening levels are used in this document for comparison with the concentrations of hazardous substances detected at the Site. The screening levels identified are not intended to be used as cleanup levels. Discussions about cleanup standards (defined as cleanup levels, points of compliance, and other applicable regulatory requirements) will be presented in future FS documents (see Section 6).

For the purposes of this document, chemical concentrations detected above the screening levels were retained for further evaluation as constituents of potential concern. Conversely, if chemical concentrations were not detected above screening levels, these constituents were not retained for further evaluation. The screening levels utilized in this evaluation do not include factors such as engineering and institutional controls, or conditional points of compliance, that could result in cleanup levels less restrictive than the screening levels used herein, though still protective of human health and the environment. These factors will be evaluated as part of FS evaluations and may be a component of remediation level development.

For soil, MTCA Method A or Method B levels based on direct contact exposure were used for screening levels. In cases where a Method B value does not exist for the direct contact exposure pathway (e.g., lead), Method A levels were used for screening. Method C levels are cited in the text and on figures for comparison as well, because selected areas of the Site are currently compatible with industrial land use, and may continue to be in the future. However, Method C levels were not used to screen out potential contaminants of concern from further evaluation.

For groundwater, Method A or Method B levels were used as screening levels. ThermoReTec (1999b) and E&E (2000) reviewed regional groundwater use in the Anacortes area, and concluded that groundwater beneath or potentially affected by the Site is not currently used for consumption. Given the presence of a public water supply at the Site (provided by sources removed from potential Site influence), and also given the presence of further institutional controls at the Site that preclude future groundwater withdrawal (see Parcel 2 CAP; ThermoReTec 1999b), future drinking water use of Site groundwater is not a reasonable future exposure scenario. Nevertheless, groundwater screening levels were based on drinking water exposure.

For surface water, chronic marine surface water quality criteria [Washington Water Quality Criteria (WAC 173-201A) and Federal Water Quality Criteria (40 CFR 131)] were used as screening levels. Seep water analytical results were compared to surface water screening levels.

Screening levels and their sources are listed in Table 3.

4.1.2 SMS Sediment Screening Levels

Two levels are specified by SMS: sediment quality standards (SQS) and sediment cleanup screening levels (CSL). The SQS is the value below which no adverse impacts to the environment are expected. The CSL is a level above which more than minor biological effects are anticipated. Sediment levels ranging between the SQS and CSL are associated with minor adverse effects. The more conservative SQS criteria were used as screening levels for the purpose of comparison in this document.

The SQS screening can be performed on the basis of either chemical concentrations or confirmatory biological testing (e.g., sediment bioassays). Since considerably more chemical (versus biological) data has been collected in the former Mill Site area (see Section 3.6.3), the chemical SQS criterion was used as the basis for screening. For metals, SQS chemical criteria are evaluated on a dry weight basis. For certain compounds (e.g. PAHs, chlorinated benzenes, phthalates), the SQS chemical criteria are provided in both a dry weight and total organic carbon (TOC) normalized basis. Where the TOC content of the sediment is greater than 0.5 percent, and for chemicals for which TOC normalization is appropriate under SMS, the TOC-normalized criteria were used. Otherwise, dry weight criteria provide the appropriate screening values. Sediment quality data were compared with SQS chemical criteria for those chemicals with promulgated SMS criteria, or with NOAA sediment quality reference values (SQRVs) if there was no promulgated SMS criterion. A sediment TOC concentration of 10 percent (dry weight basis) was used as a provisional screening level for potentially deleterious wood debris deposits, based on Kendall and Michelsen (1997). Table 3 summarizes the sediment screening level.

4.1.3 Fish and Shellfish Tissue Screening Levels

For the purpose of this data evaluation, tissue concentrations of potentially bioaccumulative chemicals in fish and shellfish (e.g., mercury, PCBs and dioxins/furans) were screened against relevant risk-based concentrations using procedures described in MTCA for the protection of human health and the environment. Tissue concentrations from crab and shellfish collected from Fidalgo Bay were evaluated using MTCA human health risk equations and compared to available and relevant ecological guidelines. Specific evaluation procedures for bioaccumulative chemicals are described in later sections of this data evaluation.

4.2 Identification of Chemicals of Potential Concern

Site chemicals of potential concern in soil, groundwater, or sediment were identified on the basis of whether the chemical exceeded the Table 3 screening criteria discussed above. As summarized in Table 4, a total of 16 chemicals or chemical groupings exceeded a screening criterion in at least one sample collected from the Site. However, for 3 of these chemicals (beryllium, naphthalene, and phenol), only a single sample exceeded the screening criterion

for a single matrix (e.g., soil or sediment). Moreover, the magnitude of exceedance in these cases was relatively minor (less than 2 times the screening value). In the case of phenol (and other related chemicals such as 4-methylphenol), similarly elevated sediment concentrations have also been observed in northern Puget Sound reference areas (Long et al. 1999). Consistent with the MTCA regulations including guidelines for statistical evaluation of site data (WAC 173-340-740[7]), the single detections above screening criteria do not constitute exceedances of relevant MTCA criteria. Therefore, beryllium, naphthalene, and phenol were not retained as chemicals of potential concern at the former Mill Site.

A total of 13 Site chemicals of potential concern, including 8 metals and 5 organic compounds or groups, were retained for further evaluation in this report. The list of chemicals of potential concern, along with their overall frequency of exceedance above conservative screening criteria (soil, groundwater, and sediment media combined; see Table 4) is provided below. Bolded substances are identified as indicator chemicals, as discussed below.

METALS:

- Antimony (3 percent of samples exceed screening level)
- **Arsenic (10 percent)**
- Cadmium (3 percent)
- Copper (2 percent)
- **Lead (8 percent)**
- Mercury (7 percent)
- Nickel (1 percent)
- Thallium (2 percent)

ORGANICS:

- **Carcinogenic PAHs (CPAHs as TTEC; 10 percent)**
- **PCBs (9 percent)**
- Chlorinated dibenzodioxins/furans (as TTEC; 3 percent)
- **Diesel-range Petroleum Hydrocarbons (TPH-D; 10 percent)**
- Wood debris/TOC (sediment concern only; 3 percent)

4.3 Site Distribution of Chemicals of Potential Concern

Of the 13 Site chemicals of potential concern identified above, 2 metals (arsenic and lead), and 3 organic compound groups (CPAHs, TPH-D, and PCBs) exceeded screening criteria most frequently and to the greatest degree. The distribution of these 5 chemicals throughout the Site also generally represents the distribution of other chemicals of potential concern (e.g., samples that contained lead above screening levels often had other metal detections above screening levels). Consistent with MTCA regulations, these chemicals or chemical groupings can be used as indicator chemicals to generally describe the distribution of all chemicals of potential concern at the Site. The distribution of chemicals of potential concern at the former Mill Site is presented below.

4.3.1 Soil

Site soil data were compared directly to soil screening levels. The site-wide upper 95th percentile confidence limit (UCL) concentrations, calculated using procedures described in Ecology's MTCASTAT program (Ecology 1997b), were also compared to the screening levels. MTCA requirements for use of statistical procedures include provisions that no single sample may exceed two times the screening level and less than ten percent of the samples may exceed the screening level. We also considered the depth profile of soil contamination. The completed Parcel 2 soil cleanup, for example, includes soil cap and institutional controls to prevent exposure to soil contaminants present at depths greater than approximately 3 feet below ground surface (bgs; ThermoReTec1999b). For the purpose of this data evaluation, soil quality data collected from surface (0 to 3 feet bgs) and subsurface (3 to 15 feet bgs) depths were considered separately. A summary of calculated UCL surface soil concentrations for chemicals of potential concern at the former Mill Site is presented in Table 5.

4.3.1.1 Metals

As discussed above, 8 metals were identified as chemicals of potential concern at the former Mill Site. The spatial distribution of each metal in Site soils is discussed below.

Antimony

The screening level for antimony is 32 milligrams per kilogram (mg/kg). Of the 100 soil samples collected from the Site and analyzed for antimony, 5 (or 5 percent; primarily subsurface samples) exceeded this screening level (Table 4). The UCL antimony concentration in surface soils at the Site is 23 mg/kg, below the screening level (Table 5). The maximum soil antimony concentration (101mgkg) was detected in subsurface soil (9 to 11.5 ft bgs) collected at station SM-10, located within the MJB North Area (Figure 2). Only one soil sample (subsurface; RTP-2 – 9 ft bgs; 60 mg/kg) collected on Port property exceeded the screening level, but was less than two times the screening level.

Arsenic

The screening level for arsenic is 20 mg/kg. By comparison, the current MTCA Method C direct contact soil cleanup level for industrial site use is 39 mg/kg (based on soil ingestion and dermal contact exposure only; groundwater pathways are evaluated separately below).

A total of 134 soil samples have been collected from the Site and analyzed for arsenic, and 17 (or 13 percent) of these samples exceeded the 20 mg/kg screening level (Table 4). The maximum soil arsenic concentration (142 mg/kg; Station SB-09) detected at the Site was located in the western portion of the MJB North Area, at a station identified by the investigators (E&E 2000) as an area background location (Figure 3). Elevated arsenic concentrations (above screening levels) have been detected in other areas of the Site, and also at locations south of the former Mill property. Overall, soil arsenic concentrations at the Site are generally highest in surface soils, as compared with subsurface depths, though considerable variability in arsenic concentrations is evident across the Site. The UCL arsenic concentration in surface soils at the Site is approximately 28 mg/kg, exceeding the screening level, but below the MTCA Method C direct contact level (Table 5). Three surface soil samples (but no subsurface soil samples) exceeded two times the screening level (Figure 3).

Since surface soil arsenic concentrations at the Site are protective of existing industrial uses of portions of the property (i.e., below MTCA Method A industrial

cleanup levels for potential direct contact soil exposures), further characterization of arsenic sources and distributions at these portions of the Site should not be necessary.

Cadmium

The screening level for cadmium is 4 mg/kg, based on ecological protection. Of the 127 soil samples collected from the Site and analyzed for cadmium, 5 (or 4 percent; including both surface and subsurface samples) exceeded the screening level (Table 4). However, no surface soil samples exceeded the screening level by more than 2 times. Moreover, no surface or subsurface soil sample exceeded the residential use direct contact criterion for cadmium.

Copper

The screening level for copper is 2,960 mg/kg. Of the 115 soil samples collected from the Site and analyzed for copper, 2 (or 2 percent) exceeded the screening level (Table 4). No surface soil sample for copper exceeded the screening level. Moreover, no subsurface soil sample exceeded the screening level by more than 2 times.

Lead

The screening level for lead is 250 mg/kg. By comparison, the current MTCA Method C cleanup level for industrial site use is 1,000 mg/kg. Of the 134 soil samples collected from the Site and analyzed for lead, 13 (or 10 percent; primarily subsurface soils) exceeded the screening level (Table 4). Seven (7) locations at the Site also contained subsurface soils that exceeded the industrial use criterion, though surface soils at these locations were below the screening level (Figure 4). No surface sample for lead exceeded the screening level.

The highest soil lead concentration was detected in subsurface soil at SHS/Port Parcel 2 (6,428 mg/kg) at Station RTP-44 (Figure 4). Soil cleanup at Parcel 2 has already been completed. The next highest lead concentration (3,250 mg/kg) was located in the MJB North Area near the shoreline (SB-10). The distribution of elevated lead concentrations in subsurface soils at the Site is consistent with its

presence in earlier fill soils (i.e., fill materials not removed during Site redevelopment).

Mercury

The screening level for mercury is 2 mg/kg, based on considerations of wildlife protection. Of the 127 soil samples collected from the Site and analyzed for mercury, 9 (or 7 percent) exceeded this screening level (Table 4). The UCL (and maximum) mercury concentration in surface soils at the Site is 15 mg/kg, which also exceeds the screening level (Table 5). The maximum mercury concentration (29 mg/kg) was detected in subsurface soil at RTP-45 (7 ft bgs). Within the MJB North Area, the highest mercury concentration (15 mg/kg) was detected in near-surface soil at SS-10 (2 to 4 ft bgs). However, the MTCA Method B direct contact soil screening level for unrestricted site use is 18 mg/kg (based on soil ingestion and dermal contact exposure only). No soil sample exceeded 2 times this value.

Nickel

The screening level for nickel is 1,600 mg/kg. None of the 115 soil samples collected from the Site and analyzed for nickel exceeded this screening level (Table 4).

Thallium

The screening level for thallium is 5.6 mg/kg. Of the 108 soil samples collected from the Site and analyzed for thallium, 4 (or 3 percent; all subsurface samples) exceeded this screening level (Table 4). However, the maximum thallium concentration in surface soils at the Site is approximately 3 mg/kg, well below the screening level (Table 5). The maximum thallium concentration (51 mg/kg) was detected in subsurface soil at SB-02 (9 to 11 ft bgs), within the MJB North Area. No other soil sample collected from the Site exceeded 2 times the screening level.

4.3.1.2 Organics

As discussed above, 5 organic compound groups were identified as chemicals of potential concern in soil at the former Mill Site. The spatial distribution of each organic in Site soils is discussed below.

Carcinogenic Polynuclear Aromatic Hydrocarbons (CPAHs as TTEC)

Consistent with MTCA, CPAHs were evaluated using (total toxicity equivalent concentration (TTEC) procedures adopted by Ecology in 2001 (CLARC 3.1, Nov 2001; WAC 173-340-708[8][e]). The screening level for total CPAHs is 0.1 mg/kg. For comparison, the current MTCA Method C direct contact soil cleanup level for industrial site use is 2.0 mg/kg. Of the 60 soil samples collected from the Site and analyzed for CPAHs, 11 (or 18 percent; primarily subsurface samples) exceeded the screening level (Table 4), but only one subsurface sample exceeded the industrial use criterion. The maximum CPAH TTEC concentration in surface soils at the Site is approximately 0.93 mg/kg, above the screening level, but below the industrial criterion (Table 5). The highest soil total CPAH concentration was detected in subsurface soil at SHS/Port Parcel 2 (6.7 mg/kg) at Station RTP-11 (Figure 5). Similar to lead, the distribution of elevated CPAH concentrations in subsurface soils at the Site is consistent with its presence in earlier fill soils (i.e., fill materials not removed during Site redevelopment). However, surface soil CPAH concentrations at the Site are protective of existing industrial uses of portions of the property (i.e., below MTCA Method C industrial use screening levels for potential direct contact soil exposures).

Polychlorinated Biphenyls (PCBs)

The screening level for PCBs is 1 mg/kg. Of the 37 soil samples collected from the Site and analyzed for PCBs, two subsurface samples (or 6 percent) exceeded this screening level (Table 4). No surface soil samples exceeded the residential screening level. The highest soil PCB concentration was detected in subsurface soil at SHS/Port Parcel 2 (23.8 mg/kg) at Station RTP-02 (Figure 7). Soil cleanup has already been completed at Parcel 2. Similar to lead and CPAHs, the distribution of elevated PCB concentrations in subsurface soils at the Site is consistent with its presence in earlier fill soils (i.e., fill materials not removed during Site redevelopment), and potentially with other PCB sources (see ThermoReTec 1999a). However, considerable sample variability was observed in these areas. PCB concentrations at the Site are protective of existing industrial uses of portions of the property (i.e., below MTCA Method C cleanup levels for potential direct contact soil exposures).

Chlorinated Dibenzodioxins & Dibenzofurans (as TTEC)

Consistent with MTCA, dioxins/furans were evaluated using TTEC procedures (WAC 173-340-708[8][e]). The screening level for total dioxins/furans is 6.7 nanograms per kilogram (ng/kg). Seven (7; or 15 percent; all subsurface) of the 47 total samples collected from the Site and analyzed for dioxins/furans exceeded this screening level (Table 4). However, none of the surface soil samples collected from the Site exceeded the screening level. Moreover, no soil sample exceeded the MTCA Method C industrial cleanup level for potential direct contact soil exposures of 875 ng/kg (Figure 8).

Diesel-range Petroleum Hydrocarbons (TPH-D)

The level for TPH-D in soil is 2,000 mg/kg, based on groundwater protection. Of the 46 soil samples collected from the Site and analyzed for TPH-D, 11 (or 24 percent; primarily subsurface samples) exceeded the screening level (Table 4). All TPH-D screening level exceedances are located on the SHS/Port Parcel 2 property. Soil within this area was remediated in 1999 (ThermoReTec 1999b and 2000). An indicator layer and clean soil cap were installed over the entire Parcel 2 property. Infiltration controls were installed at the SHS Campus to minimize surface water infiltration and subsequent groundwater flows through underlying TPH-containing soils.

4.3.2 Sediments

Several metals (copper, lead, and mercury) and organics (PCBs and wood debris/TOC) have been detected above SQS and other screening levels in sediments located in Fidalgo Bay depositional areas, including stations immediately offshore of the Site. The distribution of identified sediment chemicals of all potential concern at the former Mill Site is presented below. However, no chemicals of potential concern have been detected in sediment samples collected from the Guemes Channel in the vicinity of the former Mill Site outfall (based on SEDQUAL data queries, including DNRREC91). Based on the erosional characteristics of this channel (see Section 5.3 below), sediment deposition would not be anticipated in this area.

4.3.2.1 Metals

Copper

The screening level for copper is 390 mg/kg, based on benthic infauna protection. Of the 47 surface sediment samples collected from the Site and analyzed for copper, 2 exceeded this screening level (Table 4). The sediment sample with the highest copper concentration in the Site vicinity (854 mg/kg; Station IS-02; E&E 2000) was collected in the intertidal beach adjacent to the southern part of the MJB central area, beyond the former Mill Site boundary. The other sediment sample that exceeded SQS chemical criteria (755 mg/kg; Station ET-SS04; Earth Tech 1999c), was collected in the intertidal beach adjacent to Port upland Parcel 2.

Lead

The screening level for lead is 450 mg/kg, based on benthic infauna protection. Of the 47 surface sediment samples collected from the Site and analyzed for lead, only one sample (1,020 mg/kg; Station ET-SS03; Earth Tech 1999c) exceeded this screening criterion (Table 4). Station ET-SS03 is located within the intertidal beach immediately adjacent to upland fill materials containing similarly elevated lead concentrations (Figure 4). The shoreline in this area has historically exhibited some erosion over time, though erosion controls (riprap) have recently been installed. It is possible that prior erosion of upland soil/fill materials contributed to the localized release of lead detected in this shoreline area.

Mercury

The screening level for mercury is 0.41 mg/kg, based on benthic infauna protection. Potential bioaccumulation exposures and risks can be associated with somewhat higher sediment mercury concentrations (above 1 mg/kg; PSDDA bioaccumulation trigger; Anchor and Hart Crowser 2000). Of the 47 surface sediment samples collected from the Site and analyzed for mercury, 3 exceeded the SQS screening criterion (Table 4), though none exceeded typical bioaccumulation triggers. The highest sediment mercury concentration (0.88 mg/kg [based on the average of duplicate results]; Station ET-SS02; Earth Tech 1999c) was collected within the intertidal beach immediately adjacent to Port upland Parcel 2. Two other intertidal beach samples collected in this same area (Station ET-SS03 and Station SED-2;

Anchor 2001) marginally exceeded the SQS chemical criterion. Since similarly elevated mercury concentrations have also been detected in upland soil/fill materials in this area, it is possible that prior shoreline erosion contributed to the localized release of mercury detected in this area, similar to that described for lead.

4.3.2.2 Organics

As discussed above, 2 organic compound groups (PCBs and wood debris/TOC) were identified as chemicals of potential concern in sediment at the former Mill Site. The spatial distribution of these chemicals in Site sediments is discussed below. Of the 39 surface sediment samples collected from the Site and analyzed for PAHs, none exceeded screening levels (Tables 3 and 4; Figure 6). Similarly, of the 17 sediment samples collected from the Site and analyzed for dioxins/furans, none exceeded the screening level of 3.6 ng/kg (Figure 8).

Polychlorinated Biphenyls (PCBs)

The screening level for PCBs is 12 mg/kg OC (i.e., expressed as a TOC-normalized concentration), based on protection of benthic infauna and potential bioaccumulation exposures. By comparison, the CSL chemical criterion for PCBs (based on the potential for more than minor adverse biological effects) is 65 mg/kg OC. Of the 30 surface sediment samples collected from the Site and analyzed for PCBs, 5 samples exceeded the screening level (Table 4), and 2 also exceeded the CSL criterion. The highest sediment PCB concentration (108 mg/kg OC; Station SED-3; Anchor 2001) was collected within the intertidal beach immediately adjacent to uplands in the MJB North Area (Figure 7). Several other surface sediment samples collected with the MJB North Area intertidal beach (Stations SED-3, IS-10, and GPC-2) also exceeded the screening level. The sampling data define a contiguous, though localized area of PCB release onto the beach of less than 2 acres. Sediment samples surrounding this 2-acre area, including all subtidal samples collected within the Site vicinity, were well below the screening level. A single elevated PCB concentration detected at Station ET-SS02 (32 mg/kg OC) was not corroborated by the duplicate sample collected from this same station (duplicate results were an order of magnitude lower than the original sample).

Elevated PCB concentrations have been detected in upland soil/fill materials at the Site (Figure 7). It is possible that prior shoreline erosion could have contributed to the localized release of PCBs detected in this area, similar to the condition discussed above for lead and mercury. However, historical releases from the former Mill outfall (located in the general vicinity of Station GPC-2) could also have contributed to the observed PCB detections. Since relatively low PCB concentrations have been detected in upland soil and fill materials in the MJB North Area uplands (all soil samples collected from the MJB property contain PCB levels at or below SQS criteria), no ongoing release of PCBs from this upland area is indicated.

Wood Debris/TOC

There is no promulgated SMS criterion for wood debris in sediment. However, a SMS Clarification Paper published by Ecology (Kendall and Michelsen 1997) presents an approach to addressing the deleterious properties of wood debris accumulations in sediments. Consistent with the Clarification Paper and general Ecology policy under SMS, for the purpose of this data evaluation sediment TOC concentrations greater than 10 percent (dry weight basis) were provisionally identified as having the potential for deleterious biological effects.

Of the 35 surface sediment samples collected from the Site and analyzed for TOC, only one sample (13 percent; Station ET-SS03; Earth Tech 1999c) exceeded this screening level (Table 4). Station ET-SS03 is located within the intertidal beach immediately adjacent to upland fill materials containing wood debris (Figure 10). It is possible that prior shoreline erosion or disintegration of the docks contributed to the localized release of wood debris/TOC detected in this area, similar to that described above for lead, mercury, and PCBs.

4.3.3 Groundwater and Seeps

As discussed in Section 5.2 below, groundwater occurs at the Site within subsurface fill materials, including within the wood-containing fill deposits. Shallow groundwater discharges from the Site through seeps visible at low tide along the Fidalgo Bay beach. Validated groundwater sampling data for the Site are available for two shallow wells within the SHS/Port Parcel 2 property (RMW-06 and RMW-10; ThermoReTec 1999a), 4

shallow wells within the MJB North Area (MW-1 through MW-4; URS 2001), and 2 shoreline seeps within the MJB North Area beach (SEEP-1 and SEEP-2; Anchor 2001).

As discussed above, groundwater data were compared with conservative screening levels based on drinking water exposure. For the screening, total recoverable concentrations were used in the ground water screening, though dissolved concentrations may provide a more representative measure of groundwater quality in many situations. Seep data available for the Site were compared to surface water surface water screening levels (Table 3).

Based on the conservative screening, chemicals of potential concern identified in Site groundwater are limited to three metals (arsenic, lead, and nickel). The distribution of these metals in groundwater and seeps at the former Mill Site is presented below.

4.3.3.1 Metals

Arsenic

The screening level for arsenic is 5 micrograms per liter (ug/L). By comparison, the marine surface water standard for aquatic life protection (chronic criterion) is 36 ug/L. Of the 9 validated groundwater and seep samples collected from the Site and analyzed for arsenic, 2 exceeded the screening level (Table 4). The water sample with the highest total arsenic concentration at the Site (27 ug/L; MW-2; URS 2001) was collected near the shoreline within the MJB North Area (Figure 11). The upgradient groundwater sample collected in this area (MW-4) also exceeded the screening level. Significantly, no water sample collected from the Site has exceeded the aquatic life protection criterion for arsenic. However, detection limits achieved during prior groundwater investigations of the Port Parcel 2 property do not allow for a definitive comparison.

Lead

The screening level for lead is 15 ug/L. By comparison, the marine surface water standard for aquatic life protection (chronic criterion) is 8.1 ug/L. Of the 9 validated groundwater and seep samples collected from the Site and analyzed for lead, only one exceeded the screening level (Table 4). This sample (37 ug/L; MW-2; URS 2001)

was collected near the shoreline within the MJB North Area (Figure 12). Significantly, no water sample collected from the Site has exceeded the aquatic life protection criterion for lead. However, similar to arsenic, detection limits achieved during prior groundwater investigations of the Port Parcel 2 property do not allow for a definitive comparison.

Nickel

The screening level for nickel is 320 ug/L. By comparison, the marine surface water standard for aquatic life protection (chronic criterion) is 8.2 ug/L. Of the 9 validated groundwater and seep samples collected from the Site and analyzed for nickel, none exceeded the drinking water criterion, while the 2 seep samples (SEEP-1 and SEEP-2; Anchor 2000) collected during low tide conditions both marginally exceeded the chronic aquatic life criterion (Table 4). The maximum detected dissolved nickel concentration was 14 ug/L. However, all water sample concentrations (including the 2 seeps) contained dissolved nickel concentrations well below the short-term acute toxicity criterion for this metal of 74 ug/L. Moreover, considering that the 8.2 ug/L chronic criterion is applicable as a daily average value, incorporating the effects of tidal mixing and dilution at the point of discharge over the tidal cycle, compliance with the chronic criterion at the Site is indicated. (Note also that elevated concentrations of nickel were not observed in upland fill materials.)

4.3.3.2 Organics

No organic chemicals have been detected in groundwater or seeps at the Site above screening levels (Table 4; also see Figures 13, 14, and 15). However, as discussed in Section 4.3.1.2 above, subsurface soils within the SHS/Port Parcel 2 property, near the location of a former fuel storage facility, contain concentrations of TPH-D that exceed MTCA groundwater protection criteria. Soil remediation in this area was completed in 1999, in accordance with the Parcel 2 CAP (ThermoReTec 1999b and 2000), and infiltration controls were installed at the SHS Campus to minimize surface water infiltration and subsequent groundwater flows through underlying TPH-containing soils. Future groundwater monitoring is being proposed to confirm the effectiveness of the prior remedial action (see Section 6.1 below).

4.3.4 Fish/Shellfish Tissue

Validated tissue chemistry data for potentially bioaccumulative chemicals such as mercury, PCBs, and dioxins/furans are available for Dungeness crab samples collected in Fidalgo Bay (PTI 1991 and Ecology 1999). Significantly, the home range of crabs collected from Fidalgo Bay sampling stations overlaps the area where, based on general review of fate and transport processes (see Section 5.3 below), potential releases from the Site, including historical effluent discharges into Guemes Channel, may have been deposited. Since crabs live in contact with sediments, and since benthic infauna is a primary food source of crabs, these organisms may be particularly appropriate in evaluations of the nature and extent of chemical releases (PTI 1991; Anchor & Hart Crowser 2000).

It is important to note that in addition to the Mill Site, several refineries and other industries have operated on Fidalgo Bay and have released chemicals of potential concern to this environment. For example, a spill of approximately 20,000 gallons of oil occurred in February 1991 (Ecology 1997). Concern about sediment contamination associated with refineries was cited as reason for locating many of the prior sampling stations in Fidalgo Bay (PTI 1991; Ecology 1999). Thus, chemicals detected in crab tissue samples could represent releases from a wide range of potential sources.

A home range of approximately 2,000 acres generally represents the area of potential bioaccumulation exposure to individual Dungeness crabs (PSDDA 1998; Anchor & Hart Crowser 2000). The 2,000-acre area can be approximated as a circle with a radius of approximately 1 mile. Both PTI (1991) and Ecology (1999) have collected Dungeness crab from Fidalgo Bay stations located within the Mill Site home range area (Figure 19). Dungeness crab muscle tissues collected within this area have been analyzed for a broad suite of bioaccumulative chemicals, including mercury, PCBs, and dioxins/furans. These data are summarized in Table 6.

A composite sample of Dungeness crab muscle tissue collected by Ecology (1999) from Fidalgo Bay contained a total mercury concentration of 0.056 mg/kg wet weight (Table 6). This concentration is well below US EPA's provisional human health-based criterion and regional screening level of 0.3 mg/kg. Moreover, the mercury concentration

detected in Dungeness crabs collected from in Fidalgo Bay was lower than at the Samish Island regional reference site, which measured 0.070 mg/kg (Table 6).

Similarly, total PCBs were not detected (below 2.1 ug/kg wet weight) in Dungeness crab collected from Fidalgo Bay, compared with the estimated PCB concentration of 1.4 ug/kg detected near Samish Island (Ecology 1999).

Based on the tissue data summarized in Table 6, there is no evidence of bioaccumulation of either mercury or PCBs within the Mill Site area. The lack of detectable bioaccumulation of these chemicals is consistent with the relatively small size of the identified sediment contamination area (less than 2 acres; see Section 4.3.2), representing less than 0.1 percent of the 2,000-acre home range area. The lack of detectable bioaccumulation is also consistent with the relatively low magnitude of exceedance of screening criteria.

No dioxin or furan congeners were detected in Ecology's most recent sampling of Dungeness crabs from Fidalgo Bay (Table 6; Ecology 1999). However, earlier (1991 sampling) Dungeness crab tissue samples collected from Fidalgo Bay (PTI 1991) did contain some dioxin/furan congeners at concentrations slightly higher than in crabs collected from the designated reference area (Dungeness Bay; see Table 6). In order to provide a further evaluation of these data, the toxicity equivalency quotient (TEQ) concentration from this earlier sample was compared with relevant human health and ecological screening criteria. The human health screening criterion for dioxins/furans in fish/shellfish tissue was calculated using standard MTCA risk equations, as follows:

- 2,3,7,8-TCDD carcinogenic potency factor of 1.5×10^{5} $(mg/kg\text{-}day)^{-1}$
- Congener-specific toxicity equivalence factors, relative to 2,3,7,8-TCDD, from US EPA's (2000) Draft Dioxin Reassessment, based on World Health Organization (1998) toxicity equivalence factors for mammalian receptors
- Acceptable increase in lifetime cancer risk of 1×10^{-6} (one-in-one million)
- Fish/shellfish consumption rate of 54 grams per day
- Fish/shellfish diet fraction of 50%
- Exposure duration of 30 years

- 75 year averaging time
- Average body weight during the exposure duration of 70 kilograms

The calculated human health screening criterion for the total dioxin/furan TEQ concentration in fish/shellfish tissue is 0.21 ng/kg wet weight. The maximum detected historical TEQ concentration in Fidalgo Bay (0.18 ng/kg; PTI 1991) was below this screening criterion (Table 6). Moreover, more recent samples of Dungeness crab collected from Fidalgo Bay have not contained any detectable quantity of dioxins/furans. The maximum detected tissue concentrations are also well below screening criteria to protect sensitive ecological receptors (0.7 ng/kg wet wt; ICF Kaiser 1995). All information considered, there is no evidence that potential releases of bioaccumulative chemicals of potential concern from the Mill Site pose a risk to human health or the environment.

5 CONCEPTUAL SITE MODEL

This section presents an initial conceptual model of relevant fate, transport, and receptor characteristics for chemicals of potential concern identified at the former Mill Site.

5.1 Soils

The Mill Site was located on former shallow tidelands. Previous site investigations have characterized the geology of Site and surrounding areas, including multiple layers of recent fill overlying native marine sediment and glacial deposits (Dames & Moore 1975; Lowe 1980; ENSR 1993; ASM 1994; ThermoReTec 1999a, E&E 2000). The available geologic and geotechnical studies are summarized in Section 3.2.1.

Historically, wood debris accumulations were more extensive near historical log handling and processing areas, and fill was thickest closest to the shoreline. The nature of fill within the MJB North Area and SHS/Port Parcel 2 was modified during more recent development activities. In 1982, most of the accumulated wood debris and geotechnically unsuitable fill materials within the MJB North Area were excavated and disposed off-site (AGI 1987). Structurally suitable fill materials were subsequently imported onto the Site and placed within the excavation areas. In 1999, SHS excavated petroleum-containing wood debris and soils from two areas within Port Parcel 2. Work also included the installation of a sheet pile wall along the shoreline (ThermoReTec 2000).

Figures 16 and 17 depict the nature and extent of fill materials in cross sections through Port Parcel 2 and the MJB North Area, respectively, based on existing site characterization data. Soil exploration data obtained during the most recent MJB investigation are also included (URS 2001). At Port Parcel 2, the upper soils are predominately gravel and sand fill materials with mixed wood debris. At the MJB North Area, approximately 5 to 15 feet of granular fill material is present throughout much of the Site. Along the shoreline, fine to coarse-grained fill containing wood debris is present beneath the granular fill material. The thickness of the wood-containing fill material ranges from less than a foot near the former Mill surge ponds to approximately 15 feet at the shoreline. Overall, fill material in the MJB North Area ranges from approximately 5 feet inland to greater than 20 feet near the shoreline. Underlying the fill material throughout the former Mill Site is a native layer consisting primarily of silt and clay. The top of the native silt and clay unit is situated at an

elevation of approximately +10 feet above mean lower low water (MLLW) at inland locations, and at elevations of 0 to -10 feet MLLW near the shoreline.

As described in Section 4.3.1 above, surface soils at the former Mill Site (i.e., 0 to 3 feet bgs) contain arsenic and CPAH concentrations that exceed MTCA screening levels for unrestricted site uses. Nevertheless, surface concentrations of these (and other) chemicals at the Site are protective of existing industrial uses within some portions of the property (i.e., surface soil concentrations are below MTCA Method C cleanup levels for potential direct contact soil exposures).

Elevated concentrations of chemicals of potential concern such as lead and CPAHs are present in subsurface soils at the Site at levels that could pose a direct contact risk (i.e., above MTCA Method C cleanup levels for potential direct contact soil exposures). Similarly, subsurface soil TPH-D concentrations within portions of Port Parcel 2, coinciding with the location of a former fuel storage facility, exceed MTCA groundwater protection criteria. However, if existing site uses and institutional controls are maintained (e.g., see SHS/Port Parcel 2 CAP; ThermoReTec 1999b), further soil remediation beyond that already completed at the Site should be unnecessary.

5.2 Groundwater Transport

Previous site investigations reported encountering groundwater at the Site at depths between approximately 3 and 12 feet bgs (ENSR 1993; ThermoReTec 1999a; E&E 2000). Groundwater generally occurs within the fill material above the native silt deposits and is absent in some areas away from the shoreline where the fill is shallow and thin. Groundwater generally occurs above the native material within the granular and wood-containing fill (Figures 16 and 17). Groundwater in the vicinity of the former Mill Site generally flows eastward and discharges to Fidalgo Bay (ThermoReTec, 1999; E&E 2000; URS 2001).

Groundwater in the vicinity of the shoreline is tidally influenced (ThermoReTec 1999a; E&E 2000; URS 2001). At both Port Parcel 2 and the MJB North Area, shoreline wells had substantially greater concentrations of inorganic salts and electrical conductivity, consistent with a pattern of tidal mixing. Groundwater levels measured by URS in four monitoring

wells at the MJB North Area during November 2001 indicated that groundwater flow was tidally influenced near the shoreline. A groundwater flow gradient was calculated to be approximately 0.004 feet per foot to the southeast (towards Fidalgo Bay). A conceptual model of groundwater flow and tidal mixing at the Site is depicted on Figure 18.

E&E (2000) evaluated potential groundwater receptors within the vicinity of the Site. The closest groundwater well was approximately one mile west (upgradient) of the Site. Several wells were located to the north of the site across Guemes Channel on Guemes Island. Based on reviews provided in ThermoReTec (2000) and E&E (2000), groundwater beneath or potentially affected by the Site is not currently used for consumption. Given the presence of a public water supply at the Site (provided by sources removed from potential Site influence), and also given the presence of further institutional controls at the Site that preclude future groundwater withdrawal (see Parcel 2 CAP; ThermoReTec 1999b), future drinking water use of Site groundwater is not a reasonable future exposure scenario.

Arsenic and lead concentrations present in localized groundwater zones at the Site exceed ground water screening levels. However, no exceedance of surface water screening levels is indicated. Future groundwater monitoring is being proposed to verify this condition, and also to confirm the effectiveness of prior remedial actions (see Section 6.1 below).

5.3 Sediment Transport

Available information on the estuarine setting of Fidalgo Bay and adjacent areas, including Guemes Channel, was summarized for this data evaluation. Fidalgo Bay oceanography, sediment dynamics, habitat, and fish and shellfish resources were documented by Huckell/Weinman (1996), the Revised Final Integrated Fidalgo Bay Wide Plan and EIS (RFBWP 1999), and Antrim *et al.* (2000). In addition, an evaluation of the adequacy of the former Scott Mill submarine outfall (SML 1974) provided oceanographic and marine resource information for Guemes Channel and northern portion of Fidalgo Bay. The currents and sediment dynamics in the vicinity of the former Mill Site and Guemes Channel outfall were evaluated to assess potential historical pathways of chemical transport from this facility. Available information on currents, sediment dynamics, habitat, and fish and shellfish resources were utilized in the development of the site conceptual model.

The former Mill Site is located on the west shoreline of Fidalgo Bay, to the south of Cap Sante and the Guemes Channel (Figure 1). The western end of Guemes Channel connects to the Bellingham Channel. Fidalgo Bay is connected to the eastern end of Guemes Channel and is adjacent to Padilla Bay. March Point separates the southern part of Fidalgo Bay and Padilla Bay. There are no significant freshwater streams that flow into the Fidalgo/Guemes Channel area (Antrim et al. 2000).

Fidalgo Bay was an ancient delta of the Skagit River. The outer part of Fidalgo Bay, adjacent to the Guemes Channel is relatively deep (greater than 60 feet below MLLW), whereas the central and inner portions of Fidalgo Bay are relatively shallow subtidal mudflats less than 12 feet below MLLW. Extensive intertidal mudflats occupy the southern area of Fidalgo Bay (RFBWP 1999). Antrim et al. (2000) noted that the present bathymetry of Fidalgo Bay appeared to be largely unchanged from conditions in the late 1800s. The exceptions were localized shoreline changes associated with dredging and filling activities occurring largely between 1900 and 1980. The entire waterfront in the vicinity of the former Mill Site has been modified and consists primarily of riprap, and to varying degrees piling, sheet piling, concrete bulkheads, docks, and piers. Dredged areas in the shoreline vicinity of the former Mill Site included Cap Sante Marina and Anacortes Marina. Two channels have been dredged across the northern portion of the bay to allow medium and shallow draft ship navigation to marinas and industrial properties along the eastern shoreline (RFBWP 1999).

The circulation of Fidalgo Bay is influenced by the tides moving through Guemes Channel. In the Fidalgo Bay/Guemes Channel area, the average difference in height between mean higher high water (MHHW) and MLLW is 8.5 feet. Currents in Fidalgo Bay are slow (averaging 0.1 knots between Cap Sante and March Point), while currents in the Guemes Channel are relatively strong (averaging 0.9 and 2.1 knots on flood and ebb tides respectively; Antrim 2000). Tidal currents are affected to some extent by winds. Currents in Fidalgo Bay tend to follow a clockwise eddy on flood tides and a counterclockwise eddy on ebb tides. At the location of the former Mill outfall diffuser in Guemes Channel, SML (1974) measured maximum ebb tide current velocities of 4.2 knots and maximum flood tide velocities of 3.8 knots, noting that currents at this location were relatively uniform in speed and direction at all depths.

Fidalgo Bay in the vicinity of the former Mill Site is partially enclosed, meaning that current velocities are minimal and wave action is restricted (Antrim 2000). The shoreline is protected from northerly wind and waves by Cap Sante, and fetch (wind effect) distances from the south or east are short. Overall, the sediment transport mechanisms in Fidalgo Bay are limited by low energy, but wave action is occasionally strong enough to maintain a mixed sand/gravel/cobble intertidal substrate (Antrim 2000). Historically, the filled shoreline of the Mill Site, particularly near Smokestack Point, has been eroded, and has required shoreline stabilization controls (e.g., riprap). Net sediment transport along the western shore of Fidalgo Bay, in the vicinity of the former Mill Site, is thought to be in a southern direction (RFBWP 1999).

General sediment dynamics of the Fidalgo Bay region can be evaluated based on sediment grain size characteristics. Intertidal sediments along the MJB North Area were generally comprised of silt and sand materials. Gravel was noted in several sediment samples collected near points where the shoreline was uneven (IS02, IS06 and IS12; E&E 2000). The larger particles (gravel) may indicate areas with higher energy, although the larger particles may also be a product of shoreline modification. Along the Port marine area, sediment samples were found to contain considerable amounts of debris including wood, bark and slag (Earth Tech 1999c).

Several metals (copper, lead, and mercury) and organics (PCBs and wood debris/TOC) have been detected above sediment screening levels in sediments collected from the intertidal beach area in Fidalgo Bay immediately offshore of the Site. The sampling data define a localized area of sediment screening level exceedance of less than 2 acres. A potential source of these localized contaminated sediment deposits is historical erosion of upland fill material containing similarly elevated metal and organic chemical concentrations. Other potential historical sources of these chemicals are also possible.

Because of the relatively high current velocity in Guemes Channel, effluent historically discharged from 1952 to 1978 in this area would have been readily dispersed. Strong ebb tide currents in Guemes Channel are directed into Rosario Strait, where currents are also swift. Both the ebb tide (average 2.1 knot) and flood tide (average 0.9 knot) currents in Guemes Channel exceed the empirically derived scour velocity for fine-grained sediment in

Puget Sound of approximately 0.8 knots (40 cm/sec; Lavelle et al. 1984). Thus, Guemes Channel is an erosional environment for finer-grained sediments. Moreover, no chemicals of potential concern have been detected in sediment samples collected from the Guemes Channel in the vicinity of the former Mill Site outfall (based on SEDQUAL data queries, including DNRREC91). SML (1974) observed no discernable impacts to biological communities in the vicinity of the former Scott Paper Mill outfall during its operation.

Based on the available current data for Guemes Channel and Fidalgo Bay, the most likely area of sediment deposition associated with discharges from the former Scott Paper Mill diffuser in Guemes Channel (i.e., from 1952 to 1978) would be in Fidalgo Bay. This area is relatively shallow and is characterized by a relatively low current velocity (typically below 0.1 knot), and is conducive to deposition of fine-grained sediment (Carpenter et al. 1985). Preferential transport of effluent materials into Fidalgo Bay is also consistent with water quality data collected during the 1952 to 1978 operating period. The effluent discharged from the outfall during this period contained contaminants that were detected more frequently and at higher concentrations at the east end of Guemes Channel near Fidalgo Bay, as compared with the west end of the Channel near Rosario Strait (SML 1974).

Considerable sediment sampling and analysis data have been collected within the greater Fidalgo Bay area that can be used to characterize sediment quality conditions in this depositional area (e.g., Long et al. 1999; SEDQUAL). As noted above, the only exceedances of SQS chemical criteria in Fidalgo Bay have been observed within the nearshore beach area immediately adjacent to the former Mill Site. Moreover, beyond this localized shoreline area, there is no evidence that potential historical releases of chemicals of potential concern from the Mill Site or the outfall pose a risk to human health or the environment.

5.4 Habitat Features and Fish/Shellfish Resources

The most comprehensive discussion of upland and aquatic habitat in the vicinity of the Site is contained in the Revised Final Integrated Fidalgo Bay-Wide Plan and EIS (RFBWP 1999), which focused on the shoreline and subtidal environments but also included a discussion of avifauna and marine mammals. Also available was an earlier Fidalgo Bay–Wide Plan prepared by Huckell/Weinman et al (1996). Antrim et al (2000) present a Plan for Habitat

Protection, Restoration and Enhancement in the Fidalgo/Guemes Area that draws most of its resource information from the RFBWP (1999).

Detailed habitat or biological surveys of the upland area of the former Mill Site are not available. However, areas with marginally functional terrestrial habitat exist at the MJB North Area and Port Parcel 1. The MTCA simplified terrestrial ecological evaluation scoring process was used to assess these areas. A small area (approximately 2 acres) of low function terrestrial wildlife habitat is present in the MJB North Area. Similarly, a relatively small (less than 1 acre) weedy area of relatively low function terrestrial habitat is present in Port Parcel 1. The two patches of potential habitat are located within a larger commercial/industrial property, are of low habitat function, and are unlikely to attract significant numbers of wildlife.

The Washington State Department of Natural Resources (DNR) has classified the intertidal substrate near the former Mill Site as mixed fine, mixed coarse, and artificial materials (Antrim 2000). Limited areas of the upper intertidal zone adjacent to the former Mill Site containing a mix of sand and gravel may provide suitable spawning habitat for sandlance (*Ammodytes hexapterus*) or surf smelt (*Hypomesus pretiosus*) (Antrim 2000). Pentilla (as cited in Antrim 2000) identified patchy remnants of such habitat at the base of riprap shorelines in Fidalgo Bay. The RFBWP (1999) identified two surf smelt spawning beaches in the vicinity of the former Mill Site, at Port Parcel 3 and adjacent to the MJB North Yard. Sandlance spawning areas were not reported in the area. The shoreline adjacent to the former Mill Site was not listed as a waterfowl concentration area, Great Blue heron colony, or harbor seal haulout (RFBWP 1999).

Subtidal areas adjacent to the former Mill Site are generally unvegetated (RFBWP 1999; Antrim 2000). Offshore areas consist primarily of eelgrass (*Zostera* spp.) beds of varying densities. These beds provide a number of ecological functions including support of prey species, substrate for spawning of Pacific herring (*Clupea pallasi*), and rearing for juvenile salmon and crab (Huckell/Weinman 1996; RFBWP 1999; Antrim 2000). In addition, green macroalgae (*Ulva* spp. and *Enteromorpha* spp.) were found where intertidal and subtidal substrates consisted mostly of mixed fines and mud (Antrim 2000).

Fidalgo Bay supports numerous fish and shellfish resources including various forage fish, sandlance, surf smelt, Pacific herring, juvenile salmonids, flatfish, crabs, shrimp, gastropods, and bivalves (Huckell/Weinman 1996; RFBWP 1999; Antrim 2000). The distribution of these species in relation to the former Mill Site is largely dependent on available habitat, as discussed above. Specific areas of surf smelt and Pacific herring spawning are present adjacent to the former Mill Site. In addition, flatfish and crabs (including Dungeness crabs) likely utilize the areas adjacent to the former Mill Site; however, this area is not suitable habitat for hardshell calms (RFBWP, 1999).

Validated tissue chemistry data for potentially bioaccumulative chemicals such as mercury, PCBs, and dioxins/furans are available for Dungeness crab samples collected in Fidalgo Bay (PTI 1991 and Ecology 1999). Significantly, the home range of crabs collected from Fidalgo Bay sampling stations overlaps the area where, based on general review of fate and transport processes (see Section 5.3 above), potential releases from the Site, including historical effluent discharges into Guemes Channel, may have been deposited. Since crabs live in contact with sediments, and since benthic infauna is a primary food source of crabs, these organisms may be particularly appropriate in evaluations of the nature and extent of chemical releases.

Based on a review of the available tissue sampling data, there is no evidence of bioaccumulation of Site chemicals of potential concern within the Mill Site area. The maximum detected concentrations of mercury, PCBs, and dioxins/furans in Fidalgo Bay crab tissue are below risk screening criteria, and are generally equivalent to regional background levels. The lack of detectable bioaccumulation of these chemicals is consistent with the relatively small size of the localized nearshore sediment contamination area (less than 2 acres), representing less than 0.1 percent of the 2,000-acre home range area for crabs. All information considered, there is no evidence that potential releases of bioaccumulative chemicals of potential concern from the Mill Site pose a risk to human health or the environment.

6 APPROACH FOR FUTURE WORK

Based on the evaluation presented above, additional data may be needed to complete the cleanup study of the former Mill Site as required under MTCA. While the site characterization effort within the MJB North Area and offshore Fidalgo Bay is substantially complete, some additional data are needed to complete the investigation of Port property. The approach to complete work at the former Mill Site is presented below.

6.1 Port Investigation and Evaluation

The Port will complete a Remedial Investigation (RI), Feasibility Study (FS), and draft Cleanup Action Plan (CAP) for Port Parcels 1 and 3 soils; Port Parcels 1, 2, and 3 groundwater; and Port marine areas of the former Mill Site. The uplands and marine area RI reports will incorporate existing and, as needed, additional information to characterize the nature and extent of hazardous substances resulting from former activities at the Site so that remedial decisions can be made. The uplands area and marine area FS reports will develop and evaluate cleanup alternatives that adequately protect human health and the environment from the risks posed by hazardous constituents resulting from former activities at the Site, and will identify a preferred alternative. The draft CAP for the uplands area and the draft CAP for the marine area will summarize the relevant RI and FS reports and describe the preferred cleanup actions, cleanup standards, and other requirements. Although not discussed further in this report, the Port anticipates that the Consent Decree will provide for an expedited soil cleanup action on Parcel 1, if cleanup is necessary.

Separate documents (RI work plans and RI reports) will be prepared for the uplands area and for the marine area investigations described above. The draft RI work plans will be submitted to Ecology for their review and comment. After implementation of the RI work plans, a draft RI for the uplands and a draft RI for the marine area will be submitted to Ecology for their review and comment.

As discussed above, a number of investigations have been performed at the Port portion of the former Mill Site. In addition, a final cleanup action for soil at Parcel 2 was proposed and completed, and a no further action determination was made by Ecology (Ecology 2000). Soil data from previous investigations at Parcels 1 and 3, including results of samples from appropriate locations and depths with analysis for appropriate constituents, are generally

sufficient for evaluation of soil quality. However, additional soil data may be needed for the RI.

Analytical results from the previous investigations are described in the sections above. The results of these investigations indicate sporadic exceedances of the preliminary screening levels described in Section 4.1. At Parcel 1, the only constituents detected at concentrations above the preliminary screening levels were CPAHs and lead in sample B-8, arsenic in sample ET-TP03, and mercury in sample ET-TP01. At Parcel 3, the only constituents detected at concentrations above the preliminary screening levels were CPAHs in the deeper of two samples from B-13 (currently under the Park building), arsenic in four surface samples collected in 1992, and dioxins/furans in sample ET-TP12. Additional soil investigation may be appropriate at one area at Parcel 1 and one area at Parcel 3.

The only existing groundwater quality data available for the Port Parcels of the former Mill Site, as shown in Figure 2, are from samples collected from Parcel 2 prior to implementation of the soil cleanup action. These data indicate that constituent concentrations in groundwater generally did not exceed preliminary screening levels except in the former petroleum tank farm area. In addition, the concentration of lead in one sample from well MW-1 slightly exceeded the preliminary screening level. Groundwater quality after completion of the remedial actions has not been evaluated.

Groundwater quality and flow directions will be evaluated. Consistent with conditions at most marine shoreline sites, it is likely that groundwater flows generally toward the shoreline (i.e., Fidalgo Bay).

The results from the first round of groundwater sampling will be used to determine analyses for remaining sampling events. For example, if a specific constituent is not detected in a given well at levels of concern, analysis for that constituent will not be performed during subsequent monitoring events.

As discussed above, separate documents (FS reports and CAPs) will be prepared for the uplands and marine areas of the Port properties. A draft FS report for the uplands and a draft FS report for the marine area will be prepared and submitted to Ecology for review

and comment. Each FS report will establish cleanup levels and points of compliance, identify remedial action objectives, develop and evaluate cleanup action alternatives, and identify a recommended cleanup alternative. Ecology's comments will be incorporated into the final FS reports.

After approval of the uplands area FS by Ecology, a draft CAP for the uplands area will be submitted to Ecology. After approval of the marine area FS by Ecology, a draft CAP for the marine area will be submitted to Ecology.

6.2 K-C/MJB Cleanup Study

Concurrent with the Port Cleanup Studies described above, K-C and MJB will submit a focused FS for the remaining portions of the former Mill Site. Upland and marine area portions will be integrated into one document. The K-C/MJB FS report will characterize the nature and extent of hazardous substances resulting from former activities at the Site so that remedial decisions can be made. The focused FS report will develop and evaluate cleanup alternatives that adequately protect human health and the environment from the risks posed by hazardous constituents resulting from former activities at the Site, and will identify a preferred alternative. A CAP will be developed for the uplands separate from the marine areas that will incorporate current and future development limiting factors

A draft focused FS report that complies with MTCA requirements will be submitted to Ecology for review and comment. The focused FS will include characterization of the nature and extent of hazardous substances resulting from Mill Site activities, and will establish cleanup levels and points of compliance, identify remedial action objectives, develop and evaluate cleanup action alternatives, and identify a recommended cleanup alternative. Ecology's comments will be incorporated into the final FS report.

After approval of the FS by Ecology, a draft CAP that complies with MTCA requirements will be submitted to Ecology for review. The CAP will describe the preferred cleanup actions, cleanup standards, and other requirements at the Site. Although not discussed further in this report, K-C and/or MJB may conduct interim actions within the shoreline/sediment area during this effort. After addressing Ecology's comments on the draft CAP, the document will be provided for comment by the public.

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Table 1
Summary of Site Characterization Data for the Former Scott Paper Mill

Reference	Report Title	Sampling Dates	Site Area	Type and Number of Samples Obtained						Notes
				Surface Soil	Soil Borings or Test Pits	Subsurface Soil	Groundwater - "Bulk"	Groundwater - Wells	Surface Sediment	
EarthTech (1999b)	South Harbor Park Limited Investigation Report	1998	Port of Ancortes - Parcel 3	2	6	4	0	0	0	
EarthTech (1999c)	South Harbor Beach Area Limited Investigation Report	1998	Port of Ancortes - Parcel 3	0	0	0	0	0	9	
Otten (1997)	Phase 2 Environmental Assessment, South Basin and A-Dock Sediments	1997	Port of Ancortes - Parcel 3	0	0	0	0	0	3	
Hart Crowser (1995)	Letter on Characterization of Hydrogen Sulfide from South Harbor Site Soils	1995	Port of Ancortes - Parcel 3	0	5	0	0	0	0	
ENSR (1994)	Proposal for Site Investigation and Remedial Technology Evaluation for the Log Sort Yard	1994	Port of Ancortes - Parcel 3	0	1	2	0	0	0	Partial report available
Advanced Soil Mechanics (1994)	Results of 12/13/93 Borehole Investigation for the Port of Anacortes at the South Harbor Park Site	1993	Port of Ancortes - Parcel 3	0	2	4	0	0	0	
A-1 Pump (1992)	Letter on Site Assessment Sampling Results	1992	Port of Ancortes - Parcel 3	4	0	0	0	0	0	Report not available. Data obtained from ThermoRetec (1999). QA data not available.
Landau (1999d)	Sediment conventionals data	1999	Port of Ancortes - Parcel 3	0	0	0	0	0	12	
Hart Crowser (1989)	Results of Sampling and Chemical Analyses of Tailings Pond Waste and Marine Sediments, Scott Paper Company, Anacortes, WA	1989	Port of Anacortes - Parcels 2 & 3	1	0	0	0	0	1	
ThermoRetec (1999)	Remedial Investigation/Feasibility Study for Soils at Parcel 2 of the Former Scott Paper Company Mill Site	1998	Port of Anacortes - Parcel 2	3	58	41	0	6 (2 chemistry samples)	0	
ENSR (1993)	Log Sort Yard Site Characterization, Technical Memorandum	1993	Port of Anacortes - Parcel 2	0	18	18 (8 chemistry samples)	0	7 wells (9 samples)	0	Partial report available. Data for Parcel 2 obtained from ThermoRetec (1999).
Hart Crowser (1985)	Preliminary Geotechnical Site Evaluation, Cap Sante Marine Uplands Area, Anacortes, WA	1985	Port of Anacortes - Parcel 2	0		0	0	0	0	Report not available
EarthTech (1999a)	South Basin Upland Site Limited Investigation Report	1998	Port of Anacortes - Parcel 1							Incomplete copy. Data not available
Ecology & Environment (2000)	MJB Properties: Preliminary Assessment/Site Inspection, Anacortes, WA	2000	MJB Properties - North, Central & South Areas	12	12	20	11	0	13	
Pentec (1997)	Sediment Physical and Chemical Characterization, MJB Property, Fidalgo Bay, WA	1996	MJB Properties - North, Central & South Areas	0	0	0	0	0	4	
AGI (1987)	Site Assessment, S L Resources Inc. Property, Anacortes, WA	1987	MJB Properties - North, Central & South Areas							Data not available
Lowe (1980)	Geotechnical Investigation, Proposed Construction Pit, Anacortes, WA	1979 & 1980	MJB Properties - North Area	0	26	0	0	0	0	Analytical data not available
Dames & Moore (1975)	Report of Soils Investigation, Snelson-Anvil Facility, Anacortes, WA	1974	MJB Properties - Central & South Areas	0	26	0	0	0	0	Geotechnical investigation only
URS (2001)	Investigation of Soil and Groundwater	2001	MJB Properties - North Area	8	0	11	0	4	0	
Anchor (2001)	Investigation of Shoreline Seeps and Intertidal Sediment	2001	MJB Properties - North Area	0	0	0	0	2 groundwater seep well points	3	
Anchor (2002)	Investigation of Subtidal Sediment	2002	MJB Properties - North Area	0	0	0	0	0	9	
Hart Crowser (1996)	Results of Sediment Sampling and Analysis, Fidalgo marina, Anacortes, WA	1996	Fidalgo Bay Marina	0	0	0	0	0	10	Geotechnical investigation only
SEDQUAL (2000)	2MARINAS	1988	Offshore Sediments	0	0	0	0	0	21	
SEDQUAL (2000)	ANCHOR90	1990	Guemes Channel	0	0	0	0	0	1	
SEDQUAL (2000)	BIOEFF97	1997	Offshore Sediments	0	0	0	0	0	12	
SEDQUAL (2000)	CUSPLY95	1995	Guemes Channel & Fidalgo Bay	0	0	0	0	0	12	
SEDQUAL (2000)	DNRREC91	1991	Offshore Sediments	0	0	0	0	0	4	
SEDQUAL (2000)	PSAMP 89 to 95	1989 to 1995	Offshore Sediments	0	0	0	0	0	7	
			TOTAL	30	154	109	11	17	64	

Table 2
Quality Assurance Summary of Site Characterization Data for the Former Scott Paper Mill

Reference	Report Title	Sampling Dates	Site Area	QA/QC Review					Notes
				Recency (Since 1991)	Validated Data?	Collection Methods	Analytical methods	QA Analytical Level based on available information	
EarthTech (1999b)	South Harbor Park Limited Investigation Report	1998	Port of Ancortes - Parcel 3	Yes	Partial	OK	OK	L3	
EarthTech (1999c)	South Harbor Beach Area Limited Investigation Report	1998	Port of Ancortes - Parcel 3	Yes	Partial	OK	OK	L3	
Otten (1997)	Phase 2 Environmental Assessment, South Basin and A-Dock Sediments	1997	Port of Ancortes - Parcel 3	Yes	Yes	OK	OK	L3	
Hart Crowser (1995)	Letter on Characterization of Hydrogen Sulfide from South Harbor Site Soils	1995	Port of Ancortes - Parcel 3	Yes	No	OK	OK	L3 - sediment; L1 soil gas	
ENSR (1994)	Proposal for Site Investigation and Remedial Technology Evaluation for the Log Sort Yard	1994	Port of Ancortes - Parcel 3	Yes	Report not available				Partial report available. QA data not available.
Advanced Soil Mechanics (1994)	Results of 12/13/93 Borehole Investigation for the Port of Anacortes at the South Harbor Park Site	1993	Port of Ancortes - Parcel 3	Yes	No	OK	OK	L2	
A-1 Pump (1992)	Letter on Site Assessment Sampling Results	1992	Port of Ancortes - Parcel 3	Yes	Report not available				QA data not available. Data obtained from ThermoRetec (1999)
Landau (1999d)	Sediment conventionals data	1999	Port of Ancortes - Parcel 3	Yes					
Hart Crowser (1989)	Results of Sampling and Chemical Analyses of Tailings Pond Waste and Marine Sediments, Scott Paper Company, Anacortes, WA	1989	Port of Anacortes - Parcels 2 & 3	No	No	OK	OK	L3	
ThermoRetec (1999)	Remedial Investigation/Feasibility Study for Soils at Parcel 2 of the Former Scott Paper Company Mill	1998	Port of Anacortes - Parcel 2	Yes	Yes	OK	OK	L3	
ENSR (1993)	Log Sort Yard Site Characterization, Technical Memorandum	1993	Port of Anacortes - Parcels 1 & 2	Yes	Partial	OK	OK	L3	Partial report available. Data for Parcel 2 obtained from ThermoRetec (1999).
Hart Crowser (1985)	Preliminary Geotechnical Site Evaluation, Cap Sante Marine Uplands Area, Anacortes, WA	1985	Port of Anacortes - Parcel 2	No	Report not available				
EarthTech (1999a)	South Basin Upland Site Limited Investigation Report	1998	Port of Anacortes - Parcel 1	Yes	Data provided electronically by Landau, Inc.				
Ecology & Environment (2000)	MJB Properties: Preliminary Assessment/Site Inspection, Anacortes, WA	2000	MJB Properties - North, Central & South Areas	Yes	Partial	OK	OK	L3-sediment and soils. Reject groundwater	Groundwater samples from undeveloped borings and not filtered
Pentec (1997)	Sediment Physical and Chemical Characterization, MJB Property, Fidalgo Bay, WA	1996	MJB Properties - North, Central & South Areas	Yes	Partial	OK	OK	L3	
AGI (1987)	Site Assessment, S L Resources Inc. Property, Anacortes, WA	1987	MJB Properties - North, Central & South Areas	No	Analytical data not available				
Lowe (1980)	Geotechnical Investigation, Proposed Construction Pit, Anacortes, WA	1979 & 1980	MJB Properties - North Area	No	Geotechnical investigation only				
URS (2001)	Investigation of Soil and Groundwater	2001	MJB Properties - North Area	Yes	Yes	OK	OK	L3	
Anchor (2001)	Investigation of Shoreline Seeps and Intertidal Sediment	2001	MJB Properties - North Area	Yes	Yes	OK	OK	L3	
Anchor (2002)	Investigation of Subtidal Sediment	2002	MJB Properties - North Area	Yes	Yes	OK	OK	L3	
Hart Crowser (1996)	Results of Sediment Sampling and Analysis, Fidalgo marina, Anacortes, WA	1996	Fidalgo Bay Marina	Yes	Partial	OK	OK	L3	
SEDQUAL (2000)	2MARINAS	1988	Offshore Sediments	No	Yes	OK	OK	L3	
SEDQUAL (2000)	ANCHOR90	1990	Guemes Channel	No	Yes	OK	OK	L3	
SEDQUAL (2000)	BIOEFF97	1997	Offshore Sediments	Yes	Yes	OK	OK	L3	
SEDQUAL (2000)	CUSPLY95	1995	Guemes Channel & Fidalgo Bay	Yes	Yes	OK	OK	L3	
SEDQUAL (2000)	DNRREC91	1991	Offshore Sediments	Yes	Yes	OK	OK	L3	
SEDQUAL (2000)	PSAMP 89 to 95	1989 to 1995	Offshore Sediments	5 of 7	Yes	OK	OK	L3	

Table 3
Summary of Screening Criteria for Groundwater, Soil, Surface Water, and Sediment

Detected Chemicals	Soil		Groundwater		Surface Water	Sediment
	MTCA Screening Criterion mg/kg	Method	MTCA Screening Criteria ug/L	Method	Marine Chronic WQC ug/L	SQS [9] mg/kg
Metals						
Antimony	32	B (1)	6.4	B	500 (7)	
Arsenic	20	A	5	A	36	57
Barium	5,600	B (1)	560	B		
Beryllium	160	B (1)	32	B		
Cadmium	4	B (2)	5	A	9.3 (8)	5.1
Chromium	2,000	A (3)	50	A	50 (8)	260
Copper	3,000	B (1)	590	B	3.1 (8)	390
Lead	250	A	15	A	8.1 (8)	450
Mercury	2	A	2	A	0.025	0.41
Nickel	1,600	B (1)	320	B	8.2 (8)	
Selenium	400	B (1)	80	B	71 (8)	
Silver	400	B (1)	80	B	1.9 (8)	6.1
Thallium	5.6	B (1)	1.1	B		
Vanadium	560	B (1)	110	B		
Zinc	24,000	B (1)	4,800	B	81 (8)	410
Wood Debris/TOC	N/A	N/A	N/A	N/A	N/A	10% (10)
Phenols						
2,4-Dimethylphenol	48	B (1)	9.6	B		29
2-Chlorophenol	400	B (1)	80	B		
2-Methylphenol						63
4-Methylphenol						670
Pentachlorophenol	8.3	B (1)	0.73	B	7.9	360
Phenol	48,000	B (1)	9,600	B	5,800 (7)	
Acetophenone	8,000	B (1)	1,600	B		
Carbazole	50	B (1)	4.4	B		
Dibenzofuran						15
Phthalates						
bis(2-ethylhexyl)phthalate	71	B (1)	6.3	B	360 (7)	47
Butylbenzylphthalate	16,000	B (1)	3,200	B	3.4 (7)	4.9
Dimethylphthalate	80,000	B (1)	16,000	B	3.4 (7)	53
Di-n-butylphthalate					3.4 (7)	58
PAHs						
LPAH						370
Naphthalene	5	B (1)	20	B	2350 (7)	99
Acenaphthylene	24,000	B (1)	2,400	B	300 (7)	66
Acenaphthene	4,800	B (1)	960	B	710 (7)	16
Fluorene	3,200	B (1)	640	B	300 (7)	23
Phenanthrene					4.6 (7)	100
Anthracene	24,000	B (1)	2,400	B	300 (7)	220
2-Methylnaphthalene					300 (7)	38
HPAH						960
Fluoranthene	3,200	B (1)	640	B	16 (7)	960
Pyrene	2,400	B (1)	480	B	300 (7)	1000
Benzo(a)anthracene	0.14	B (1)	0.01	A	300 (7)	110
Chrysene	0.14	B (1)	0.01	B	300 (7)	110
Benzo(b)fluoranthene	0.14	B (1)	0.01	B	300 (7)	
Benzo(k)fluoranthene	0.14	B (1)	0.01	B	300 (7)	
Total Benzofluroanthenes						230
Benzo(a)pyrene	0.14	B (1)	0.01	B	300 (7)	99
Indeno(1,2,3-cd)pyrene	0.14	B (1)	0.01	B	300 (7)	34
Dibenzo(a,h)anthracene	0.14	B (1)	0.01	B	300 (7)	12
Benzo(g,h,i)perylene					300 (7)	31
Carcinogenic PAHs	0.1	A (4)	0.1	A (4)		
PCBs						
PCB (total)	1.0	A	0.1	A	0.03	12
Pesticides						
Aldrin	0.06	B (1)	0.01	B	0.0019	
alpha-Chlordane	2.9	B (1)	0.25	B	0.004	
Dieldrin	0.06	B (1)	0.01	B	0.0019	
Sum of p,p'-DDE and o,p'-DDE	3		0.3		0.001	
Petroleum Hydrocarbons						
TPH - Diesel Range	2,000	A (5)	500	A		
TPH - Motor Oil Range	2,000	A (5)	500	A		
Dioxins/Furans						
Total 2,3,7,8-TCDD Equivalants	0.0000067 (6)	B (1, 4)				0.0036 (11)

(1) Direct contact pathway
(2) Terrestrial ecological value. Table 749-3
(3) Chromium III. Hexavalent chromium was not detected above the Method A screening value
(4) Calculated as total toxicity equivalence factor
(5) Protection of drinking water
(6) CLARC 1996
(7) NOAA 1999. Screening quick reference table (SQRT) values.
(8) Corrected from total to dissolved metals
(9) Sediment Quality Standards (SQS) criteria for metals and phenols are on dry wt. basis. All other organic criteria are organic carbon normalized
(10) Wood debris screening level based on 10% TOC (dry weight basis; Kendall and Michelsen 1997)
(11) Neanthes apparent effect threshold (NOAA 1999), dry wt. basis

Table 4
Summary of Screening Level Exceedances; Former Scott Paper Mill

	Soil	Groundwater	Seep	Sediment	Chemical of Potential Concern [4]
Metals:					
Antimony	5/100	0/7	0/2	0/43	Yes
Arsenic	17/134	2/7	0/2 (2)	0/47	Yes, Indicator
Cadmium	5/127	0/7	0/2	0/34	Yes
Copper	2/115	0/7	0/2	2/47	Yes
Lead	13/134	1/7	0/2	1/47	Yes, Indicator
Mercury	9/127	0/7	0/2	3/47	Yes
Nickel	0/115	0/7	2/2	0/43	Yes
Thallium	3/108	0/7	0/2	0/4	Yes
Organics:					
Phenol	0/31	0/2	0/2	1/32	No
Naphthalene	1/63	0/4	0/2	0/39	No
Total Carcinogenic PAHs as TEQ	11/60	0/7	0/2 (3)	NA	Yes, Indicator
Total PCBs	2/37	0/7	0/2	5/30	Yes, Indicator
Dioxin TEQ	7/47	0/2	0/2	0/17	Yes
Diesel Range Hydrocarbons	11/46	0/4	0/2	NA	Yes, Indicator
Wood Debris/TOC	N/A	N/A	N/A	1/35	Yes

NA Not analyzed
(1) SMS PAH exceedance based on low or high molecular weight compounds.
(2) Both seep samples did exceed the groundwater screening level
(3) Seep 1 exceeded the groundwater screening level
(4) Refer to text for discussion of selection process and use of indicator chemicals

Table 5
Statistical Summary of Surface Soil Concentrations of Chemicals of Concern

Chemical of Potential Concern	Screening Level	MTCA Method C Industrial Land Use Criterion	95% Upper Confidence Level (UCL) (1)
Metals (mg/kg dry wt):			
Antimony	32	-	23*
Arsenic	20	39	28
Cadmium	4 (2)	-	4.8* (3)
Copper	2,960	-	174
Lead	250	-	49
Mercury	18	-	15 *
Nickel	1,600	-	all soil samples below screening level
Thallium	5.6	-	3*
Organics (mg/kg dry wt):			
Total Carcinogenic PAHs as TEQ	0.1	2	0.93 *
Total PCBs	1	-	0.74*
Dioxin TEQ	0.0000067	-	0.0000015
Diesel Range Hydrocarbons	2,000	-	93*

NOTES:

(1) Upper 95% Confidence Level of Mean. Maximum concentration presented if UCL is higher than maximum value or if distribution not normally or log normally distributed. Maximum detected values denoted with asterisk (*).

(2) Terrestrial ecological screening value (plants)

(3) Only one data point for cadmium had a concentration above the screening level. This value was less than 2 times the screening level.

Values in yellow shading denote exceedance of screening level.

Table 6
Summary of Crab Muscle Data for Bioaccumulative Chemicals: Fidalgo Bay and Reference Areas

Data Source / Sample Location		Reference Areas		Fidalgo Bay Sites	
		PSEP 1991 Dungeness Bay	Ecology 1999 Samish Island	PSEP 1991 March Point	Ecology 1999 Fidalgo Bay
Metals (ug/kg wet wt)					
Mercury		NM	70	NM	56
Polychlorinated Biphenyls (ug/kg wet wt)					
Total PCBs		NM	1.4 J	NM	2.1 U
TEF (1)	**PCDD/PCDF** (ng/kg wet wt):				
1	2,3,7,8-TCDD	0.15 U	0.79 U	0.15 U	0.41 U
1	1,2,3,7,8-PeCDD	0.2 U	0.89 U	0.2 U	0.58 U
0.1	1,2,3,4,7,8-HxCDD	0.2 U	0.93 U	0.2 U	0.57 U
0.1	1,2,3,6,7,8-HxCDD	0.15 U	1.6 U	0.54	0.62 U
0.1	1,2,3,7,8,9-HxCDD	0.2 U	0.76 U	0.2 U	0.7 U
0.01	1,2,3,4,6,7,8-HpCDD	0.25 U	1.8 U	0.46	0.65 U
0.0001	OCDD	3.8	1.2 U	2.5	2.6 U
0.1	2,3,7,8-TCDF	0.1 U	0.51 J	0.95	0.39 U
0.05	1,2,3,7,8-PeCDF	0.15 U	0.79 U	0.15 U	0.69 U
0.5	2,3,4,7,8-PeCDF	0.15 U	0.69 U	0.15 U	0.53 U
0.1	1,2,3,4,7,8-HxCDF	0.15 U	0.58 U	0.15 U	0.45 U
0.1	1,2,3,6,7,8-HxCDF	0.1 U	1.2 U	0.1 U	0.68 U
0.1	1,2,3,7,8,9-HxCDF	0.19	1.2 U	0.22	1.5 U
0.1	2,3,4,6,7,8-HxCDF	0.15 U	0.67 U	0.15 U	0.64 U
0.01	1,2,3,4,6,7,8-HpCDF	0.1 U	1.5 U	0.1 U	0.98 U
0.01	1,2,3,4,7,8,9-HpCDF	0.15 U	0.53 U	0.2 U	0.58 U
0.0001	OCDF	0.3 U	1.8 U	0.35 U	0.86 U
	Calculated TEQ	0.02	0.05	0.18	NC

(1) From EPA's June 2000 Draft Dioxin Reassessment, based on World Health Organization 1998 toxicity equivalence factors (TEFs) for mammalian receptors.
NM: Not measured

Table 7
Summary of of Chemicals of Potential Concern for Port and MJB Uplands and Marine Sediments

Detected Chemicals	Upland Areas		Marine Sediment
	Port of Anacortes	MJB North Area	
Metals			
Antimony	X	X	
Arsenic	X	X	
Copper			X
Lead	X	X	X
Mercury	X	X	X
Thallium		X	
Organics			
Carcinogenic PAHs	X	X	
PCB (total)	X		X
Diesel Range TPH	X		
Dioxins/Furans (1)	X		
Wood Debris/TOC			X

(1) Total 2,3,7,8-TCDD Equivalants