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September 27, 2007

Denise Baker-Kircher, Task Monitor
United States Environmental Protection Agency
1200 Sixth Avenue, Mail Stop ECL-115
Seattle, Washington 98101

RE: Contract Number: EP-S7-06-02
Technical Direction Document Number: 07-04-0006
Final Seward Ship's Dry Dock Site Inspection

Dear Ms. Baker-Kircher:

Attached, please find the final site inspection report for the Seward Ship's Dry Dock site, which is located in Seward, Alaska. If you have any questions or comments regarding this submittal, please contact me at (206) 624-9537.

Sincerely,
ECOLOGY AND ENVIRONMENT, INC.

Renee Nordeen
START-3 Project Leader

07-04-0006

Seward Ship's Dry Dock
Site Inspection
Seward, Alaska

September 2007

Prepared for:
United States Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Prepared by:
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Table of Contents

Table of Contents (cont.)

Section **Page**

Table of Contents (cont.)

Section **Page**

List of Tables

List of Figures

List of Abbreviations and Acronyms

Acronym	Definition
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CLPAS	Contract Laboratory Analytical Services
DQO	Data Quality Objectives
CRQL	Contract Required Quantitation Limit
DRO	Diesel Range Organics
E & E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
GRO	Gasoline Range Organics
IDW	Investigation-derived waste
MS/MSD	Matrix Spike/Matrix Spike Duplicate
J/UJ	Qualified or Estimated Quantities
IPHC	International Pacific Halibut Commission
NOV	Notice of Violation
PCBs	Polychlorinated biphenyls
PPE	Probable point of entry
ppm	parts per million
RPD	Relative Percent Difference
R^2	Correlation Coefficient

List of Abbreviations and Acronyms (cont.)

Acronym	Definition
%R	Surrogate Spike Percent Recovery
(R)	Rejected
QA/QC	Quality Assurance/Quality Control
RRO	Residual Range Organics
SI	Site Inspection
SPAF	Sample Plan Alteration Form
SMIC	Seward Marine Industrial Complex
SQAP	Sampling and Quality Assurance Plan
SQL	Sample Quanititation Limit
SSDD	Seward Ship's Dry Dock
START	Superfund Technical Assessment and Response Team
SVOCs	Semivolatile Organic Compounds
TAL	Target Analyte List
TBT	Tributyltin
TCLP	Toxicity Characteristic Leaching Procedure
TDL	Target Distance Limit
U	Not Dectected
TM	Task Monitor
USFWS	United States Fish and Wildlife Service

1 Introduction

The United States Environmental Protection Agency (EPA) has tasked Ecology and Environment, Inc. (E & E) to provide technical support and conduct a Site Inspection (SI) at the Seward Ship's Dry Dock (SSDD) facility, which is located in Seward, Alaska. E & E completed the SI activities under Technical Direction Document Number 07-04-0006 issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 contract Number EP-S7-06-02. The specific goals for this SI were intended to address site assessment objectives and are presented below:

- Collect and analyze samples to characterize the potential sources discussed in Subsection 2.6;
- Determine off-site migration of contaminants;
- Provide the EPA with adequate information to determine whether the site is eligible for placement on the National Priorities List; and
- Document any threat or potential threat to public health or the environment posed by the site.

Completion of this SI included reviewing site information, determining regional characteristics, collecting receptor information within the site's range of influence, executing a sampling plan, and producing this report. The report is organized as follows:

- Section 1, Introduction – Authority for performance of this work and summary of report contents;
- Section 2, Site Background – Site description, site operations and source characteristics, and summary of investigation locations;
- Section 3, Field Activities and Analytical Protocol – Summary of the field effort;
- Section 4, Quality Assurance/Quality Control (QA/QC) – Summary of the field screening and laboratory data;
- Section 5, Analytical Results Reporting and Background Samples – Discussion of background sample locations and results;
- Section 6, Potential Sources – Discussion of site sources, sample locations, and analytical results;
- Section 7, Migration/Exposure Pathways and Targets – Discussion of the migration/exposure pathways, sample locations, and analytical results;
- Section 8, Summary and Conclusions – Summary of the investigation and recommendation for the site, based on the information gathered during the investigation;
- Section 9, References – List of references cited throughout the text;

- Appendix A, Sample Plan Alteration Form – Description and justification for deviations from the approved sampling plan;
- Appendix B, Chain-of-Custody Documentation – Forms documenting sample chain-of-custody for the field effort;
- Appendix C, Data Validation Memoranda – laboratory analytical results for all samples submitted to off-site fixed laboratories; and
- Appendix D, Field Screening Results – A table with results of the field screening analysis.

2 Site Background

This section describes the background of the site including location, description, ownership history, operations and source characteristics, previous investigations, and summary of site investigation locations.

2.1 Site Location

Site Name:	Seward Ship's Dry Dock
CERCLIS ID Number:	AKN001002683
Site Address:	Mile 7 Nash Road Seward, Alaska 99664
Latitude:	60° 5" 5.7" North
Longitude:	149° 20' 56.9" West
Legal Description:	Section 18, Township 1S, Range 1E, Seward Meridian
County:	Kenai Peninsula
Congressional District:	1
Site Owner(s):	City of Seward Seward Boat Harbor Attn: Scott Ransom, Harbormaster P.O. Box 167 Seward, Alaska 99664-0167 (907) 224-3138
Site Operator(s):	Seward Ship's Dry Dock, Inc. DJ Whitman, General Manager Mile 7 Nash Road Seward, Alaska 99664 (907) 224-3198
Site Contact(s):	Seward Ship's Dry Dock, Inc. James T. Pruitt, President Mile 7 Nash Road Seward, Alaska 99664 (907) 224-3198

2.2 Site Description

The SSDD facility is an active boat refurbishing facility located on the banks of Resurrection Bay in Seward, Alaska (Figure 2-1). The site has operated since 1973 and has been at its current location since 1985 (Marcorelle 2005). The SSDD facility is located within the larger Seward Marine Industrial Complex (SMIC; Figure 2-2). The SSDD comprises approximately 9.25 acres

(Figure 2-2; Whitman 2007). Of these 9.25 acres, approximately 2 acres are managed by the SSDD, but they are not a portion of the lease and are used as public access (Whitman 2007). The site is fenced but access is not restricted.

Land use surrounding the site is primarily industrial. The site is bordered as follows: to the west by Resurrection Bay; to the south by Lot 3 Block 8, which was used to burn boats; and to the north and east by Lot 4 Block 7, which is used by public vessel owners for boat repairs (Whitman 2007). Additionally, the portion of Block 4 excluding, Lot 1A, is used for boat repairs by vessel owners (Figure 2-2; Whitman 2007).

2.3 Site Ownership History

The SMIC covers approximately 100 acres and is owned, almost in its entirety, by the City of Seward. Additional businesses that occupy space within the SMIC are presented in Figure 2-2. The nature of business conducted by these additional lessees/owners is not known. The SSDD leases Lot 3 Block 7 and Lot 1A Block 7 within the SMIC. SSDD began operations at this location in 1985 (Marcorelle 2005).

2.4 Site Operations and Source Characteristics

Site features are presented in Figure 2-3. Ships are pulled out of Resurrection Bay at the pullout dock. The ships are then placed on the rail system and power washed close to the beach so all organic matter (i.e., seaweed and barnacles) is removed using only water pressure. The removed materials are disposed on the beach where they are either dispersed by the tide or allowed to decompose (Marcorelle 2005). The ships are then moved to the east. The ship will either be moved into place in the outdoor sandblasting area or moved to the north over the transfer pit and transferred to another set of rails and moved to the indoor sandblasting area. North of the indoor sandblasting area (which is a large tent-like structure) are three stockpiles of sandblast grit (which are disposed periodically as discussed above in Subsection 2.4).

East of the indoor sandblast area is a solvent storage area. The solvent storage area had an aboveground storage tank measuring approximately 200 gallons. Additionally, numerous paint containers of varying fullness are stored on pallets. The cans of paint were all covered, but not sealed. Soil staining was noted in this area.

South of the outdoor sandblasting area is an office and vehicle maintenance area. One equipment refueling truck was parked south of the maintenance area. A large area of stained soil with a distinct petroleum-like odor was noted in this area. Northeast of the maintenance area was a shed that is reported to be used to sandblast small items. A pile of sandblast grit is inside the shed.
SSDD performs sandblasting and painting of commercial ships at this facility. Ships are removed from Resurrection Bay and placed on a rail system. The ships are then power washed close to the beach; so all organic matter (i.e., seaweed and barnacles) is removed using only water pressure. The removed materials are

disposed on the beach, where they are either dispersed by the tide or allowed to decompose. (Marcorelle 2005)

Currently, SSDD purchases approximately 100 to 120 tons of virgin sandblast grit each year made from recycled bottles from Anchorage Recycle Center and between 100 and 1,000 tons per year of "Kleen Blast," based on the workload. During the sandblasting operations, sand and paint chips fall to the ground inside the covered area. When a "significant" amount builds up on the ground inside the covered area, it is added to a used sandblast grit pile outside the covered area. Spent sandblast grit is sampled then shipped to the Kenai Peninsula Borough Landfill, which is located in Soldotna, Alaska (Whitman 2004). Shipments have been sent in 1992, 1995, 1997, 2000, and 2004 (Whitman 2004). A new shipment is planned for 2007 (Whitman 2007). The shipment had not yet occurred at the time of the field event.

Some time during 2004, a load of sandblast grit with a volume of approximately 189 cubic yards was shipped to a nearby residential property for disposal. Also at this time, one pile with a volume of approximately 178 cubic yards remained at the site. Five samples were collected from the on-site stockpile, and three samples were collected from the piles located at the nearby residential property. No background sample was collected for comparative purposes. Samples of the sandblast grit piles were collected and analyzed for the following: toxicity characteristic leachate procedure (TCLP) metals using EPA method SW6010b TCLP; gasoline range organics (GRO) using EPA method 8015M/7021B; diesel range organics (DRO) and residual range organics (RRO) using Alaska method 102/103; TCLP semivolatile organic compounds (SVOCs) using EPA method SW8270 TCLP; TCLP pesticides using EPA method SW8081A TCLP; and TCLP volatile organic compounds using EPA method SW8260B TCLP. The results from these sample analyses are presented in Table 2-1. Analytes are presented only if detections were above the instrument detection limits in at least one sample.

2.5 Previous Investigations

On October 29, 2004, an inspection was conducted by an Alaska Department of Environmental Conservation (ADEC) environmental specialist to determine the DRO source found in the sandblast grit samples (described above). Results of DRO samples were 146 parts per million (ppm), 335 ppm, and 349 ppm. There were no conclusions as to the source of the DRO found in the sandblast grit samples. (Marcorelle 2005).

An on-site inspection by the ADEC Division of Air Quality was conducted on April 15, 2005, based on complaints received by ADEC. Based on this inspection and on interviews with employees and the complainants, ADEC alleges that from approximately December 28, 2004, through May 4, 2005, SSDD released fugitive particulate emissions from the open-air sandblasting operations at the facility. ADEC issued a Notice of Violation (NOV) to the SSDD in May 2005 for uncontrolled fugitive emissions and creating an air pollution nuisance in violation of Section 18 Alaska Administrative Code (AAC) 50.045(d) and Section 18 AAC

50.110 (Brena 2005). Section 18 AAC 50.045(d) states in part "that a person who causes or permits bulk materials to be handled, transported, or stored, or who engages in an industrial activity or construction project shall take reasonable precautions to prevent particulate matter from being emitted into the ambient air." As a result of this investigation, ADEC determined that because SSDD conducts sandblasting and painting operations as a primary activity of its marine service business, its operations were determined to constitute industrial activities that handle bulk materials that are subject to 18AAC 50.045(d). ADEC further determined that SSDD was in violation of this Section.

Additionally, Section 18 AAC 50.110 in part states, "that no person may permit any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property." SSDD's work activities emit fugitive particulate emissions; thereby, its activities were determined by ADEC to be subject to 18 AAC 50.110. ADEC also determined that these activities were in violation of this Section. The NOV listed the following actions to be addressed by June 10, 2005:

- A list of the interim immediate control measures SSDD is implementing to reduce airborne emissions, including a description and date of installation; and
- A list of the permanent planned control measures SSDD intends to implement to comply with 18 AAC 50.045(d) and 18 ACAC 50.110, including a description and schedule for implementation.

SSDD completed installation of the windscreens on the covered repair berth in September 2005 and completed the installation of the outside repair berth in March 2006 (Espinoza 2007).

Public complaints were again received for March 19, 2006, February 6, 2007, February 18, 2007, and February 20, 2007, and included photographic evidence that dust control measures have not been fully implemented. As a result of the February 6 complaints, an on-site inspection was conducted by ADEC on February 7, 2007. During the inspection it was determine that:

- SSDD had failed to deploy windscreens around a vessel during sandblasting operations;
- SSDD did not use the vacuum assisted unit during sandblasting the main deck;
- SSDD did not use tarps or plastic sheeting to suppress dust emissions from sandblasting the main deck; and
- Observations of the snowfield outside the south fence-line at the SSDD clearly showed residual materials from sandblasting operations.

Based on this inspection, another NOV for violation of 18 AAC 50.110 was issued to SSDD.

2.6 Summary of SI Investigation Locations

Sampling under the SSDD SI was conducted at possible on-site sources of Comprehensive Environmental Response, Compensation, and Liability Act

(CERCLA) –regulated substances and at receptors (i.e., targets) that may have been contaminated through the migration of hazardous substances from site sources. The features identified under inspection under the SSDD SI were determined based on a site visit, interviews with regulatory agencies, and a review of background information. These features are discussed below:

Potential Sources:

- **Sandblast Grit:** Sandblast grit is present at the site. This investigation was designed to assist in determining whether sandblast grit contains hazardous substances at significant concentrations. Potential contaminants of concern associated with this source are: tributyltin (TBT), target analyte list (TAL) metals, SVOCs, polychlorinated biphenyls (PCBs), DRO, RRO, GRO, and benzene, toluene, ethylbenzene, and total xylenes (BTEX).

Targets:

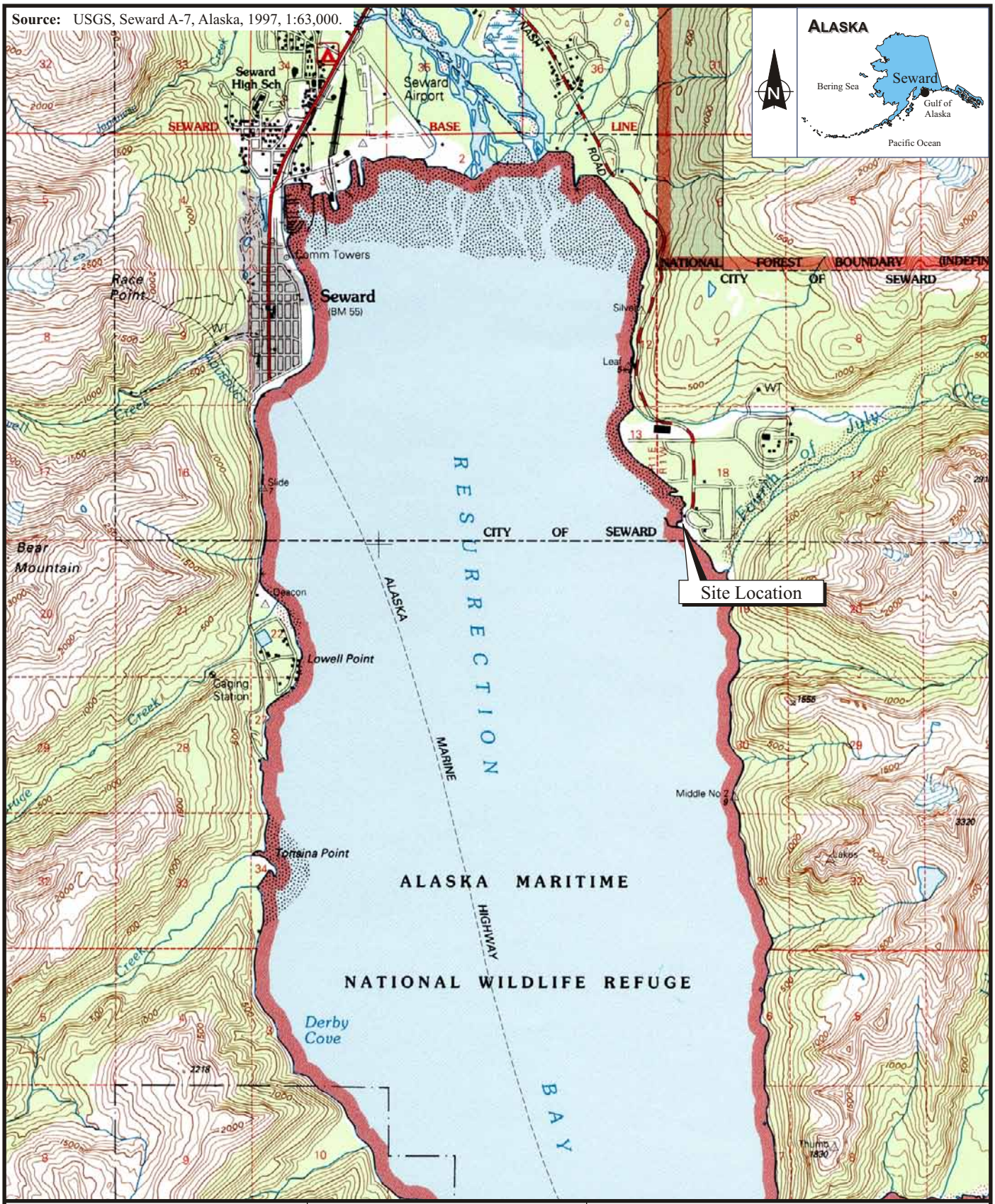
- **Resurrection Bay:** Contaminants from on-site sources may be impacting sediments, fisheries, and sensitive environments in Resurrection Bay. This investigation was designed to assist in determining whether sediments in the bay have elevated concentrations of hazardous substances. Potential contaminants of concern are TBT, TAL metals, SVOCs, PCBs, DRO, RRO, GRO, and BTEX.

Table 2-1 Sandblast Grit Stockpile Samples Analytical Results Summary

Sample ID	083005 001	083005 002	083005 003	083005 004	083005 005	083005 006	083005 007	083005 008
Location	On-site Stockpile					Off-site Stockpile		
TCLP Metals (mg/L)								
Barium	**0.584**	**0.857**	**1.26**	**1.24**	**1.39**	**1.22**	**1.43**	**0.856**
Lead	0.500 U	**0.743**	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Volatile Fuels Department (µg/kg)								
GRO	**23600**	**15600**	**22400**	**13100**	**24600**	**12900**	**18300**	**10600**
Toluene	56.7 U	50.1 U	53.8 U	**67.3**	47.4 U	44.3 U	45.2 U	49.9 U
Ethylbenzene	**444**	**153**	**273**	**212**	**520**	**165**	**366**	**149**
P & M-Xylene	**2350**	**1000**	**1510**	**1250**	**2750**	**1050**	**2040**	**863**
o-Xylene	**1960**	**120**	**1560**	**1390**	**2560**	**1260**	**2030**	49.9 U
Semivolatile Organic Fuels Department (mg/kg)								
DRO	**161**	**298**	**249**	**308**	**361**	**233**	**324**	199 U
RRO	**509**	**825**	**849**	**1150**	**1030**	**784**	**948**	**692**

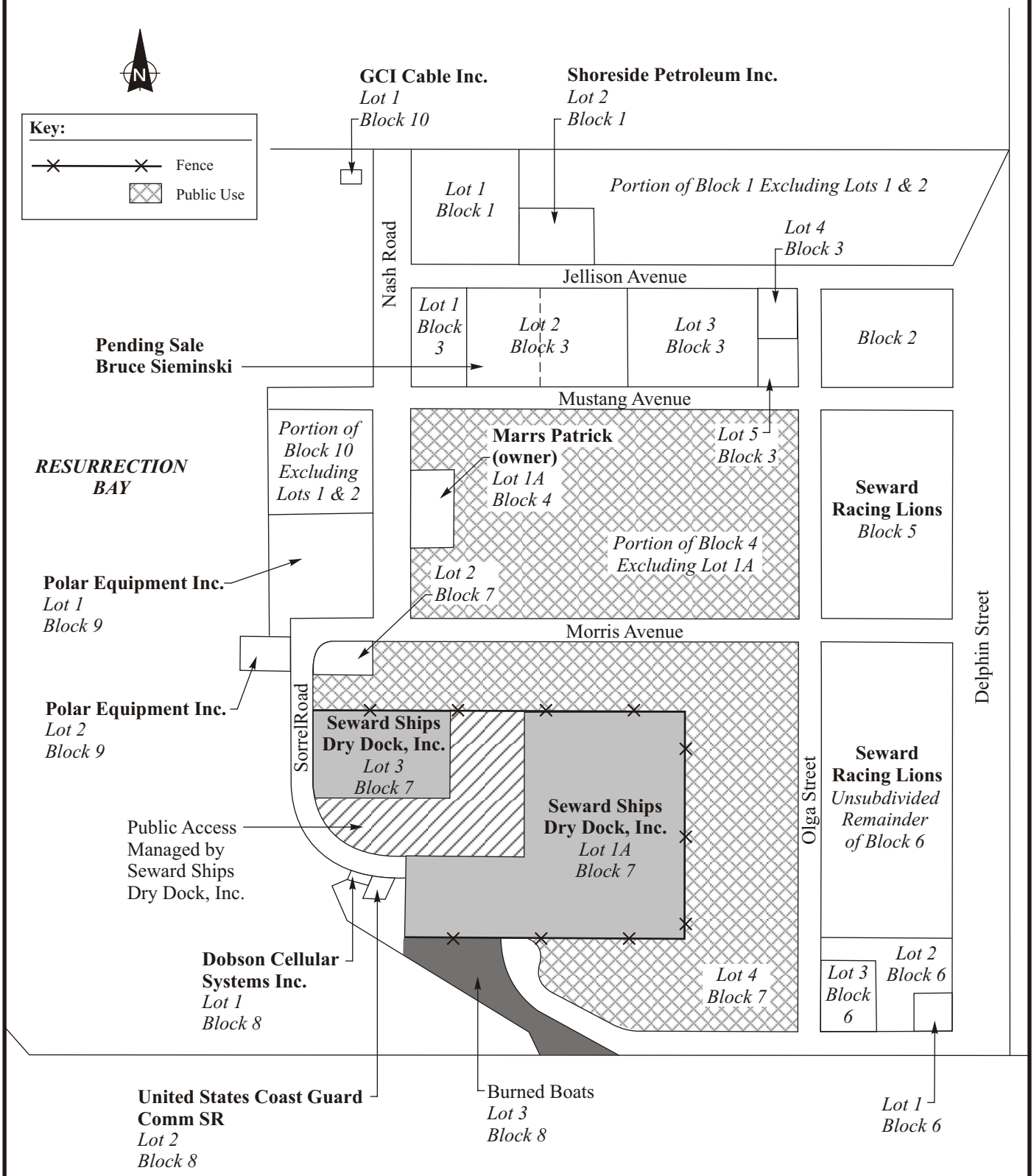
Source: SSDDI n.d.
Note: Bold type indicates the sample result is above the instrument detection limit.

Key:
DRO = Diesel Range Organics.
GRO = Gasoline Range Organics.
ID = Identification.
mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.
RRO = Residual Range Organics.
TCLP = Toxicity characteristic leaching procedure.
U = The analyte was analyzed for but was not detected. The associated numerical value is the instrument detection limit.
µg/L = micrograms per liter.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	SEWARD SHIP'S DRY DOCK SITE INSPECTION Seward, Alaska	Figure 2-1 VICINITY MAP		
	0 .5 1 Approximate Scale in Miles	Date: 8-21-07	Drawn by: AES	10:START-3\07040006\fig 2-1

Source: Seward Planning Department, n.d.



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SEWARD SHIP'S DRY DOCK
SITE INSPECTION
Seward, Alaska

Figure 2-2

SEWARD MARINE INDUSTRIAL COMPLEX

0 2,640 5,280
Approximate Scale in Feet

Date: 8-21-07 | Drawn by: AES | 10:START-3\07040006\fig 2-2

N W E S

0 150 300 Feet

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SEWARD SHIP'S DRY DOCK SITE INSPECTION

Seward, Alaska

Figure 2-3

Site Map

Job Id: 002233.0201.01SI

Date: 8/21/2007

GIS Analyst: amm

Map Source Information: Kenai Peninsula Borough, 2005 Imagery

3 Field Activities and Analytical Protocol

A sampling and quality assurance plan (SQAP) for the SSDD SI was developed by the START prior to field sampling (E & E 2007). The SQAP describes the sampling strategy, sampling methodology, and analytical program used to investigate potential hazardous substance sources and potential targets. With few exceptions, the SI field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP are described, when applicable, in this section and in the sampling location discussions in Section 6, source areas, and Section 7, target areas. All deviations to this SQAP were pre-approved by the EPA Task Monitor (TM) during the field sampling event and were documented on a Sample Plan Alteration Form (SPAF). The SPAF is included in Appendix A.

The SI field sampling event was conducted from June 6, through 8, 2007. The START was accompanied around the site by the General Manager, Mr. Whitman, and Ms. Diane Richardson of the EPA. On June 7, 2007, the START was met by Mr. Trevor Fairbanks of ADEC. A total of 25 samples, including two background samples were collected for the SI. Sample types and methods of collection are described below. A list of all samples collected for laboratory analysis under this SI is contained in Table 3-1. Sample locations are presented in Figures 3-1 and 3-2.

Samples were identified using the sample numbers assigned by the EPA. In addition to the EPA assigned sample number, samples are tracked with a sample code system designed to allow easy reference to the sample's origin and type. The sample tracking and location codes are presented in Table 3-2.

This section describes sampling methodology, analytical protocol, global positions system, and investigation-derived waste (IDW).

3.1 Sampling Methodology

Grass leaves and other vegetative material, rocks, and other debris unsuitable for analysis were removed from samples before being placed into sample containers. Samples were stored on ice in coolers continuously maintained under the custody of START personnel. Chain-of-custody forms that accompanied the samples to the laboratory are presented in Appendix C. Sampling methods used for each sample type are described below.

3.1.1 Surface Soil Sampling

Surface soil samples (0 to 6 inches below ground surface [bgs]) were collected using dedicated stainless steel spoons. Collected material was placed in a dedicated stainless steel bowl, thoroughly homogenized, and placed into prelabeled containers. The GRO/BTEX and DRO aliquots were collected directly into the sample containers prior to homogenization and the GRO/BTEX aliquot was preserved immediately after collection.

3.1.2 Sediment Sampling

Sediment samples (0 to 6 inches bgs) were collected using dedicated stainless steel spoons. Collected material was placed in a dedicated stainless steel bowl, thoroughly homogenized, and placed into pre-labeled containers. The GRO/BTEX and DRO aliquots were collected directly into the sample containers prior to homogenization and the GRO/BTEX aliquot was preserved immediately after collection.

3.2 Analytical Protocol

Analytical protocols applied to SI samples included fixed laboratory analysis of DRO (AK-102), GRO/BTEX (AK-101), PCBs (Contract Laboratory Program Analytical Services [CLPAS] SOM01.1 [EPA 2006]), RRO (AK-103), SVOCs (CLPAS SOM01.1 [EPA 2006]), TAL metals (CLPAS ILM05.4 [EPA 2007]), and TBT (Krone et al. 1989). Additionally, field screening for the presence of petroleum products using the PetroFLAG® system was conducted using EPA SW-846 method 9074. The types of analysis applied to samples were based on known or suspected contaminants and field screening results for petroleum products. For this reason, some samples were not analyzed for all of the analytical methods listed above.

The following samples were submitted to Contract Laboratory Program (CLP) and subcontract laboratories for analysis:

- **TAL Metals:** Twenty-five samples, including quality assurance/quality control (QA/QC) samples were submitted to Sentinel, Inc. of Huntsville, Alabama.
- **GRO/BTEX:** Ten samples, including QA/QC samples were submitted to Severn Trent, Inc. of Tacoma, Washington.
- **DRO/RRO:** Ten samples, including QA/QC samples were submitted to Severn Trent, Inc. of Tacoma, Washington.
- **PCBs:** Twenty-five samples, including QA/QC samples were submitted to A4 Scientific, Inc. of The Woodlands, Texas.
- **SVOCs:** Twenty-five samples, including QA/QC samples were submitted to A4 Scientific, Inc. of The Woodlands, Texas.
- **TBT:** Twenty-five samples, including QA/QC samples, were submitted to Severn Trent, Inc. of Tacoma, Washington.

3.3 Global Positioning System

Trimble Pathfinder Processional Global Positioning System (GPS) survey units and Corvalis data loggers were used by the START personnel to approximate the sample location coordinates of the SI samples. Due to an equipment failure, GPS

coordinates for samples were lost. Sample locations were placed on the figures contained in this report based on field notes.

3.4 Investigation-Derived Waste

IDW generated during the SI sampling effort included used sampling equipment (i.e., stainless steel bowls and spoons) and personal protective equipment (i.e., gloves), which were disposed of at the municipal landfill. No IDW remains at the site.

Table 3-1 Sample Collection and Analytical Summary

EPA Sample ID	CLP Sample ID	Station Location	Matrix	Date	Time	Tributyltin	TAL Metals	SVOCs	PCBs	DRO	RRO	GRO/BTEX	Sample Description
07234000	J8762	SD01	SS	6/6/07	1440	X	X	X	X				Western stockpile, dark grey, sandy gravel, moist to wet, no odor.
07234001	J8763	SD02	SS	6/6/07	1450	X	X	X	X				Middle stockpile, dark grey, sandy gravel, moist to wet, no odor.
07234002	J8764	SD03	SS	6/6/07	1455	X	X	X	X	X	X	X	Eastern stockpile, dark grey to black, sand with visible paint chips, moist to wet, no odor.
07234003	J8765	SD04	SS	6/6/07	1505	X	X	X	X				Northeastern portion of the outdoor sandblasting area, black and dark grey, sand, layers of lighter grey sand, tan layer with clay-like consistency, moist, no odor.
07234004	J8766	SD05	SS	6/6/07	1520	X	X	X	X				Central portion of the outdoor sandblasting area, dark brown, gravel and sand, some paint chips and barnacles, moist, no odor.
07234005	J8767	SD06	SS	6/6/07	1644	X	X	X	X	X	X	X	Southwestern portion of the outdoor sandblasting area, dark brown, gravel and sand, some paint chips, moist, no odor.
07234006	J8768	SD07	SS	6/6/07	1657	X	X	X	X				Northeast corner of the transfer pit, brown, sand with paint chips, moist, no odor.
07234007	J8769	SD08	SS	6/6/07	1700	X	X	X	X	X	X	X	Center of the transfer pit, brown, sand, moist, no odor.
07234008	J8770	SD09	SS	6/6/07	1710	X	X	X	X				Southeast corner of transfer pit near tracks, brown, sand, moist, no odor.
07234009	J8771	SD10	SS	6/6/07	1725	X	X	X	X				South of pullout dock, dark brown, sand, moist, no odor.
07234010	J8772	SD11	SS	6/7/07	0900	X	X	X	X				East gate, dark gray, gravelly sand, wet, no odor.
07234011	J8773	SD12	SS	6/7/07	0912	X	X	X	X				Eastern entrance of covered sandblast area, dark gray sandy gravel for 1 inch, rust-colored sand for 1 inch, rose-colored sand for 1 inch, tan sand for 2 inches, moist, no odor.
07234012	J8774	SD13	SS	6/7/07	0920	X	X	X	X	X	X	X	Middle of the covered sandblast area, black sand with paint chips for 1 inch, dark brown sand for 1 inch, light brown sand for 1 inch, grey sand with gravel for 1 inch, dry, no odor.
07234013	J8775	SD14	SS	6/7/07	0925	X	X	X	X				Western entrance to covered sandblast area, black sand for 1 inch, light tan sand for 0.5 inch, brown sand for 1 inch, dark brown sand for 2 inches, dark gray to black sand below, paint chips visible throughout the layers, moist, no odor.

Table 3-1 Sample Collection and Analytical Summary

EPA Sample ID	CLP Sample ID	Station Location	Matrix	Date	Time	Tributyltin	TAL Metals	SVOCs	PCBs	DRO	RRO	GRO/BTEX	Sample Description
07234014	J8776	SD15	SS	6/7/07	0940	X	X	X	X	X	X	X	Maintenance shed area of soil staining, dark gray, oil covered fill, some paint chips, wet, distinct petroleum-like odor.
07234015	J8777	SD16	SS	6/7/07	1007	X	X	X	X				South gate, dark gray sandy gravel, slight amount glass and paint chips, wet, no odor.
07234016	J8778	SD17	SS	6/7/07	1015	X	X	X	X				Southwest corner of property (obvious area of snow blading), gray and black layer with paint chips approximately 0.25 inch, light gray gravelly sand below, damp, no odor.
07234017	J8779	SD18	SS	6/7/07	1117	X	X	X	X				Outside of east gate, dark gray sandy gravel, wet, no odor.
07234018	J8780	OP01	SD	6/7/07	1137	X	X	X	X	X	X	X	Drainage ditch, dark gray gravel and sand, wet, no odor.
07234019	J8781	BG01	SS	6/7/07	1155	X	X	X	X	X	X	X	Background surface soil, MS/MSD, dark brown, sandy, wet, no odor.
07234020	J8782	RB01	SD	6/7/07	1205	X	X	X	X				Resurrection Bay at confluence with Creek, dark gray, sand, wet, no odor.
07234021	J8783	RB02	SD	6/7/07	1217	X	X	X	X				Resurrection Bay near southwest corner of property, dark gray, sand, wet, no odor.
07234022	J8784	RB03	SD	6/7/07	1230	X	X	X	X	X	X	X	Resurrection Bay near pullout dock, dark gray, sand, wet, no odor.
07234023	J8785	BG01	SD	6/7/07	1255	X	X	X	X	X	X	X	Background sediment, MS/MSD, dark gray, sand, wet, no odor.
07234024	J8786	SD19	SS	6/7/07	1820	X	X	X	X	X	X	X	Solvent paint storage shed, dark gray to black, sand, wet, petroleum-like odor.

Key:
BTEX = Benzene, toluene, ethylbenzene, and xylenes.
CLP = Contract Laboratory Program.
DRO = Diesel Range Organics.
EPA = United States Environmental Protection Agency.
GRO = Gasoline Range Organics.
ID = Identification.
MS/MSD = Matrix Spike/Matrix Spike Duplicate.
PCBs = Polychlorinated biphenyls.
RRO = Residual Range Organics.
SD = Sediment.
SS = Surface Soil.
SVOCs = Semivolatile Organic Compounds.
TAL = Target Analyte List.
X = Sample was analyzed for this parameter.

Table 3-2 Sample Coding

Digits	Description	Code	Example
1,2	Source Code	BG	Background
		OP	Overland Pathway
		SD	Seward Ship's Dry Dock
		RB	Resurrection Bay
3,4	Consecutive Number	01	First Sample of Source Type
5,6	Matrix Code	SS	Surface Soil
		SD	Sediment

N
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0 150 300 Feet

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SEWARD SHIP'S DRY DOCK SITE INSPECTION

Seward, Alaska

Figure 3-1

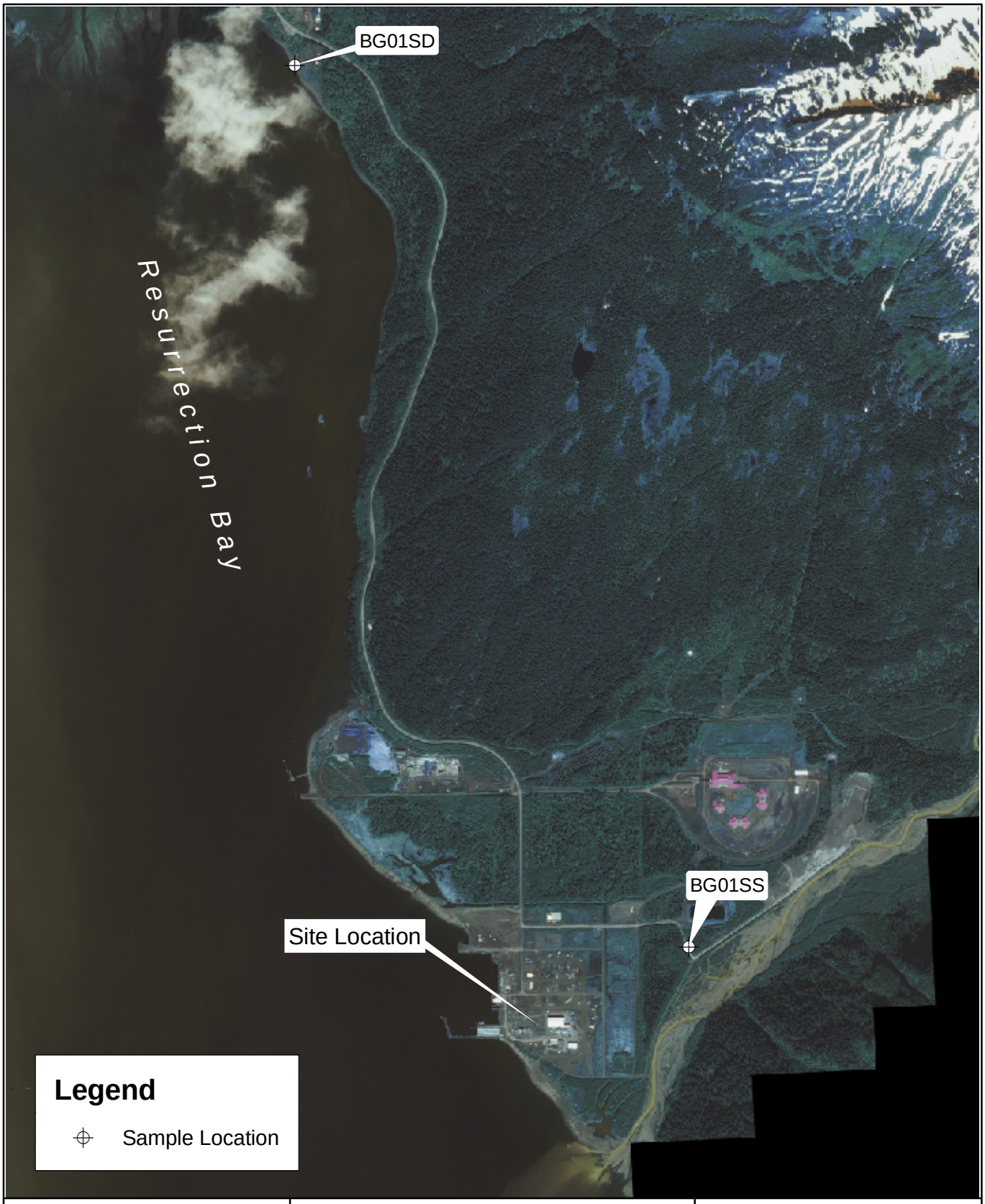
Sample Locations

Job Id: 002233.0201.01SI

Date: 8/21/2007

GIS Analyst: amm

Map Source Information: Kenai Peninsula Borough, 2005 Imagery



N
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0 0.2 0.4 Miles

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SEWARD SHIP'S DRY DOCK SITE INSPECTION

Seward, Alaska

Figure 3-2

Background Sample Locations

Job Id: 002233.0201.01SI	
Date: 8/21/2007	GIS Analyst: amm
Map Source Information: Kenai Peninsula Borough, 2005 Imagery	

4 Quality Assurance/ Quality Control

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interference and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in the *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 2007) and *Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 2006). These QC requirements, or equivalent requirements, found in the analytical methods were followed for analytical work on this SI. This section describes the QA/QC measures taken for the SI and provides an evaluation of the usability of data presented in this report.

All samples were collected following the guidance of the SQAP (E & E 2007). Deviations from the SQAP included in addition of analysis for DRO, RRO, GRO, and BTEX.

Data from the CLP laboratories were reviewed and validated by EPA chemists. Data from the START-3-subcontracted commercial laboratory were reviewed and validated by a START chemist. Field analyses were validated against the manufacturer's instruction. Data qualifiers were applied as necessary according to the following guidance:

- EPA (2004a) *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*; and

- EPA (2004c) *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*.

In the absence of other QC guidance, method- and/or SOP-specific QC limits were also utilized to apply qualifiers to the data.

4.1 Satisfaction of Data Quality Objectives

The following EPA (2000) guidance document was used to establish data quality objectives (DQOs) for this SI:

- *Guidance for the Data Quality Objectives Process*, (EPA QA/G-4), EPA/600/R-96/055.

The EPA TM determined that definitive data without error and bias determination would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the field activities produced sufficient data that

met the DQOs stated in the SQAP. A detailed discussion of accomplished SI objectives is presented in the following sections.

4.2 QA/QC Samples

The QA samples included one trip blank sample. Rinsate blank samples were not collected as all samples were collected using dedicated sampling equipment. Water trip blank samples were collected from a deionized water source for the project.

QC samples included matrix spike/matrix spike duplicate (MS/MSD) samples for organic analyses at a rate of one MS/MSD per 20 samples per matrix and MS/duplicate samples for inorganic analyses at a rate of one MS/duplicate per 20 samples per matrix.

4.3 Project-Specific DQOs

The laboratory data were reviewed to ensure that DQOs for the project were met. The following describes the laboratories' abilities to meet project DQOs for precision, accuracy, and completeness and the field team's ability to meet project DQOs for representativeness and comparability. The laboratories and field team were able to meet the DQOs for the project.

4.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory and field precision is defined as the relative percent difference (RPD) between duplicate sample analyses. The laboratory duplicate samples of MS/MDS samples measure the precision of the analytical method. The RPD values were reviewed for all commercial laboratory samples. No sample results were qualified based on laboratory duplicate QC outliers. The DQO for precision was met.

4.3.2 Accuracy

Accuracy measures the reproducibility of the sampling and analytical methodology. Laboratory accuracy is defined as the surrogate spike percent recovery (%R) or the MS %R for all laboratory analyses. Sixteen results (approximately 0.6% of the data) were qualified as estimated quantities (J or UJ) and two results (approximately 0.08% of the data) were rejected (R) based on surrogate QC outliers.

The MS %R values were reviewed for all MS/MSD analyses. Thirty-two sample results (approximately 1.2% of the data) were qualified as estimated quantities (J or UJ) based on spike QC outliers. The DQO for accuracy was met.

4.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data validation and usability. Two results were rejected (approximately 0.08% of the data); therefore, the project DQO for completeness was met.

4.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The DQO for representativeness was met.

4.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this project followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met.

4.4 Laboratory QA/QC Parameters

The laboratory data also were reviewed for holding times, temperatures, laboratory blanks samples, field/trip blank samples, serial dilution analyses, and interference check sample analyses. These QA/QC parameters are summarized below. In general, the laboratory and field QA/QC parameters were considered acceptable.

4.4.1 Holding Times/Temperatures

All holding times were met. All samples were maintained within QC limits.

4.4.2 Laboratory Blanks

All laboratory blanks met the frequency criteria. The following potential contaminant of concern was detected in the laboratory blanks:

- **TAL Metals:** Beryllium

Associated sample results less than five times the blank concentration were qualified as not detected (U).

4.4.3 Trip Blanks

One water trip blanks sample was collected during the field event; therefore, meeting the frequency criteria of one per cooler per 20 VOC samples. No contaminants of concern were detected in the trip blank.

4.4.4 Serial Dilution

Serial dilution analyses were performed at a frequency of one per 20 samples, per matrix, meeting QC frequency criteria. A total of 127 results (approximately 4.9% of the data) were qualified as estimated quantities (J or UJ), based on the serial dilution outliers.

4.4.5 Interference Check Samples

Interference check sample analyses were performed at a frequency of one per 20 samples, per matrix, meeting QC frequency criteria. All interference check sample results were within QC limits.

4.5 Field Screening Correlation

START personnel used Dexsil, Inc., PetroFLAG® hydrocarbon test kits to field-analyze 26 soil samples for hydrocarbons (Appendix C). Field results were used to delineate potential on- and off-site surface contamination from various locations. Based on these results, seven soil samples were submitted to a commercial laboratory for confirmation analysis following ADEC methods AK-102 (DRO) and AK-103 (RRO). A linear regression analysis of applicable field and confirmation results for BTEX compounds performed by a START-3 chemist showed a correlation coefficient (R^2) of 0.270. According to EPA guidance, a minimum R^2 of 0.700 is necessary to consider field analytical results acceptable when compared with laboratory confirmation results. The field result for sample SD13 was much higher than any other result, skewing the correlation. When the result for sample SD13 is removed, the R^2 is 0.868. The field screening accomplished its objective of identifying areas of contamination and of determining the extent of contamination. Correlation results are presented in Table 4-1 and Figures 4-1 (including sample SD13SS) and 4-2 (without sample SD13SS).

Table 4-1 Field Screening and Fixed Laboratory Correlation

Station Location	Fixed Laboratory Result (mg/kg)	Field Screening Result (mg/kg)	Correlation Coefficient
Correlation with Sample SD13SS			
BG01SD	29	206	
BG01SS	3.52	85	
OP01SD	1172	1076	
SD03SS	1368	1742	
SD08SS	3497	2377	
SD13SS	2236	10000	0.270
Correlation without Sample SD13SS			
BG01SD	29	206	
BG01SS	3.52	85	
OP01SD	1172	1076	
SD03SS	1368	1742	
SD08SS	3497	2377	0.868

Note: All results are corrected for percent moisture.

Figure 4-1
Correlation Values with Sample SD13SS

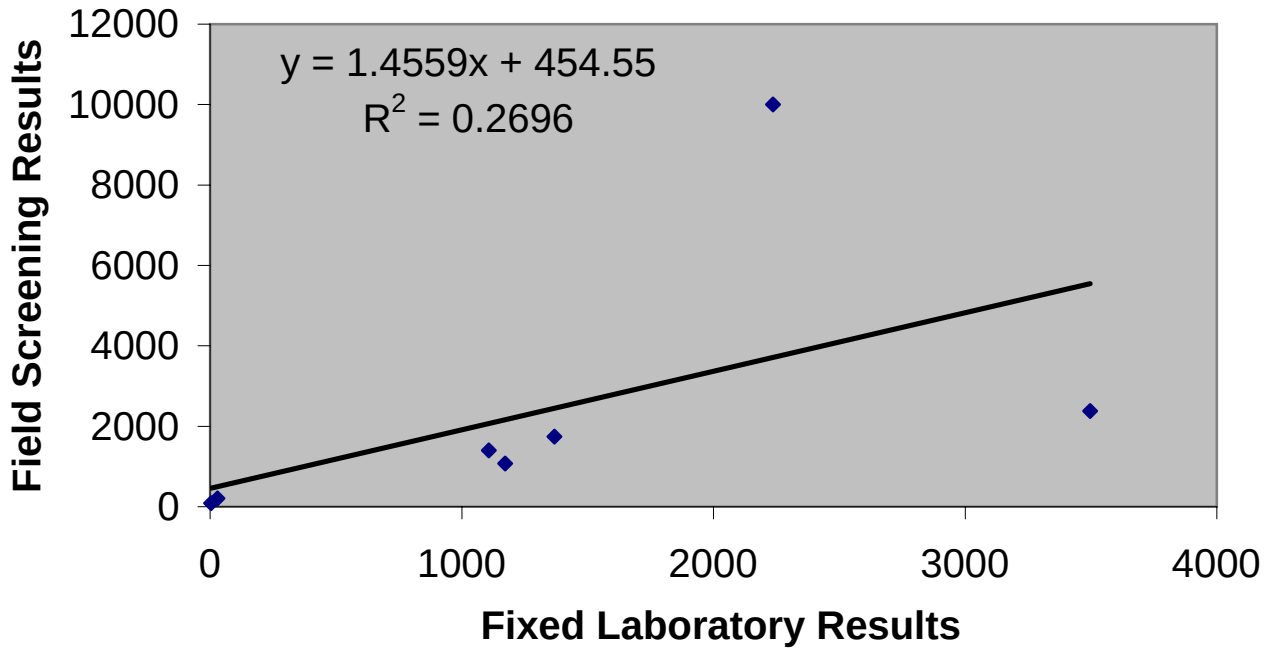
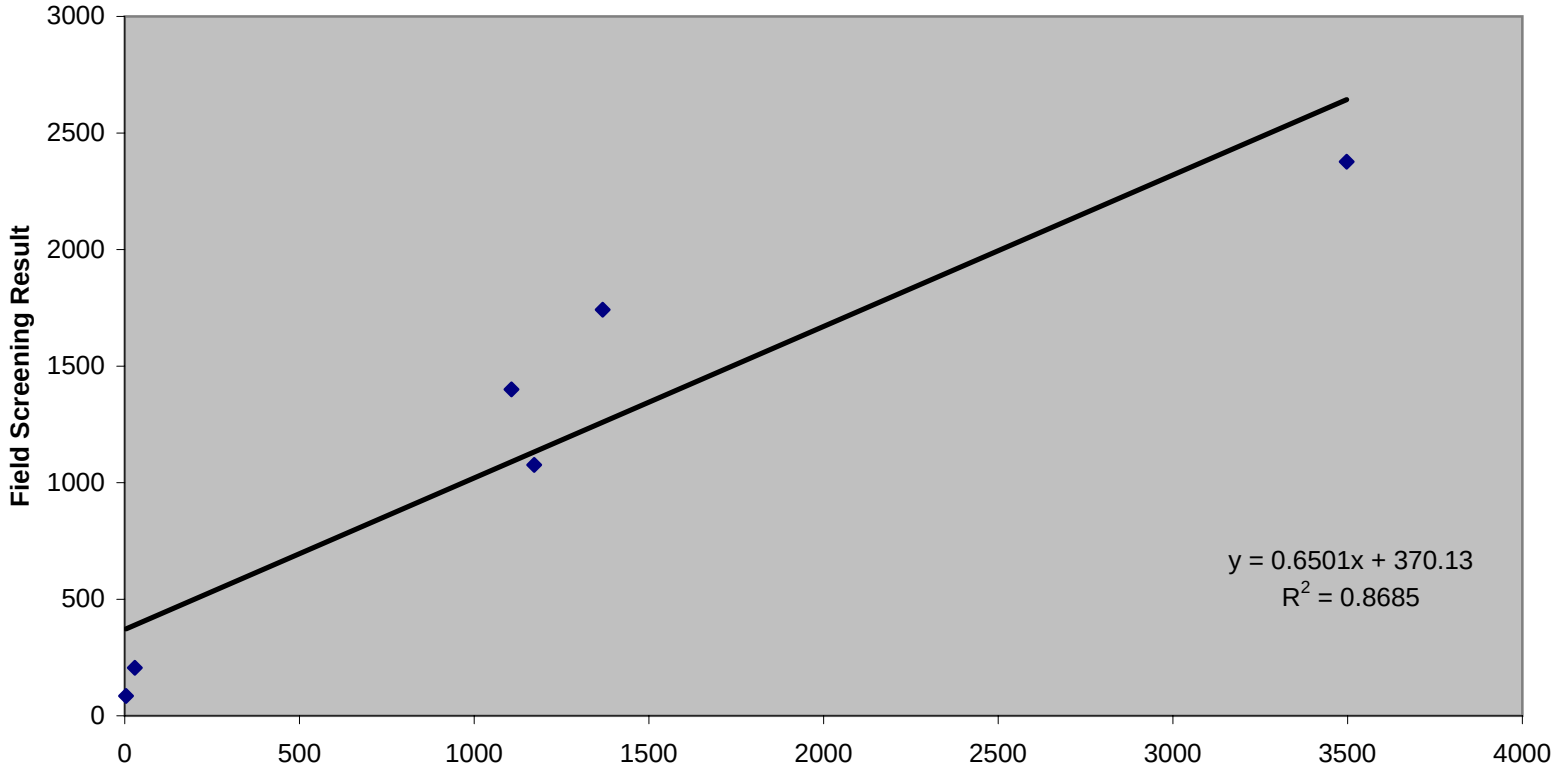


Figure 4-2
Correlation Values without Sample SD13SS



5 Analytical Results Reporting and Background Samples

This section describes the reporting and methods applied to analytical results presented in Sections 6 (sources) and 7 (targets), of this report and discusses background locations and sample results. Table 3-1 lists all samples collected for off-site fixed laboratory analysis.

5.1 Analytical Results Evaluation Criteria

Analytical results presented in the summary tables of Sections 6 and 7 show, in bold type, all analytes detected above instrument detection limits. Analytical results indicating significant (source samples)/elevated (target samples) concentrations of contaminants in source samples (Section 6) and target samples (Section 7) with respect to background concentrations are shown underlined and in bold type. For the purposes of this investigation, significant (source samples)/elevated (target samples) concentrations are those concentrations that are:

- Equal to or greater than the sample's Contract Required Quantitation Limit (CRQL) or the Sample Quantitation Limit (SQL), when a non-CLP laboratory was used; and
- Equal to or greater than the background sample's CRQL or SQL when the background concentration was below detection limits; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the CRQL or SQL.

The analytical summary tables present all detected compounds, but only those detected analytes at potential sources and targets meeting the significant/elevated concentration criteria are discussed in the report text. All detected concentrations are also discussed for the background samples.

5.1.1 Sample Results Reporting

The analytes aluminum, calcium, iron, magnesium, potassium, and sodium are common earth crust elements. Based on EPA, Region 10 policy, these common earth crust elements will not be discussed or evaluated as a part of this porject.

When samples were diluted for re-analysis at a laboratory, the dilution results were considered for evaluation and are provided in the tables.

5.2 Background Samples

Background samples were collected for each of the naturally occurring media from which SI samples were collected. These media are surface soil and sediment. Results for the appropriate background samples are shown in the first column of the analytical results summary tables in Sections 6 and 7 for comparison against source or target results.

5.2.1 Background Surface Soil Sample

5.2.1.1 Sample Location

One background surface soil sample (BG01SS) was collected from an area assumed to be outside the influence of potential on-site contamination. The sample was collected approximately 0.34 mile east of the site.

5.2.1.2 Sample Results

Fixed laboratory analytical results for the background surface soil sample are presented in Table 6-1. Field screening results for the background surface soil sample are presented in Appendix E. The background surface soil sample was submitted to an off-site fixed laboratory for TBT, TAL metals, SVOCs, PCBs, DRO, RRO, and GRO/BTEX analysis.

Ten TAL metals (arsenic, barium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc) were detected in the background surface soil sample. Not detected in the sample were DRO, RRO, GRO, TBT, PCBs, SVOCs, and BTEX.

5.2.2 Background Sediment Sample

5.2.2.1 Sample Location

One background sediment sample (BG01SD) was collected from Resurrection Bay from an area assumed to be outside the potential migration of potential on-site contamination. The sample was collected approximately 2.5 miles north of the site.

5.2.2.2 Sample Results

Fixed laboratory analytical results for the background sediment sample are presented in Table 6-2. Field screening results for the background sediment sample are presented in Appendix E. The background sediment sample was submitted to an off-site fixed laboratory for TBT, TAL metals, SVOCs, PCBs, DRO, RRO, and GRO/BTEX analysis.

Ten TAL metals (arsenic, barium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc) were detected in the background sediment sample. Not detected in the sample were DRO, RRO, GRO, TBT, PCBs, SVOCs, and BTEX.

6 Potential Sources

This section describes potential sources, sample locations, and analytical results of SI samples obtained from potential sources. Laboratory data sheets of analytical results for all samples are provided in Appendix C.

6.1 Sandblast Grit

Sandblast grit is present over the surface of the entire site. The sandblast grit appeared to be of uniform thickness throughout the site with the exception of the stockpile. Because the material was spread uniformly throughout the site; however, approximately 2 acres are not under the care of SSDD; therefore, the estimated area of this source is 6.94 acres which is equivalent to 301,964.76 square feet. The site is fenced, but the fence remains open at all times and access to the site is unrestricted. No areas of the site are paved. The site is not used for recreational activities.

photos…..

6.1.1 Sample Locations and Results

A total of 19 surface soil samples (SD01SS through SD19SS) were collected from the site. A summary of the analyses applied to each sample is provided in Table 3-1. Sample locations are presented in Figure 3-1. Sample results for all locations are presented in Table 6-1. Field screening results for all samples are presented in Appendix D.

6.1.1.1 Pullout Dock

One surface soil sample (SD10SS) was collected from the pullout dock. The sample was submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs.

TBT was detected at a significant concentration with respect to the background concentration in the sample. Four TAL metals were detected at significant concentrations with respect to background concentrations. Nine SVOCs were detected at significant concentrations with respect to background concentrations. No PCBs were detected in the sample collected from the pullout dock.

6.1.1.2 South Gate

One surface soil sample (SD16SS) was collected from near the south gate. The sample was submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs.

TBT was detected at a significant concentration with respect to the background concentration. One TAL metal was detected at a significant concentration with respect to the background concentration. Two SVOCs were detected at significant concentrations with respect to background concentrations. No PCBs were detected in the sample collected from the South Gate.

6.1.1.3 Southwest Corner

One surface soil sample (SD17SS) was collected in the southwest corner of the property. The sample was submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs.

TBT was collected at a significant concentration with respect to the background concentration. Three TAL metals were detected at significant concentrations with respect to background concentrations. Two SVOCs were detected at significant concentrations with respect to background concentrations. No PCBs were detected in the sample collected from the southwest corner.

6.1.1.4 Transfer Pit

Three samples (SD07SS through SD09SS) were collected from the transfer pit. Sample SD07SS was collected from the northeast corner of the pit, sample SD08SS was collected from the center of the pit, and sample SD09SS was collected from the southeast corner of the pit near a drain. The samples were submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs. Additionally, sample SD08SS was submitted for off-site fixed laboratory analysis for DRO, RRO, GRO, and BTEX.

TBT was detected at significant concentrations with respect to background concentrations in all three samples. Six TAL metals were detected at significant concentrations with respect to background concentration in at least one of the three samples. Of these TAL metals, copper and zinc were detected at significant concentrations in all three of the samples. Eighteen SVOCs were detected at significant concentrations with respect to background concentrations in at least one of the three samples. Of these SVOCs, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, fluroanthene, phenanthrene, and pyrene were detected at significant concentrations in all three samples. One PCB was detected at a significant concentration with respect to the background concentration in one sample. Finally, DRO, RRO, GRO, ethylbenzene, m-&p-xylene, and o-xylene were detected at significant concentrations with respect to background concentrations in the single transfer pit sample analyzed for these parameters.

6.1.1.5 Stockpile

Three surface soil sample (SD01SS through SD03SS) were collected from the three transfer pits that are located north of the indoor sandblasting area. Sample SD01SS was collected from western stockpile; sample SD02SS was collected from the central stockpile; and sample SD03SS was collected from the eastern stockpile. The samples were submitted for off-site fixed laboratory analysis for

TBT, TAL metals, SVOCs, and PCBs. Additionally, sample SD03SS was submitted for off-site fixed laboratory analysis for DRO, RRO, GRO, and BTEX.

TBT was detected at significant concentrations with respect to background concentrations in all three samples. Seven TAL metals were detected at significant concentrations with respect to background concentrations in at least one of the samples. Of these TAL metals, copper, silver, and zinc were detected at significant concentrations in all three of the samples. Seventeen SVOCs were detected at significant concentrations with respect to background concentrations in at least one of the samples. Of these SVOCs, bis(2-ethylhexyl)phthalate was detected at significant concentrations in all three of the samples. One PCB was detected at a significant concentration with respect to the background concentration in one of the samples. Finally, DRO, RRO, GRO, ethylbenzene, m-&p-xylene, and o-xylene were detected at significant concentrations with respect to background concentrations in the single stockpile sample analyzed for these parameters.

6.1.1.6 Covered Sandblasting Area

Three surface soil samples (SD12SS through SD14SS) were collected from the covered sandblasting area. Sample SD12SS was collected from eastern entrance to the covered sandblasting area; sample SD13SS was collected near the center of the covered sandblasting area; and sample SD14SS was collected from the western entrance to the covered sandblasting area. The samples were submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs. Additionally, sample SD13SS was submitted for off-site fixed laboratory analysis for DRO, RRO, GRO, and BTEX.

TBT was detected at significant concentrations with respect to background concentrations in all three samples. Ten TAL metals were detected at significant concentrations with respect to background concentrations in at least one of the three samples. Of these TAL metals, copper, silver, thallium, and zinc were detected at significant concentrations in all three of the samples. Eighteen SVOCs were detected at significant concentrations with respect to background concentrations in at least one of the samples. Of these SVOCs, acetophenone, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, phenanthrene, and phenol were detected at significant concentrations in all three of the samples. One PCB was detected at a significant concentration with respect to the background concentration in one sample. Finally, DRO, RRO, GRO, ethylbenze, m-&p-xylene, and o-xylene were detected at significant concentrations with respect to background concentrations in the single covered sandblasting area sample analyzed for these parameters.

6.1.1.7 Solvent Storage Area

One surface soil sample (SD19SS) was collected from soils adjacent to the solvent storage area. The sample was collected from an area of soil staining and had a petroleum-like odor. The sample was submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, PCBs, DRO, RRO, GRO, and BTEX.

TBT was detected at a significant concentration with respect to the background concentration. Four TAL metals were detected at significant concentrations with respect to background concentrations. Three SVOCs were detected at significant concentration with respect to background concentrations. No PCBs were detected in the sample. Finally, DRO, RRO, GRO, ethylbenze, m-&p-xylene, and o-xylene were detected at significant concentrations with respect to background concentrations in the solvent storage area sample.

6.1.1.8 Outdoor Sandblasting Area

Three surface soil samples (SD04SS through SD06SS) were collected from the outdoor sandblasting area. Sample SD04SS was collected from northeastern portion of the outdoor sandblasting area; sample SD05SS was collected from the central portion of the outdoor sandblasting area; and sample SD06SS was collected from the southwestern portion of the sandblasting area. The samples were submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs. Additionally, sample SD06SS was submitted for off-site fixed laboratory analysis for DRO, RRO, GRO, and BTEX.

TBT was detected at significant concentrations with respect to background concentrations in all three of the samples. Nine TAL metals were detected at significant concentrations with respect to background concentrations. Of these TAL metals, copper, silver, thallium, and zinc were detected at significant concentrations in all three of the samples. Thirteen SVOCs were detected at significant concentrations with respect to background concentrations. Of these SVOCs, acetphenone, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, fluoranthene, phenanthrene, and pyrene were detected at significant concentrations in all three of the samples. One PCB was detected at a significant concentration with respect to the background concentration in one sample. Finally, DRO, RRO, GRO, ethylbenze, m-&p-xylene, and o-xylene were detected at significant concentrations with respect to background concentrations in the single outdoor sandblasting area sample analyzed for these parameters.

6.1.1.9 Maintenance Shed Area

One surface soil sample (SD15SS) was collected from an area adjacent to the maintenance shed. The sample was collected from an area of obvious soil staining. The sample had a distinct petroleum-like odor. The sample was submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, PCBs, DRO, RRO, GRO, and BTEX.

TBT was detected at a significant concentration with respect to the background concentration. Two TAL metals were detected at significant concentrations with respect to background concentrations. Three SVOCs were detected at significant concentrations with respect to background concentrations. No PCBs were detected in the maintenance shed area. Finally, DRO, RRO, m-&p-xylene, and o-xylene were detected at significant concentrations with respect to background concentrations in the maintenance shed area sample. GRO was not detected in the sample.

6.1.1.10 East Gate Area

One surface soil sample (SD11SS) was collected near the east gate of the property. It has been reported that during the winter months, the gates are opened and the work areas are graded and snow is pushed out of the gate. Additionally, one surface soil sample (SD18SS) was collected from outside the fence line at the east gate. The samples were submitted for off-site fixed laboratory analysis for TBT, TAL metals, SVOCs, and PCBs.

TBT was detected at significant concentrations with respect to background concentration in both samples. Three TAL metals were detected at significant concentrations with respect to background concentrations in at least one sample. Of these TAL metals, copper was detected in both samples. One SVOC was detected in one sample. No PCBs were detected in the samples collected from the east gate area.

Note: This page intentionally left blank.

Table 6-1 Source Surface Soil Samples Analytical Results Summary

EPA Sample ID	07234019	07234009	07234015	07234016	07234006	07234007	07234008	07234000	07234001	07234002
CLP Sample ID	J8781	J8770	J8776	J8777	J8767	J8768	J8769	J8762	J8763	J8764
Station Location	BG01SS	SD10SS	SD16SS	SD17SS	SD07SS	SD08SS	SD09SS	SD01SS	SD02SS	SD03SS
Description	Background	Pullout Dock	South Gate	Southwest Corner	Transfer Pit			Stockpile		
Tributyltin (µg/kg)										
Tributyltin	1.39 U	**30900 JL**	**174**	**911**	**483**	**4920**	**2210 JH**	**375**	**353**	**401 JH**
Target Analyte List Metals (mg/kg)										
Aluminum	**13700**	**10100**	**10700 JL**	**10400 JL**	**17000**	**15500**	**18300**	**10500**	**12900**	**28100**
Arsenic	**9.8 JL**	**5.7 JL**	**4.8**	**6.3**	**13.2 JL**	**13.2 JL**	**15.0 JL**	**6.4 JL**	**7.7 JL**	**24.7 JL**
Barium	**218**	**67.4**	**54.9 JL**	**89.5 JL**	**304**	**421**	**455**	**58.0**	**80.1**	**894**
Cadmium	0.53 U	0.52 U	0.52 U	0.53 U	0.46 JQ	0.40 JQ	**0.73**	0.53 U	0.53 U	0.45 JQ
Calcium	**3540**	**8730**	**6460 JL**	**8990 JL**	**41100**	**41600**	**48900**	**7990**	**12700**	**101000**
Chromium	**34.8**	**29.9**	**30.5 JL**	**29.6 JL**	**41.6**	**59.2**	**63.1**	**27.2**	**38.1**	**62.3**
Cobalt	**12.9**	**9.2**	**10.3**	**10.5**	**21.3**	**21.8**	**25.1**	**8.9**	**11.3**	**41.1**
Copper	**28.7**	**952**	**313**	**321**	**1730**	**1900**	**1560**	**399**	**724**	**3690**
Iron	**21700**	**24000**	**24700 JL**	**26000 JL**	**56800**	**72800**	**67800**	**25100**	**31500**	**127000**
Lead	**6.2 JL**	**9.6 JL**	**5.4**	**7.8**	**10.3 JL**	**26.9 JL**	**31.4 JL**	**10.0 JL**	**6.7 JL**	**17.1 JL**
Magnesium	**8010**	**7240**	**8210 JL**	**7290 JL**	**11100**	**10300**	**12200**	**6890**	**8810**	**16600**
Manganese	**501**	**434**	**415 JL**	**475 JL**	**1120**	**1380**	**1310**	**413**	**546**	**2180**
Mercury	0.11 U	0.10 U	0.10 U	0.11 U	0.046 JQ	0.021 JQ	0.10 U	0.016 JQ	0.021 JQ	0.10 U
Nickel	**22.8**	**19.7**	**19.9 JL**	**22.9 JL**	**26.7**	**30.4**	**42.5**	**20.7**	**25.6**	**43.2**
Potassium	**5250**	**1290**	**1290 JL**	**726 JL**	**2120**	**1840**	**2260**	**651**	**877**	**3350**
Silver	0.58 JQ (1.06 SQL)	**1.1**	0.97 JQ	**1.3**	**2.0**	**3.1**	**2.5**	**1.2**	**1.4**	**3.3**
Sodium	358 JQ	**859**	**586**	**804**	**1640**	**3430**	**2430**	**721**	**1010**	**4910**
Thallium	1.3 JQ (2.66 SQL)	**2.6**	2.2 JQ	2.6 JQ	**5.7**	**7.1**	**6.1**	2.6 JQ	**3.3**	**8.0**
Vanadium	**49.3**	**31.2**	**33.2 JL**	**28.2 JL**	**54.9**	**55.5**	**58.2**	**25.1**	**33.6**	**90.2**
Zinc	**59.6**	**274**	**163 JL**	**267 JL**	**467**	**1220**	**760**	**221**	**306**	**1610**
Semivolatile Organic Compounds (µg/kg)										
2-Methylphenol	230 U	180 U	240 U	220 U	170 U	230 U	170 U	190 U	180 U	**280**
Acenaphthene	230 U	70 JQ	240 U	220 U	43 JQ	**320**	68 JQ	190 U	180 U	160 JQ
Acetophenone	230 U	**320**	**280**	**240**	**490**	**1500**	**220**	190 U	180 U	**820**
Anthracene	230 U	180 U	240 U	220 U	69 JQ	**510**	110 JQ	190 U	180 U	**210**
Benzo(a)anthracene	230 U	**250**	71 JQ	48 JQ	**280**	**1300**	**460**	190 U	180 U	**1100**
Benzo(a)pyrene	230 U	180 U	240 U	220 U	**300**	**1400**	**520**	190 U	180 U	**1400**
Benzo(b)fluoranthene	230 U	**340**	240 U	220 U	170 U	**2200**	**810**	190 U	180 U	**2800**
Benzo(g,h,i)perylene	230 U	150 JQ	63 JQ	220 U	**250**	**1200**	**440**	190 U	180 U	**1300**
Benzo(k)fluoranthene	230 U	130 JQ	240 U	220 U	**610**	**680**	**300**	190 U	180 U	**640**
Bis(2-ethylhexyl)phthalate	230 U	**630**	**280**	**560**	**1100**	**2700**	**810**	**350**	**410**	**8300**
Butylbenzylphthalate	230 U	180 U	240 U	220 U	170 U	230 U	170 U	190 U	180 U	**240**
Carbazole	230 U	180 U	240 U	220 U	83 JQ	**470**	83 JQ	190 U	180 U	**500**
Chrysene	230 U	**270**	82 JQ	64 JQ	**330**	**1600**	**560**	190 U	180 U	**1600**
Dibenzo(a,h)anthracene	230 U	180 UJK	240 UJK	220 UJK	170 UJK	**300**	**180 JL**	190 UJK	180 UJK	**360**

Table 6-1 Source Surface Soil Samples Analytical Results Summary

EPA Sample ID	07234019	07234009	07234015	07234016	07234006	07234007	07234008	07234000	07234001	07234002
CLP Sample ID	J8781	J8770	J8776	J8777	J8767	J8768	J8769	J8762	J8763	J8764
Station Location	BG01SS	SD10SS	SD16SS	SD17SS	SD07SS	SD08SS	SD09SS	SD01SS	SD02SS	SD03SS
Description	Background	Pullout Dock	South Gate	Southwest Corner	Transfer Pit			Stockpile		
Dibenzofuran	230 U	180 U	240 U	220 U	170 U	**240**	50 JQ	190 U	180 U	120 JQ
Di-n-octylphthalate	230 U	180 UJK	240 UJK	220 UJK	170 UJK	230 UJK	170 UJK	190 UJK	180 UJK	**890**
Fluoranthene	230 U	**500**	200 JQ	140 JQ	**770**	**4500**	**1200**	190 U	88 JQ	**4300**
Fluorene	230 U	38 JQ	240 U	220 U	56 JQ	**420**	79 JQ	190 U	180 U	**210**
Indeno(1,2,3-cd)pyrene	230 U	130 JQ	51 JQ	220 U	**210**	**980**	**380**	190 U	180 U	**990**
Naphthalene	230 U	180 U	240 U	220 U	170 U	110 JQ	170 U	190 U	180 U	130 JQ
Phenanthrene	230 U	**300**	170 JQ	74 JQ	**550**	**3600**	**780**	190 U	53 JQ	**2500**
Phenol	230 U	**240**	240 U	220 U	170 U	230 U	170 U	190 U	180 U	180 U
Pyrene	230 U	**370**	150 JQ	100 JQ	**560**	**3000**	**890**	190 U	180 U	**2600**
Polychlorinated Biphenyls (µg/kg)										
Aroclor-1254	46 U	34 U	47 U	43 U	34 U	**90**	33 U	37 U	**1500**	33 JQ
Diesel Range Organics (mg/kg)										
DRO	3.52 JQ (21.3 SQL)	NA	NA	NA	NA	**487**	NA	NA	NA	**346**
Residual Range Organics (mg/kg)										
RRO	53.2 U	NA	NA	NA	NA	**3010**	NA	NA	NA	**761**
Gasoline Range Organics (mg/kg)										
GRO	1.74 U	NA	NA	NA	NA	**5.91**	NA	NA	NA	**11.0**
Benzene, Toluene, Ethylbenzene, Total Xylenes (µg/kg)										
	17.4 U	NA	NA	NA	NA	**103**	NA	NA	NA	**178**
M- & p-Xylene	17.4 U	NA	NA	NA	NA	**563**	NA	NA	NA	**1190**
o-Xylene	17.4 U	NA	NA	NA	NA	**588**	NA	NA	NA	**1150**

Table 6-1 Source Surface Soil Samples A

EPA Sample ID	07234019	07234011	07234012	07234013	07234024	07234003	07234004	07234005	07234014	07234010	07234017
CLP Sample ID	J8781	J8772	J8773	J8774	J8786	J8764	J8765	J8766	J8775	J8771	J8778
Station Location	BG01SS	SD12SS	SD13SS	SD14SS	SD19SS	SD04SS	SD05SS	SD06SS	SD15SS	SD11SS	SD18SS
Description	Background	Covered Sandblasting Area			Solvent Storage	Outdoor Sandblasting Area			Maintenance Shed	East Gate Area	
Tributyltin (µg/kg)											
Tributyltin	1.39 U	**1290**	**5640**	**12200**	**640**	**841 JH**	**12500**	**584**	**938 JK**	**653**	**3040**
Target Analyte List Metals (mg/kg)											
Aluminum	**13700**	**10500**	**22800 JL**	**24900 JL**	**11200 JL**	**22100**	**17900**	**26200**	**8300 JL**	**9640**	**12000 JL**
Arsenic	**9.8 JL**	**9.1 JL**	**19.2**	**26.1**	**7.1**	**19.1 JL**	**17.8 JL**	**24.8 JL**	**6.0**	**5.1 JL**	**6.6**
Barium	**218**	**466**	**696 JL**	**665 JL**	**214 JL**	**699**	**516**	**1330**	**58.0 JL**	**33.8**	**67.0 JL**
Cadmium	0.53 U	**0.61**	0.46 JQ	**0.71**	0.27 JQ	0.40 JQ	0.29 JQ	0.45 JQ	0.20 JQ	0.53 U	0.54 U
Calcium	**3540**	**28900**	**67600 JL**	**72000 JL**	**13000 JL**	**65100**	**49400**	**74900**	**8820 JL**	**4340**	**12300 JL**
Chromium	**34.8**	**56.1**	**62.0 JL**	**68.0 JL**	**37.9 JL**	**65.8**	**39.5**	**63.1**	**22.4 JL**	**26.2**	**29.9 JL**
Cobalt	**12.9**	**19.5**	**32.0**	**40.2**	**11.9**	**34.4**	**24.3**	**40.2**	**7.7**	**8.1**	**10.6**
Copper	**28.7**	**4190**	**5060**	**9060**	**2270**	**8150**	**9390**	**3030**	**299**	**364**	**462**
Iron	**21700**	**46600**	**84600 JL**	**118000 JL**	**29400 JL**	**90100**	**66300**	**143000**	**21500 JL**	**20400**	**29000 JL**
Lead	**6.2 JL**	**10.5 JL**	**12.3**	**161**	**74.5**	**16.1 JL**	**14.9 JL**	**12.3 JL**	**10.1**	**8.1 JL**	**15.0**
Magnesium	**8010**	**7100**	**14100 JL**	**15200 JL**	**7900 JL**	**14100**	**11200**	**15200**	**5850 JL**	**6790**	**8580 JL**
Manganese	**501**	**809**	**1750 JL**	**1900 JL**	**550 JL**	**1700**	**1290**	**2080**	**383 JL**	**350**	**540 JL**
Mercury	0.11 U	0.11 U	0.10 U	0.026 JQ	0.11 U	**0.25**	0.11 U	0.10 U	0.11 U	0.11 U	0.11 U
Nickel	**22.8**	**186**	**33.2 JL**	**43.8 JL**	**26.2 JL**	**43.5**	**28.7**	**117**	**18.8 JL**	**19.8**	**20.4 JL**
Potassium	**5250**	**1160**	**2640 JL**	**2950**	**888 JL**	**2890**	**2180**	**3280**	**608 JL**	**846**	**1540**
Silver	0.58 JQ (1.06 SQL)	**2.4**	**2.8**	**2.9**	**1.9**	**3.0**	**2.7**	**3.8**	1.0 JQ	1.0 JQ	**1.1**
Sodium	358 JQ	**3520**	**6430**	**4310**	**2070**	**5410**	**4330**	**2930**	**694**	**712**	**598**
Thallium	1.3 JQ (2.66 SQL)	**5.4**	**4.6**	**5.6**	2.7 JQ	**7.5**	**7.0**	**9.1**	1.8 JQ	1.9 JQ	2.1 JQ
Vanadium	**49.3**	**33.3**	**73.9 JL**	**79.9 JL**	**30.4 JL**	**71.2**	**57.9**	**81.2**	**23.7 JL**	**25.5**	**37.1 JL**
Zinc	**59.6**	**1330**	**2410 JL**	**1410 JL**	**815 JL**	**1890**	**1510**	**808**	**209 JL**	**225**	**140 JL**
Semivolatile Organic Compounds (µg/kg)											
2-Methylphenol	230 U	230 U	220 U	220 U	180 U	**450**	180 U	180 U	240 U	220 U	230 U
Acenaphthene	230 U	230 U	**260**	**310**	180 U	190 U	130 JQ	45 JQ	240 U	220 U	230 U
Acetophenone	230 U	**2000**	**1200**	**2000**	**190**	**870**	**2600**	**1200**	**510**	130 JQ	**540**
Anthracene	230 U	66 JQ	**440**	**830**	180 U	190 U	180 U	180 U	240 U	220 U	230 U
Benzo(a)anthracene	230 U	**320**	**1600**	**3500**	65 JQ	160 JQ	**270**	**200**	240 U	220 U	56 JQ
Benzo(a)pyrene	230 U	**330**	**1700**	**2600**	69 JQ	160 JQ	**260**	180 U	240 U	220 U	230 U
Benzo(b)fluoranthene	230 U	**520**	**2700**	**5900**	100 JQ	190 U	180 U	180 U	240 U	220 U	230 U
Benzo(g,h,i)perylene	230 U	**240**	**1200**	**1500**	60 JQ	120 JQ	170 JQ	**230**	240 U	220 U	230 U
Benzo(k)fluoranthene	230 U	200 JQ	**700**	**1200**	67 JQ	**330**	**490**	**460**	240 U	220 U	230 U
Bis(2-ethylhexyl)phthalate	230 U	**2100**	2200 U	**1700**	**5900**	**1800**	**930**	**650**	**540**	210 JQ	220 JQ
Butylbenzylphthalate	230 U	230 U	220 U	220 U	**800**	190 U	180 U	180 U	240 U	220 U	230 U
Carbazole	230 U	54 JQ	**370**	**700**	180 U	53 JQ	73 JQ	58 JQ	240 U	220 U	230 U
Chrysene	230 U	**450**	**1700**	**3300**	86 JQ	180 JQ	**270**	**260**	240 U	220 U	74 JQ
Dibenzo(a,h)anthracene	230 U	230 UJK	**310 JL**	**430**	180 U	190 UJK	180 U	180 UJK	240 UJK	220 UJK	230 UJK

Table 6-1 Source Surface Soil Samples A

EPA Sample ID	07234019	07234011	07234012	07234013	07234024	07234003	07234004	07234005	07234014	07234010	07234017
CLP Sample ID	J8781	J8772	J8773	J8774	J8786	J8764	J8765	J8766	J8775	J8771	J8778
Station Location	BG01SS	SD12SS	SD13SS	SD14SS	SD19SS	SD04SS	SD05SS	SD06SS	SD15SS	SD11SS	SD18SS
Description	Background	Covered Sandblasting Area			Solvent Storage	Outdoor Sandblasting Area			Maintenance Shed	East Gate Area	
Dibenzofuran	230 U	230 U	180 JQ	200 JQ	180 U	190 U	90 JQ	180 U	240 U	220 U	230 U
Di-n-octylphthalate	230 U	230 UJK	220 UJK	220 UJK	**1500 JH**	190 UJK	180 UJK	**250 JL**	240 UJK	220 UJK	230 UJK
Fluoranthene	230 U	**750**	**4600**	**8200**	**180**	**520**	**650**	**480**	240 U	70 JQ	120 JQ
Fluorene	230 U	230 U	**320**	**390**	180 U	47 JQ	110 JQ	41 JQ	240 U	220 U	230 U
Indeno(1,2,3-cd)pyrene	230 U	210 JQ	**1000**	**1300**	72 JQ	98 JQ	150 JQ	150 JQ	240 U	220 U	230 U
Naphthalene	230 U	230 U	**540**	**510**	27 JQ	96 JQ	140 JQ	180 U	240 U	220 U	230 U
Phenanthrene	230 U	**340**	**2900**	**3900**	150 JQ	**490**	**580**	**310**	**250**	55 JQ	76 JQ
Phenol	230 U	**380**	**300**	**340**	180 U	190 U	**490**	**210**	240 U	220 U	230 U
Pyrene	230 U	**620**	**3800**	1100 U	140 JQ	**360**	**480**	**390**	240 U	57 JQ	100 JQ
Polychlorinated Biphenyls (µg/kg)											
Aroclor-1254	46 U	44 U	43 U	**58**	34 U	**40**	**310**	34 U	47 U	44 U	44 U
Diesel Range Organics (mg/kg)											
DRO	3.52 JQ (21.3 SQL)	NA	**546 JH**	NA	**445**	NA	NA	**238**	**1010**	NA	NA
Residual Range Organics (mg/kg)											
RRO	53.2 U	NA	**1690 JH**	NA	**774**	NA	NA	**1130**	**881**	NA	NA
Gasoline Range Organics (mg/kg)											
GRO	1.74 U	NA	**8.06 JH**	NA	**30.4**	NA	NA	**11.5**	0.663 JQ	NA	NA
Benzene, Toluene, Ethylbenzene, Total Xylene											
	17.4 U	NA	**174 JK**	NA	**718**	NA	NA	**240**	6.32 JQ	NA	NA
M- & p-Xylene	17.4 U	NA	**1010 JK**	NA	**4010**	NA	NA	**1310**	**26.9**	NA	NA
o-Xylene	17.4 U	NA	**793 JK**	NA	**2740**	NA	NA	**1120**	**29.1**	NA	NA

Note: Bold type indicates the sample result is above the instrument detection limit.
Underline type indicates the sample result is significant as defined in Section 5.

Key:
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
H = High bias.
ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
L = Low bias.
mg/kg = milligrams per kilogram.
µg/kg = micrograms per kilogram.
Q = The sample result is estimated because the concentration is below the contract required quantitation limit.
SQL = Sample Quantitation Limit.
U = Unknown bias.

7 Migration/Exposure Pathways and Targets

The following subsections describe migration pathways and potential targets within the site's range of influence. These pathways are graphically depicted in Figures 7-1 and 7-2. This section discusses the groundwater migration pathway, the surface water migration pathway, the soil exposure pathway, and the air migration pathway.

7.1 Ground Water Migration Pathway

The target distance limit (TDL) for the groundwater migration pathway is a 4-mile radius that extends from the sources at the site. Figure 7-1 depicts the groundwater 4-mile TDL.

The mean annual precipitation for Seward, Alaska, is 68.42 inches (WRCC 2007). The potential evapotranspiration for Seward, Alaska, is 19.88 inches (Patric and Black 1968). Therefore, a net mean annual precipitation for Seward, Alaska is 48.54 inches.

7.1.1 Geologic Setting

The surface geology of the Seward, Alaska, area is predominantly comprised of unconsolidated Quaternary surficial deposits. These deposits are chiefly of glaciofluvial origin. Bedrock exposed in the Seward area has only recently been exhumed from beneath glacial ice; thus, unconsolidated deposits have had little time to form. Bedrock in the vicinity has been mapped as late Cretaceous Age and includes metasedimentary rocks of the Valdez Group. The bedrock comprises dark gray, thin to thick bedded sandstone, siltstone, and mudstone flysch. The mineralogy of the sandstone consists of plagioclase feldspar, quartz, and up to 40% igneous rock fragments. Conglomeratic sandstone with well-rounded cobbles and pebbles of felsic porphyry is observed at the base of some sandstone beds. The bedrock has been metamorphosed largely to the chlorite zone of the greenschist facies (Tysdal and Case 1979).

7.1.2 Aquifer System

Data from wells logs within the groundwater TDL indicate the initial 65 feet bgs is composed mostly of silty gravel (E & E 2002). Based on this lithology, the START assumes groundwater occurs at depths as shallow as 3 feet bgs, and soil layers yield a hydraulic conductivity of 10^{-4} centimeters per second (E & E 2002). Resurrection Bay is located immediately adjacent to the site and may act as an aquitard to groundwater targets across the bay.

7.1.3 Drinking Water Targets

A total of 48 groundwater wells are located within the TDL. All of these wells are located across Resurrection Bay from the site; therefore, they are outside the influence of the site and are not discussed in detail in this report. It is assumed that groundwater can be used for drinking water. The site is not located in a wellhead protection area.

7.2 Surface Water Migration Pathway

The surface water migration pathway TDL begins at the probable point of entry (PPE) of surface water runoff from the site to a surface water body and extends downstream for 15 miles. Figure 7-2 depicts the surface water migration 15-mile TDL.

The 2-year, 24-hour probable maximum rainfall for the Seward, Alaska, area is 5 inches (Miller 1963). As previously mentioned, the net mean annual precipitation for Seward, Alaska, is 68.42 inches (WRCC 2007). Based on the lack of topographic relief at the site, the START does not expect any upgradient drainage area; therefore, the upland drainage area is the site itself, which is approximately 9.25 acres (Hanson 2007).

Soils at the site are classified as Humic Cryothods, which fall under the order of Spodosols. In Spodosols, organic carbon, aluminum, and, in most places, iron have been leached by percolating water from the upper part of the soil, and have been deposited or precipitated at a greater depth to form the spodic horizon. Humic Cryorthods have large accumulations of organic material in at least the upper part of the spodic horizon and many of the soils were formed in gravelly glacial moraine material. A typical profile is as follows: 0.5 to 4 inches of forest litter, 0 to 4 inches of silt loam, 19 to 26 inches gravelly silt loam, 17 to 20 inches gravelly loam, and 20 to 32 inches of gravelly sandy loam. (Reiger, et al. 1979)

The area of flooding at the site is undetermined, but a possible flood hazard exists (FEMA 1988). Alaskan Communities Flood Hazard Data indicates floods in Seward, Alaska, have occurred in 1962, 1982, and 1986. Based on this information, the START assumes the site is in a 50-year flood plain (USACE 1993).

7.2.1 Overland Route

The SSDD site has two PPEs. The site has minimal topographic relief, and no distinct surface water runoff route drains the site. It is assumed that during heavy rains and during snow melt, water will likely flow west into Resurrection Bay (PPE 1; Figure 7-2). Snow is also pushed out of the eastern gate near a man-made ditch. The ditch flows approximately 50 feet before it enters a ponded area. The ponded area flows to an unnamed stream, which flows for approximately 900 feet to the confluence with Resurrection Bay. The 15-mile TDL concludes in a radial arc in Resurrection Bay. Resurrection Bay is a glacial fjord with water depths greater than 200 feet (Christian, et al. 2001).

7.2.1.1 Sample Locations

One sediment sample (OP01SD) was collected from the drainage ditch that flows overland to Resurrection Bay (Figure 3-1).

7.2.1.2 Sample Results

Fixed laboratory analytical results for the overland pathway sample are presented in Table 7-1. Field screening results are presented in Appendix E. TBT was detected at an elevated concentration with respect to the background concentration. One TAL metal (copper) was detected at an elevated concentration with respect to the background concentration. One SVOC [bis(2-ethylhexyl)phthalate] was detected at an elevated concentration with respect to the background concentration. DRO and RRO were detected at elevated concentrations with respect to background concentrations. No PCBs, GRO, or BTEX were detected in the overland pathway sample.

7.2.2 Drinking Water Targets

Surface water is not used for drinking water in the Seward area (ACDED 2007). Additionally, because surface water within the TDL consists only of salt water, the START assumes surface water within the TDL is not used for the irrigation of greater than 5 acres of commercial food or forage crops, watering of commercial livestock, as an ingredient in commercial food preparation, as a supply for commercial aquaculture, or as a supply for a major or designated water recreation area.

7.2.3 Human Food Chain Targets

Both sport and commercial fishing are popular in Resurrection Bay. Fishing was observed occurring at the dock/park adjacent to the SSDD facility. The nearest fishing location is adjacent to the site on Resurrection Bay. The Alaska Department of Fish and Game (ADF&G) tabulates sport fish harvest for the State of Alaska. Sport catch data for Resurrection Bay are provided in Table 7-2.

ADF&G also regulates the commercial fish harvest of salmon, groundfish, herring, and shellfish. No herring or shellfish were harvested commercially within the site's TDL. Commercial groundfish harvests are reported for four statistical areas: 496002, 495931, 495932, and 495938 (E & E 2002). The START estimates the following percentages of those statistical areas fall within the site's 15-mile TDL: 496002 – 100%; 495931 – 5%; 495932 – 20%; and 495938 – 70%. The START has calculated the corresponding percentage of salmon and groundfish harvested for each statistical area. The sums for each species are presented in Table 7-2.

Commercial harvest of halibut is regulated by the International Pacific Halibut Commission (IPHC), and, like ADF&G, IPHC tracks harvest data by statistical areas. The halibut statistical area corresponding with the surface water TDL is statistical area 250 (Kong 2007). The START estimates that 3% of IPHC statistical area 250 falls within the surface water TDL. Therefore, the START has estimated that 3% of the halibut harvest occurs within the TDL. Pounds of Pacific halibut harvested are presented in Table 7-2.

7.2.4 Environmental Targets

The United States Fish and Wildlife Service (USFWS) manage terrestrial threatened and endangered species in the United States. There are no Federal-listed terrestrial threatened or endangered species known to occur within the surface water TDL (E & E 2002). The National Oceanic and Atmospheric Administration Fisheries manage all marine threatened and endangered species in the United States. Of those species, the humpback whale (*Megaptera novaengliae*) and the Stellar sea lion (*Eumetopia jubatus*) are known to occur within Resurrection Bay on a migratory basis (E & E 2002). Both are Federal-listed endangered species.

From National Wetland Inventory maps, it is estimated that 1.5 miles of wetland frontage occurs along the 15-mile surface water TDL (Hanson 2007). All wetlands occur on Resurrection Bay.

7.2.5 Surface Water Migration Pathway Samples

7.2.5.1 Sample Locations

Three samples (RB01SD through RB03SD) were collected from the banks of Resurrection Bay (Figure 3-1). All three of the samples were collected from the intertidal zone. Sample RB01SD was collected adjacent to the pullout dock. Sample RB02SD was collected near the public parking area. Sample RB03SD was collected near the unnamed stream that enters Resurrection Bay.

7.2.5.2 Sample Results

Fixed laboratory analytical results for the Resurrection Bay sediment samples are presented in Table 7-1. Field screening results are presented in Appendix E. No TBT, TAL metals, SVOCs, PCBs, DRO, RRO, GRO, or BTEX were detected at elevated concentrations with respect to background concentrations in any of the samples collected from Resurrection Bay.

7.3 Soil Exposure Pathway

The soil exposure pathway is evaluated based on the threat to residents and workers and nearby populations from soil contamination within the first two feet of the surface.

7.3.1 Site Setting and Exposed Sources

Exposed contaminated soil is present at the site and within 200 feet of workers. The site is fenced with no recreational use. The area of contamination present at the site is approximately 402,930 square feet (see sources section above).

7.3.2 Targets

There are 60 employees at the SSDD. There are no residences or daycares at the SSDD or within 200 feet of the contamination. There are approximately 593 people residing within a 1-mile travel distance of the site. Population by distance ring is presented in Table 7-3.

No resources such as commercial agriculture, silviculture, or livestock production occur on an area of contamination at the site. No terrestrial sensitive environments are present on an area of contamination at the site.

7.3.2.1 Sample Locations

Surface soil samples were collected at the site. Please refer to Section 6 of this document for information regarding these samples.

7.4 Air Migration Pathway

The air migration pathway TDL is a 4-mile radius that extends from the sources at the site (Figure 7-1). As discussed in the previous investigations section (Subsection 2.5.1), citizen complaints have been filed with ADEC regarding the releases of sandblast grit from the site.

7.4.1 Human Targets

There are 2,790 people residing within the 4-mile TDL. As noted, there are approximately 60 workers present at the site, and, as the number of workers at the nearby businesses was not reported, the START conservatively assumes between 30 and 100 workers are present at these facilities, which are located from 0 to 0.25 mile of the site. The nearby Spring Creek Correctional Facility which is located approximately 0.6 mile northeast of the site, employs 200 workers and houses up to 500 prisoners. Four schools (Seward Elementary School, Seward High School, Seward Middle School, and Spring Creek School) are present within the TDL. All the schools are located between 3 to 4 miles from the site. The number of students and teachers for the schools totals 727 people (ADCED 2007). Population, including workers and students, by distance ring is presented in Table 7-3.

7.4.2 Environmental Targets

The Federal-listed endangered humpback whale (*Megaptera novaengliae*) and the Stellar sea lion (*Eumetopia jubatus*) are known to occur within Resurrection Bay on a migratory basis (E & E 2002). These targets are assumed to be located between 1 and 2 miles of the site.

Approximately 678.58 acres of wetlands are present within the 4-mile TDL. Wetland acreage by distance ring is presented in Table 7-4.

Table 7-1 Sediment Samples Analytical Results Summary

EPA Sample ID	07234023	07234018	07234020	07234021	07234022
CLP Sample ID	J8781	J8780	J8782	J8783	J8784
Station Location	BG01SD	OP01SD	RB01SD	RB02SD	RB03SD
Description	Background	Overland Pathway	Resurrection Bay		
Tributyltin (µg/kg)					
Tributyltin	1.76 U	**125**	1.36 U	1.49 U	1.69 U
Target Analyte List Metals (mg/kg)					
Aluminum	**10900 JL**	**10500 JL**	**9140 JL**	**6710 JL**	**11100 JL**
Arsenic	**13.6**	**7.6**	**4.5**	**3.3**	**4.2**
Barium	**41.1 JL**	**37.5 JL**	20.6 JQ	15.4 JQ	20.8 JQ
Calcium	**3310 JL**	**2510 JL**	**2310 JL**	**1710 JL**	**2590 JL**
Chromium	**27.1 JL**	**28.4 JL**	**23.6 JL**	**15.6 JL**	**27.0 JL**
Cobalt	**10.6**	**12.3**	**8.1**	**6.1**	**9.3**
Copper	**42.2**	**279**	**25.5**	**17.9**	**23.4**
Iron	**22000 JL**	**28800 JL**	**18300 JL**	**13900 JL**	**22600 JL**
Lead	**7.0**	**14.0**	**3.3**	**2.0**	**2.5**
Magnesium	**7000 JL**	**7250 JL**	**7180 JL**	**5350 JL**	**8850 JL**
Manganese	**353 JL**	**439 JL**	**327 JL**	**235 JL**	**372 JL**
Nickel	**24.9 JL**	**22.6 JL**	**16.0 JL**	**11.8 JL**	**18.4 JL**
Potassium	**1790 JL**	**1060**	**1350**	**1000 JL**	**1400**
Sodium	515 JQ	**620**	359 JQ	448 JQ	570 JQ
Vanadium	**33.6 JL**	**35.4 JL**	**31.5 JL**	**21.8 JL**	**36.9 JL**
Zinc	**62.8 JL**	**172 JL**	**40.1 JL**	**31.3 JL**	**64.4 JL**
Semivolatile Organic Compounds (µg/kg)					
Bis(2-ethylhexyl)phthalate	70 JQ	**470**	61 JQ	54 JQ	75 JQ
Diesel Range Organics (mg/kg)					
DRO	11.6 JQ	**355**	NA	NA	25.1 U
Residual Range Organics (mg/kg)					
RRO	17.4 JQ	**817**	NA	NA	12.0 JQ

Note: Bold type indicates the sample result is above the instrument detection limit.

Underline type indicates the sample result is significant as defined in Section 5.

Key

CLP = Contract Laboratory Program

EPA = United States Environmental Protection Agency

H = High bias

ID = Identification

J = The analyte was positively identified. The associated numerical result is an estimate.

L = Low bias

mg/kg = milligrams per kilogram

µg/kg = micrograms per kilogram

Q = The sample result is estimated because the concentration is below the contract required quantitation limit.

SQL = Sample Quantitation Limit

U = Unknown bias

Table 7-2 Fish Harvest Data for Resurrection Bay

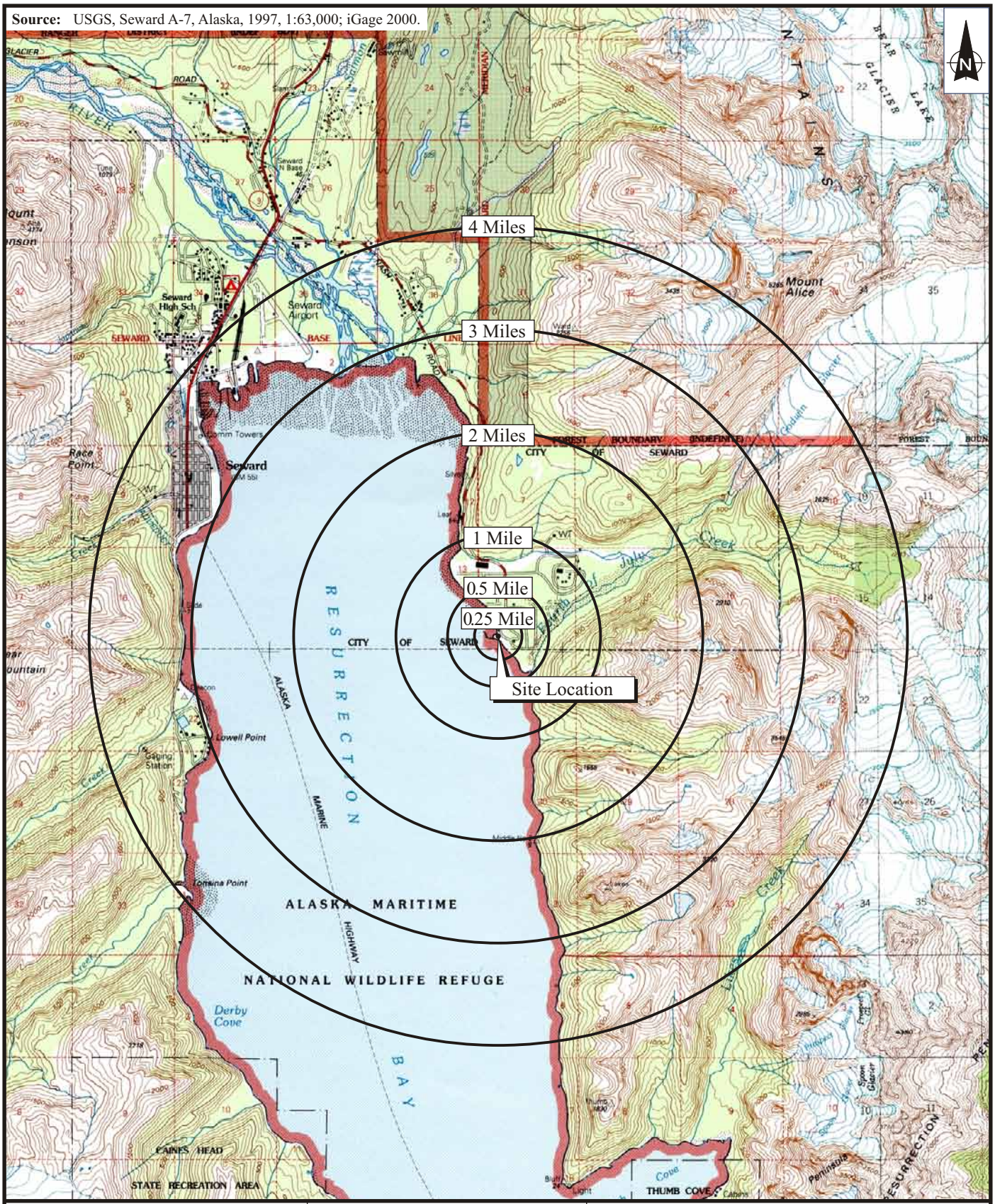
Species	Number Harvested	Average Pound per Fish	Pounds Harvested
Sport Catch			
Chinook salmon (*Oncorhynchus tshawytscha*)	2,161	15	32,415
Coho salmon (*Oncorhynchus kisutch*)	109,559	10	1,095,590
Sockeye salmon (*Oncorhynchus nerka*)	4,922	5	24,610
Pink salmon (*Oncorhynchus gorbuscha*)	5,637	10	56,370
Chum salmon (*Oncorhynchus keta*)	1,178	8	9,424
Dolly varden (*Salvelinus malma*)	146	4	584
Rock fish (*Sebastes spp.*)	22,970	3	68,910
Lingcod (*Ophodon elongates*)	2,405	4	9,620
Steelhead trout (*Oncorhynchus mykiss*)	163	8	1,304
Pacific halibut (*Hippoglasus stenolepis*)	28,160	18	506,880
Shark, including salmon shark (*Lamna ditropis*), Pacific sleeper shark (*Somniosus pacificus*), and spiny dogfish (*Squalus acanthias*)	237	20	4,740
Other finfish (species not specified)	1,139	2[a]	2,278
Commercial Harvest			
Coho salmon (*Oncorhynchus kisutch*)	6,306	10	63,060
Sockeye salmon (*Oncorhynchus nerka*)	56,951	5	284,755
Pink salmon (*Oncorhynchus gorbuscha*)	13,500	10	135,000
Chum salmon (*Oncorhynchis keta*)	385	8	3,080
Pacific halibut (*Hippoglasus stenolepis*)	NA	NA	109,898
Total			**2,408,518**

Source: ADF&G 2006; E & E 2002; Hammarstrom and Dickson 2006.

Table 7-3 Population and Wetland Acreage by Distance Ring

Distance Ring	Population	Wetland Acreage
0n-Site	60 workers	0
0 to 0.25 mile	1 resident 30 workers	10.81
0.25 to 0.5 mile	1 resident	32.17
0.5 to 1 mile	501 residents 200 workers	23.89
1 to 2 miles	481 residents	45.85
2 to 3 miles	78 residents	78.37
3 to 4 miles	1,698 residents 727 students/workers	487.5
TOTAL	**3,777**	**678.58**

Source: Hanson 2007.



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Seattle, Washington

SEWARD SHIP'S DRY DOCK
SITE INSPECTION
Seward, Alaska

Figure 7-1

4-MILE MAP

0 .5 1
Approximate Scale in Miles

Date: 6-21-07

Drawn by: AES

10:START-3\07040006\fig 7-1

Note: This page intentionally left blank.

Source: iGage 2000.

15-Mile Target Distance Limit

Site Location

15-Mile Target Distance Limit

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	SEWARD SHIP'S DRY DOCK SITE INSPECTION Seward, Alaska	Figure 7-2 15-MILE MAP	
	0 .5 1 Approximate Scale in Miles	Date: 6-21-07	Drawn by: AES	10:START-3\07040006\fig 7-2

8 Summary and Conclusions

In June 2007, the START conducted an SI sampling event at the SSDD facility, which is located in Seward, Alaska. The site is composed of an active boat refurbishing facility on the banks of Resurrection Bay. The site measures approximately 9.25 acres. The purpose of the SI was to investigate the potential presence of hazardous substances and the potential for hazardous substance migration into the adjacent Resurrection Bay.

8.1 Sources

Nineteen surface soil samples were collected from source areas at the site. Samples were collected from areas where operations indicated the potential for the presence of hazardous substances. TBT was detected at a significant concentration with respect to the background concentration in all 19 of the samples. Eleven TAL metals were detected at significant concentrations with respect to background concentrations in at least one of the on-site samples. Of these TAL metals, copper was detected at significant concentrations with respect to the background concentration in all of the samples; zinc was detected at significant concentrations with respect to the background concentration in 17 of the 19 samples; and silver was detected at significant concentrations with respect to the background concentration in 16 of the 19 samples. Twenty-three SVOCs were detected at significant concentrations with respect to background concentrations in at least one of the on-site surface soil samples. Of these SVOCs, acetaphenone was detected at significant concentrations with respect to the background concentration in 14 of the 19 samples and phenanthrene was detected at significant concentrations with respect to the background concentration in 12 of the 19 samples. One PCB, Aroclor-1254 was detected at significant concentrations with respect to the background concentration in four of the 19 samples. Finally, DRO, RRO, m-& p-xylenes, and o-xylene were detected at significant concentrations with respect to background concentrations in all six of the samples submitted for off-site fixed laboratory analysis; while GRO and ethylbenzene were detected at significant concentrations with respect to background concentrations in five of the six samples.

8.2 Targets

The site is located on the banks of Resurrection Bay where both sport and commercial fishing are known to occur. Fishing was observed to have occurred adjacent to the facility. Additionally, the Federal-listed endangered humpback whale (*Megaptera novaenfliae*) and the Stellar seal lion (*Eumetopia jubatus*) are

known to occur in Resurrection Bay. Finally, 1.5 miles of wetland frontage are present along the banks of Resurrection Bay within the 15-mile TDL.

One sample collected from the ditch east of the site contained elevated concentrations with respect to the background concentration of TBT, one TAL metal (copper), one SVOC [bis(2-ethylhexyl)phthalate], DRO, and RRO. No analytes were detected at elevated concentrations with respect to the background concentrations in any of the three sediment samples collected from Resurrection Bay.

There are approximately 3,077 people that reside within 4-miles of the site. Additionally, approximately 60 workers are present at the site.

8.3 Conclusions

Hazardous substances are present at significant concentrations throughout the site. Approximately 60 workers are present at the site and are within 200 feet of an area of observed contamination. Resurrection Bay, which is adjacent to the site, contains Federal-listed threatened species, wetlands, and is utilized for both commercial and sport fishing. Based on analytical results from the SI, hazardous substances associated with the site were not detected at elevated concentrations with respect to background concentrations in any of the samples collected from Resurrection Bay.

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