Hoy's Marine Site
Newport, Oregon
Combined Preliminary Assessment/ Site Inspection
TDD: 98-07-0011

Contract: 68-W6-0008
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Region 10

START

Superfund Technical Assessment and Response Team

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HOY'S MARINE SITE
NEWPORT, OREGON
COMBINED PRELIMINARY ASSESSMENT/SITE INSPECTION REPORT

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LIST OF ACRONYMS

Acronym	Definition
%R	percent recovery
AC	adjusted concentration
B	Detected below the Contract Required Detection Limit but equal to or greater than the instrument detection limit
bgs	belowground surface
AST	aboveground storage tank
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CLP	Contract Laboratory Program
CRDL/CRQL	Contract Required Detection/Quantitation limit
DQOS	Data Quality Objectives
DL	Detection Limits
E & E	Ecology & Environment, Inc.
EPA	Environmental Protection Agency
GPS	global positioning system
H	High bias
IDW	investigation-derived waste
J	Estimated concentration
K	Unknown bias
L	Low bias
LCS	Laboratory Control Sample
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
NPL	National Priorities List
ODEQ	Oregon Department Of Environmental Quality
PAHs	Polynuclear aromatic hydrocarbons

LIST OF ACRONYMS

Acronym	Definition
PCBs	polychlorinated biphenyls
PPE	probable point of entry
QA/QC	Quality assurance/quality control
R	Rejected
RPD	relative percent difference
SQAP	Sampling Quality Assurance Plan
SQL	Sample quantitation limit
START	Superfund Technical Assessment and Response Team
SVOCs	Semivolatile organic compounds
TAL	Target Analyte List
TBT	Tributyltin
TDD	Technical Direction Document
TOC	Total organic carbon
U	Not detected at sample quantitation limit
USGS	United States Geologic Survey
VOCs	Volatile organic compound
yd^3	Cubic yards

COMBINED PRELIMINARY ASSESSMENT/SITE INSPECTION
HOY'S MARINE SITE
NEWPORT, OREGON

1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has tasked Ecology and Environment, Inc. (E & E) to provide technical support and conduct a combined Preliminary Assessment/Site Inspection (PA/SI) at the Hoy's Marine site located in Newport, Oregon. E & E completed the PA/SI activities under Technical Direction Document (TDD) No. 98-07-0011 issued under EPA Region 10 Superfund Technical Assessment and Response Team (START) Contract No. 68-W6-0008. The specific goals for this PA/SI were intended to address site assessment objectives and are presented below:

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

Completion of this PA/SI included reviewing site information, determining regional characteristics, collecting receptor information within the site's range of influence, conducting a site visit, executing a site-specific sampling plan, and producing this report.

This document includes site background information (Section 2), field sampling activities and analytical protocols (Section 3), quality assurance/quality control (QA/QC) criteria (Section 4), analytical results reporting and background sampling (Section 5), potential sources (Section 6), migration/exposure pathways and targets (Section 7), summary and conclusions (Section 8), and references (Section 9).

2. SITE BACKGROUND

This section describes the site location (Section 2.1), site description (Section 2.2), site ownership history (Section 2.3), site operations and waste characteristics (Section 2.4), site characterization (Section 2.5), and summary of investigation locations (Section 2.6).

2.1 SITE LOCATION

Site Name:	Hoy's Marine
CERCLA ID No.:	ORD987190840
Location:	4592 Yaquina Bay Road Newport, Oregon
Latitude:	44° 35' 45" North
Longitude:	124° 0' 43.5" West
Legal Description:	Section 22, Township 11 South, Range 11 West, Willamette Meridian, Lincoln County, Oregon
Site Owners:	Arloa J. Christiansen and Cynthia M. Steele 123 SW 12th Street Newport, Oregon 97365 (541) 265-2340 Port of Newport 600 SE Bay Boulevard Newport, Oregon 97365 (541) 265-7758
Site Operators:	Hoy's Marine 4592 Yaquina Bay Road Newport, Oregon 97365 (541) 574-9890
Site Contact:	Guy Hoy Hoy's Marine 4592 Yaquina Bay Road Newport, Oregon 97365 (541) 574-9890

The Hoy's Marine site is located on the east bank of the Yaquina River directly north of Wiser Point (USGS 1984) (Figure 2-1). The city of Newport, which is on the coast of the Pacific Ocean, is located approximately three miles northwest of the site. The site is accessible by land via Yaquina Bay road and by boat via the facility's floating dock.

2.2 SITE DESCRIPTION

Hoy's Marine is a ship repairing and refurbishing business. The site comprises three adjacent tax lots, totaling approximately 0.75 acres. The site features include a large building housing the main shop and office; a paint storage shed; a spent sandblast grit storage shed; marine ways and a dry dock; and a floating dock. The main shop is used for minor repairs to boat hulls, storage of materials used at the facility, and occasionally is used as a covered work area when needed. A graveled lot south of the main shop historically was used for parking and miscellaneous storage; however, the lot is not currently being used.

The site is generally flat, but slopes steeply near the river bank. Drainage from the site runs off into the Yaquina River. A stormwater collection pipe is located along the side of the spent grit storage shed. This pipe collects stormwater runoff from the hill across the Yaquina Bay Road and discharges into the Yaquina River. The surrounding vicinity consists of scattered homes, camp grounds, ship repairing businesses, marinas, and oyster farms. Another boat refurbishing shop, Riverbend Marine, is located approximately 0.5 mile upstream of Hoy's Marine. Riverbend Marine conducts similar operations as Hoy's Marine, but sandblasting is conducted inside an enclosed building (E&E 1999a).

2.3 SITE OWNERSHIP HISTORY

The site is situated on three adjacent tax lots (Figure 2-2). The northern tax lot number 3600 has been owned by Juliette and Richard Christiansen since at least 1974. On July 22, 1974, the Christiansens leased the property to Bayside Machine Works. In 1982, the Christiansens assigned the interest of the property to their granddaughter Arloa J. Christiansen. On July 1, 1984, Bayside Machine Works assigned its leasehold interest to the Port of Newport. Between 1984 and 1994, the Port of Newport subleased the property to Fair Line Marine. On November 15, 1995, the Port of Newport subleased the property to Hoy's Marine. On June 25, 1996, the Christiansens sold the property to Hoy's Marine. However, sale reportedly was not completed due to default of payment by Hoy's Marine. On May 15, 1997, Arloa J. Christiansen assigned half of her interest in the property to Cynthia Steele (Port of Newport 1999).

The middle tax lot number 3801 was owned by the Port of Newport between 1984 and 1995. Between 1984 and 1994, the Port of Newport leased the property to Fair Line Marine. On November 9,

1994, the Port of Newport granted Commercial Iron Works a license to use the property. On June 15, 1995, Hoy's Marine assumed Commercial Iron Works' license. On November 15, 1995, Hoy's Marine purchased the property from the Port of Newport (Port of Newport 1999). However, the sale reportedly was not completed because Hoy's Marine was in default of payment.

The southern tax lot number 3802 has been owned by the Christiansens since at least 1974. Between 1984 and 1994, the lot was leased to Fair Line Marine. On November 3, 1995, the Christiansens leased a portion of the property to Hoy's Marine. On June 25, 1996, the Christiansens sold the property to Hoy's Marine. However, the sale reportedly was not completed because Hoy's Marine was in default of payment. On May 15, 1997, Arloa J. Christiansen assigned half of her interest in the property to Cynthia Steele (Port of Newport 1999). The ownership and operator history of the site is summarized in Table 2-1. The previous operators of the site listed in Table 2-1, including Bayside Machine Works, Fair Line Marine, and Commercial Iron Works, are all believed to have conducted ship refurbishing operations similar to the operations conducted by Hoy's Marine (E & E 1999a).

2.4 SITE OPERATIONS AND WASTE CHARACTERISTICS

The primary site operations are refurbishing vessel hulls by sandblasting old paint from ship's hulls and repainting the surface. Sandblasting and painting of the vessels are conducted outdoor on a dry dock (Figure 2-2). Ships are brought onto the dry docks by marine ways that run into the Yaquina River. After sandblasting, the ship hull surface is cleaned with high pressure water. The wastewater carrying sandblasting grit and paint chips is allowed to drain directly into the Yaquina River without a permit. No engineered systems exist to contain spent grit and wastewater. The composition of the sandblasting grit is 38.1% silicon oxide (SiO_2), 27.4% aluminum oxide (Al_2O_3), and 3.9% manganese oxide (MgO; MSDS 1991). Paint chips potentially contain hazardous substances including heavy metals and butyltins, which were applied to marine paints before the 1980s as an anti-foulant. Spent grit at the Hoy's Marine site is periodically collected and stored in a storage shed on the north side of the site, and later transported to a landfill in Corvallis, Oregon (E & E 1999a).

Paints and solvent are stored in containers in a paint shed (Figure 2-2). The paint currently used at Hoy's Marine is Devoe 214 anti-fouling paint manufactured by Devoe Coating Company. The major constituents of the paint include 40 % Copper Oxide, 15% Zinc Oxide, 15 % Resin, 10 % Xylene, 10 % n-Butyl alcohol, and 5 % Iron Oxide (MSDS 1992). Waste paint/thinner is also stored in the paint shed and is allowed to evaporate. Empty containers are disposed in the Dahl recycle center in Toledo, Oregon.

Heavy equipment, including cranes, forklifts, and loading trucks, are used at the site. The engine oil for this equipment is stored in drums in the main shop. A 300-gallon above-ground diesel storage tank

(AST) is located near the southeast corner of the spent grit storage shed. An underground storage tank (UST) is located near the office portion of the main shop. However, it is not used and was reportedly filled with sand (E & E 1999a)..

2.5 SITE CHARACTERIZATION

This section describes the previous investigations and the START site visit.

2.5.1 Previous Investigations

A number of previous investigations were conducted by various environmental consultants and the Oregon Department of Environmental Quality (ODEQ). These environmental consultants include SRH Associates, Inc. (SRH), GEM Consulting, Inc. (GEM), and Maul Foster & Alongi, Inc. (MFA). The investigations are summarized in the following sections.

2.5.1.1 SRH Associates, Inc. Inspection

In 1989, SRH conducted an environmental inspection of the site on behalf of Fair Line Marine, Newport, Oregon. The inspection was conducted to identify potential hazardous materials and any potential violations of state regulations. The inspection identified on-site hazardous materials including waste oil, paint thinner, unused chemicals, and cleaning solvents such as Chevron 325. These liquid materials were stored in drums and containers located throughout the facility. The hazardous materials also included sandblast grit, which is primarily iron, aluminum, silica, and calcium oxide-based "Kleen Blast". The spent sandblast grit was found throughout the facility, especially in the intertidal area. A 1,000-gallon gasoline UST was identified outside of the office. Six borings were installed surrounding the tank, no odors or visible evidence of gasoline were detected. A subsurface soil sample was collected from 6 feet below ground surface (bgs) from one of the borings. No hydrocarbons were detected above the detection limit of 2 parts per million (ppm) (SRH 1989).

2.5.1.2 GEM Investigation

In 1995, GEM conducted a Level 2 site investigation for Arloa Christiansen and Cynthia Steele who own two of the lots. The investigation was to confirm the conclusions made in the 1989 SRH study. Soil samples were collected and several results were reported to have exceeded the ODEQ Soil Cleanup levels. Table 2-2 summarizes the analytical results of sampling conducted during the GEM investigation. A summary of the primary areas of concern identified by GEM is provided below (GEM 1996):

- **Underground Storage Tank.** According to GEM's observations, it is likely that some product still remains in the underground storage tank (UST) located outside of the office building. One subsurface soil sample was collected from a test pit (TP-1) 4 feet bgs near the UST and was analyzed for the presence of BTEX and total petroleum hydrocarbons - gasoline range (TPH-G) using EPA Method 8020 and Oregon Method TPH-G. No analytes were detected above the quantitation limits for the sample. Two subsurface soil samples were collected west of the UST in front of the main shop from a test pit (TP-2) 1 foot bgs and 8-feet bgs. The sample collected from 1-foot bgs was analyzed for BTEX and TPH using EPA Methods 8020 and 418.1, respectively, and the sample collected from 8-feet bgs was analyzed for BTEX and TPH-G using EPA Methods 8020 and Oregon Method TPH-G respectively. A concentration of 4,100 mg/kg TPH was detected from the sample collected from 1-foot bgs. No BTEX or TPH-G was detected in the sample collected from 8-feet bgs.

- **Paint Storage Shed.** One surface soil (0.5 feet bgs) and one subsurface soil (1.5 feet bgs) samples were collected from a test pit (TP-3) excavated at the entrance to the paint shed, and were analyzed for BTEX and VOCs (EPA Method 8240). In addition, one grab soil sample (GS-1) was collected down-slope of the shed and was analyzed for BTEX, VOCs (EPA Method 8240), and total metals (EPA Method 6010). The test pit subsurface soil samples contained detectable concentrations of xylenes (0.030 mg/kg) and 1,2-dichlorobenzene (0.007 mg/kg) at 1.5 feet bgs. No BTEX or VOCs were detected from the test pit surface soil sample or the surface soil sample down-slope of the shed. However, the down-slope shed surface soil sample contained metal concentrations of arsenic (7.4 mg/kg), barium (110mg/kg), cadmium (1.2 mg/kg), chromium (1,700 mg/kg), lead (180 mg/kg), and mercury (0.12 mg/kg).

- **Above-Ground Diesel Tank and Waste Oil Drums.** Several 55-gallon drums containing waste oil or motor oil were stored without containment on the south side of the spent sandblast grit shed. Oil stained soils were pervasive throughout the area during GEM's inspection. One grab soil sample (GS-7) was collected from a drainage path leading from the storage area and analyzed for BTEX (EPA Method 8020), VOCs (EPA Method 8240), TPH (EPA Method 418.1), and total metals (EPA Method 6010). The results showed a TPH-G concentration of 4,600 mg/kg. Total metals were detected at concentrations of arsenic 16 mg/kg, barium (270 mg/kg), cadmium 1.3 mg/kg, chromium 100 mg/kg, lead 27 mg/kg, and selenium (1.9 mg/kg). No BTEX or VOCs were detected above the sample quantitation limits.

- **Spent Sandblast Grit and Paint Chips.** Spent grit and paint chips were observed throughout the shore and intertidal areas. Three grab samples (GS-2, GS-3, and GS-8) of spent grit were collected by GEM from various locations and analyzed for total metals (EPA Method 6010). Two of the samples were analyzed for VOCs and BTEX, and one sample also was analyzed for leachable metals following the Toxicity Characteristic Leaching Procedure (TCLP) for metals (EPA Method 1311). The results showed BTEX (xylenes) in one sample at a concentration of 0.03 mg/kg and 1,2-dichlorobenzene at 0.007 mg/kg. Total metal concentrations of arsenic up to 55 mg/kg, barium up to 410 mg/kg, cadmium up to 3.8 mg/kg, chromium up to 61 mg/kg, lead up to 310 mg/kg, selenium up to 1.7 mg/kg, and silver up to 1.2 mg/kg were detected in the samples. TCLP concentrations for all metals were below analytical detection limits.

- **Solid Waste and Metal Shavings Dump.** Previous operators of the facility reportedly disposed of metal shavings on the ground surface and in the Yaquina River near the southwest corner of the main shop. A grab soil sample (GS-6) was collected and analyzed for BTEX (EPA Method 8020), VOCs (EPA Method 8240), and total metals (EPA Method 6010). The results showed concentrations of arsenic (37 mg/kg), barium (120 mg/kg), cadmium (11 mg/kg), chromium (1,300

mg/kg), lead (990 mg/kg), selenium (3.1 mg/kg), and silver (1.5 mg/kg). No BTEX or VOCs were detected above the sample quantitation limits.

- **Waste Oil Tank Area.** An above ground storage tank that contained waste oil and diesel fuel were situated on the lot south of the main shop (tax lot 3802). The tank was located on bare soil, and there was oil-like staining on the ground surface in various locations around the tank. Two grab soil samples (GS-4 and GS-5) were collected near the main shop building to assess the presence of contamination from the tank area. The samples were analyzed for TPH (EPA Method 418.1). Both samples were also analyzed for TCLP metals (EPA Method 1311). The samples contained TPH concentrations of 380 mg/kg and 560 mg/kg. Lead was the only analyte detected in the TCLP metals analysis at a concentration of 0.051 ppm.

2.5.1.3 MFA Inspection

In 1997, MFA performed sampling at the site to support litigation proceedings between Arloa Christiansen and Hoy's Marine. Seven surface soil samples, one grit sample, and an off-site surface soil sample were collected. The sample locations were not provided. Four of the surface soil samples and the grit sample were analyzed for total metals (EPA Method 6010 and 7000 series). Three surface soil samples were analyzed for TPH (EPA Method 8015M). Two surface soil samples were analyzed for VOCs (EPA Method 8260) (MFA 1997).

Arsenic was detected at concentrations ranging from 25 mg/kg to 34 mg/kg; chromium was detected at concentrations ranging from 58 mg/kg to 142 mg/kg; copper was detected at concentrations ranging from 1,830 mg/kg to 2,960 mg/kg; lead was detected at concentrations ranging from 20 mg/kg to 50 mg/kg; zinc was detected at concentrations ranging from 636 mg/kg to 3,170 mg/kg; TPH (diesel range) was detected at concentrations ranging from 2,490 mg/kg to 3,400 mg/kg; TPH (heavy range) was detected at concentrations ranging from 6,240 mg/kg to 20,000 mg/kg, and naphthalene, 1,2,4-trimethylbenzene, and n-butylbenzene were detected in one sample at concentrations of 300 mg/kg, 48 mg/kg, and 68 mg/kg, respectively. Concentrations of arsenic and TPH (diesel) were reported to have exceeded Oregon soil cleanup levels (MFA 1997).

2.5.1.4 ODEQ Inspections

ODEQ has conducted a number of inspections at the Hoy's Marine site. The purpose of each inspection and the major areas of concern are summarized in Table 2-3 (ODEQ 1998).

On May 6, 1997, representatives from the water quality program in ODEQ visited Hoy's Marine to investigate a water quality complaint. Sandblasting residue were observed deposited at dry dock and surrounding areas. A Class I violation of discharging waste without a permit was asserted and a formal enforcement action was recommended by ODEQ (ODEQ 1998).

On July 25, 1997, representatives from water quality and site assessment/cleanup programs from ODEQ visited Hoy's Marine to continue on water quality investigation and to perform a preliminary inspection of the site to identify a release of hazardous substance and to determine whether further investigation or cleanup is needed at the site. Two near-surface sediment samples were collected offshore of the site. One sample was collected below the marine way and appeared to mostly spent sandblasting grit. The second sample was collected below the tide line and north of the dry dock. The second sample appeared to be native material (river silt). No background sample was collected. The samples were analyzed for total metals, butyltins, polychlorinated biphenyls (PCBs) and 11 polycyclic aromatic hydrocarbons (PAHs). The analytical methods were not reported. The analytical results are summarized in Table 2-4. Concentrations of the following analytes in the samples exceeded the National Oceanic and Atmospheric Administration (NOAA) Effect Range the lower 10 percentile (ER-L) criteria for sediments: antimony, arsenic, chromium, copper, lead, nickel, zinc, total PCBs, and 10 PAHs. Tributyltin was detected up to a concentration of 10.55 mg/kg, however, a NOAA ER-L does not exit for the analyte. ODEQ staff also cited that open burning of unspecified materials in the south portion of the site be discontinued (ODEQ 1998).

On September 11, 1997, representatives from the enforcement section in ODEQ visited Hoy's Marine to determine compliance with the State and Federal Hazardous Waste Rules. Five violations of State or Federal Hazardous Rules were identified. The most serious violations included allowing waste thinner/paint to evaporate from containers which constituted an illegal treatment of hazardous waste, and failure to clean up spills of petroleum products on the ground. Correction of these violations were required by ODEQ (ODEQ 1998).

2.5.2 START Site Visit

On March 9, 1999, the START conducted a PA/SI site reconnaissance visit at Hoy's Marine. During the visit, the START observed spent sandblasting grit throughout the site, especially along the river bank and marine ways. Oil sheens were observed on sediments underlying the marine ways and dry dock. Five 55-gallon drums containing motor oil and/or waste oil were located in the main shop near the entrance without proper containment. Oil staining was observed on the ground in front of the main shop. Stormwater runoff appeared to wash oil residues from this area into the Yaquina River. The paint shed containing a number of paint/paint thinner containers was not well maintained. The concrete floor was stained with various paints. The floor of the west side of the paint shed was corroded and precipitation leaking into the paint shed could run off from the west side. Accumulated spent grit was observed along the west base of the paint shed. The south side of the paint shed was used to store scrap metals. The spent grit shed was dilapidated and soil stains were noted near the diesel AST located at the southeast corner of

the spent grit shed. The former waste oil area identified in SRH and GEM's investigations was vacant and no oil stains or odor were noted by the START. Metal shavings previously identified by GEM had been removed, however, the soil in this area appeared to be fill containing various solid wastes, concrete, and rusted metals (E & E 1999a).

2.6 SUMMARY OF PA/SI INVESTIGATION LOCATIONS

Based on a review of historical and background information which was supplemented by the site reconnaissance visit, areas and features within the site were identified for investigation during the PA/SI as potential Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance sources. In addition, on- and off-site locations were identified as possible receptors of contamination originating from these sources. Those potential sources and receptors are listed below.

Potential Sources:

- **Former Waste Oil Tank Area.** Soils in this area may be contaminated from storage of waste oil. The major contaminants of concern include SVOCs.

- **Former Solid Waste and Iron Shavings Dump Area.** Soils in this area may be contaminated from historical dumping of solid waste and metal shavings. The major contaminants of concern include TAL metals and SVOCs.

- **Soil in Front of the Main Shop.** Soils in this area may be contaminated from oil residue washed out from the concrete floor in front of the main shop. The major contaminants of concern include SVOCs.

- **Paint Storage Shed Area.** Paints and solvent stains were observed by the START on the floor and soils outside of the paint shed. The entrance area may be contaminated from foot traffic in and out of the paint shed. Soils outside the west side of the paint storage shed may be contaminated from leakage of materials stored inside the shed. The major contaminants of concern include SVOCs, metals, and VOCs.

- **Spent Sandblasting Grit Storage Shed Area.** A diesel AST is located at the southeast corner of the grit shed. This area historically was used for storage of waste oil drums. Soils may be contaminated from PAHs. The major contaminants of concern include SVOCs and metals.

- **Spent Sandblasting Grit.** Spent sandblasting grit is stored in the spent sandblasting grit storage shed and also observed throughout the site, particularly in the intertidal area. The major contaminants of concern include TAL metals associated with sandblasting grit and butyltins - TBT, dibutyltin (DBT), and monobutyltin (MBT) associated with marine antifouling paints from paint chips (DBT and MBT are degradation products of TBT).

Potential Receptors:

- **Yaquina River.** Contamination from on-site sources may be entering the Yaquina River, which supports a significant sport fishery and commercial fishing operations. The Yaquina River also supports several oyster farming facilities, and is a proposed critical habitat for anadromous fish species.

- **Wetland.** An EPA-recognized wetland is located on the Yaquina River across the river from Hoy's Marine, approximately 0.3 miles from the on-site potential contaminant sources. The wetland may be impacted by the migration of contaminants to the river from the site.

Insert Table 2-1

Insert Table 2-2

Insert Table 2-3

Insert Table 2-4

Insert Figure 2-1

Insert Figure 2-2

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

A sampling and quality assurance plan (SQAP) was developed by the START prior to field sampling (E & E 1999b). The SQAP was based upon a review of background information, interviews with site representatives, and a site reconnaissance visit by the START in March 1999. The SQAP describes the sampling strategy, sampling methodology, and analytical program to investigate potential hazardous substance sources and potential targets. With few exceptions, the PA/SI field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP were approved by EPA and are described when applicable in the sampling location discussions in Section 6 (source areas) and Section 7 (target areas).

The PA/SI field sampling event was conducted from May 24 to 27, 1998. A total of 50 samples, including background samples but excluding quality assurance (QA; rinsate and trip blank) samples were collected from on-site and off-site locations. Sample types and the methods of collection are described below. A list of all samples collected for laboratory analysis under the PA/SI is contained in Table 3-1. Photographic documentation of PA/SI field activities is contained in Appendix A.

Alphanumeric identification numbers applied by the START to each sample location (for example (SS01SS, IT01SD, ST01SD) are the sample location identifiers used in the report. Sample locations are provided in Figures 3-1 and 3-2.

This section describes sampling methodology (Section 3.1), analytical protocol (Section 3.2), global positioning system (Section 3.3), and investigation-derived waste (Section 3.4).

3.1 SAMPLING METHODOLOGY

Grass, leaves and other vegetative material, marine organisms and sea shells, rocks, and other debris unsuitable for analysis were removed from samples before being placed into sample containers. The aliquot of each sample being collected for volatile organic compounds (VOCs) analysis was placed directly into sample containers without homogenization. Sample material for all other analysis was homogenized in dedicated stainless steel bowls prior to containerization. Dedicated stainless steel spoons were used to extract, homogenize, and place sampled material into sample containers. Sampling tools (van Veen grab sampler) was decontaminated at the start of the PA/SI and after each sample collection. Samples were stored on ice in coolers continuously maintained under the custody of the START personnel.

This section describes collection of surface soil samples and intertidal and subtidal sediment samples.

3.1.1 Surface Soil and Grit Samples

A total of 15 surface soil samples, including two background surface soil samples, and one spent sandblasting grit sample, were collected from the Hoy's Marine site. The soil samples were discrete-located grab samples collected from the potential on-site source areas. Surface soil samples were collected from 0 to 3 inches bgs using dedicated stainless steel spoons and bowls. The spent sandblasting grit sample was collected from the grit pile located in the spent grit storage shed from 0 to 3 inches in depth using dedicated stainless steel spoons and bowls.

3.1.2 Intertidal Sediment Samples

A total of 8 intertidal sediment samples (including one background sample) were collected from the area in front of the Hoy's Marine site; from a wetland directly across the Yaquina River from the site; and from an upstream background location. The samples were collected just above the low tide line at a depth of 0 to 3 inches using dedicated stainless steel spoons and bowls. The samples were collected at the time of low tide based on a tide chart.

3.1.3 Subtidal Sediment Samples

A total of 26 subtidal sediment samples, including two background samples, were collected from areas downstream, near, and upstream of the Hoy's Marine site. All of the subtidal sediment samples were collected during an outgoing (ebb) tide. The tidal period was determined by a tide chart. The samples were collected from 0 to 6 inches bgs using a van Veen grab sampler, starting from the most downstream locations and continuing to the most upstream locations. Sediment material containerized for sample aliquots was collected from areas within the van Veen sampler that were not in contact with the inside surface of the sampler.

3.2 ANALYTICAL PROTOCOL

Analytical methods applied to PA/SI samples include Contract Laboratory Program Analytical Services (CLPAS) OLM03.1 for VOCs, CLPAS OLM03.1 for SVOCs, CLPAS ILM04.0 for TAL metals, USEPA SW-846 Method 9060 for TOC, and a published method for butyltins (Krone et. al.1989). These analytical suites were applied to samples in varying combinations based on the sample location and the expected contaminants at that location. Analysis of samples collected during the PA/SI for VOCs, SVOCs, and Target List Analyte (TAL) metals were performed by the EPA Region 10 laboratory located in Manchester, Washington. Analysis of butyltins and TOC were performed by Sound Analytical Services, located in Tacoma, Washington, a commercial laboratory subcontracted to the START.

3.3 GLOBAL POSITIONING SYSTEM

Trimble Pathfinder Professional global positioning system (GPS) survey units and Corvalis data loggers were used by the START personnel to approximate the sample location coordinates of the PA/SI surface soil and sediment samples. GPS coordinates for some of the subtidal sediment samples were plotted onto a base map (Figure 3-2). For those samples that no GPS coordinates were recorded, the sample locations were approximated based on the field log book. GPS data was not obtainable at these locations due to insufficient satellite coverage at the time of sampling. Recorded GPS coordinates by sample point are listed in Appendix B.

3.4 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) generated during the PA/SI sampling effort consisted of solid disposable sampling equipment and approximately 7 gallons of decontamination water used for decontaminating the van Veen grab sampler for subtidal sediment sampling. The IDW was disposed as non-hazardous waste by Foss Environmental Services subcontracted by the START on June 10, 1999. No IDW generated by the START remains at the site.

Insert Table 3-1

Insert Figure 3-1

Insert Figure 3-2

4. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in EPA's *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 1991a) and in EPA's *Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 1991b). These QC requirements or equivalent requirements were followed for analytical work on the Hoy's Marine PA/SI. This section describes the QA/QC measures 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 1999b) for the field activities. All inorganic analyses were performed by the EPA Manchester Environmental Laboratory (MEL) following EPA 200 Series Methods (EPA 1983), all VOC analyses were performed by the EPA MEL following EPA SW-846 Method 8260A (EPA 1996b), all SVOC analyses were performed by the EPA MEL following EPA SW-846 Method 8270C (EPA 1996b), all PCB analyses were performed by the EPA MEL following EPA SW-846 Method 8081A (EPA 1996b), and total organic carbon and butyltin analyses were performed at Sound Analytical Services, Inc., a commercial laboratory, following EPA SW-846 Method 9060 (EPA 1996b) and a Puget Sound Extraction Protocol method (Krone et. al.1989), respectively.

All data from analyses performed at the EPA MEL laboratory were reviewed and validated by EPA chemists; data from the commercial laboratory were reviewed and validated by START chemists. Data qualifiers were applied as necessary according to the following guidance documents:

- *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (February 1994b);
- *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (February 1994c); and (when applicable)
- *EPA Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures* (April 1990).

In the absence of other QC guidance, laboratory- and/or method-specific QC limits also were utilized to apply qualifiers to the data. Copies of the data QA memoranda are included in Appendix D.

4.1 SATISFACTION OF DATA QUALITY OBJECTIVES

The following EPA (1993) guidance document was used to establish data quality objectives (DQOs) for this PA/SI:

- *Data Quality Objectives Process for Superfund, Interim Final Guidance*, EPA 540-R-93-071.

The EPA TM determined that the definitive data without error and bias determination criteria would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the fieldwork produced sufficient data that met the data objectives stated in the SQAP (E & E 1999b).

A discussion of the objectives that were accomplished is presented in the following sections.

4.2 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA samples included trip blank and rinsate samples. In total, 2 trip blank samples (at a rate of one trip blank per cooler of VOC samples) were shipped to the laboratories. Two rinsate samples from the van Veen sediment sampler and sediment homogenization bowls were submitted for the project. QC samples included matrix spike/matrix spike duplicate (MS/MSD) or MS/Duplicate (MS/DUP) samples at a rate of one MS/MSD per 20 organic samples or one MS/DUP per 20 inorganic samples.

4.3 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

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 DQO's for representativeness and comparability. The laboratories and the field team were able to meet 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 or MS/MSD samples measure the precision of the analytical method.

The RPD values were reviewed for all laboratory samples. None of the sample results were qualified based on duplicate RPD QC outliers. Overall, the project DQO of 90 % 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) for each VOC, SVOC, PCB, or butyltin analysis or the matrix spike %Rs for all analyses. The surrogate %R values were reviewed for all appropriate

sample analyses. Eighteen sample results (approximately 0.3 %) were qualified as estimated quantities ("J" or "UJ") based on surrogate QC outliers.

The matrix spike %R values were reviewed for all MS/MSD analyses. Twenty-eight results (approximately 4.4 %) were rejected ("R") and 29 results (approximately 4.5 %) were qualified as estimated quantities ("J" or "UJ") based on MS/MSD recoveries. Overall, the project DQO of 90 % 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. Approximately 95.3 % of the PA/SI data were determined to be usable, therefore the project DQO of 90% 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 of 90 % 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 site followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met.

4.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PARAMETERS

The laboratory data also were reviewed for holding times, laboratory blank samples, trip blank samples, and rinsate blank samples. These QA/QC parameters are summarized below. In general, the laboratory and field QA/QC parameters were considered acceptable.

4.4.1 Holding Times

All sample analyses met EPA, Region 10, and method-specific holding time criteria.

4.4.2 Laboratory Blanks

All laboratory blanks met the frequency criteria. The following contaminants of concern were detected in the laboratory blanks:

Metals: Beryllium;

SVOCs: Di-n-butylphthalate; and

VOCs: Methylene chloride and acetone.

Any associated sample result less than five times the blank contamination (10 times for common laboratory contaminants) were qualified as not detected ("U"). See the data QA memoranda (Appendix D) for sample results that were qualified based on blank contamination.

4.4.3 Trip Blanks

Trip blanks met the frequency criteria. Chloromethane was detected in each trip blank (samples TB01WT and TB02WT) at 19.9 micrograms per liter (µg/L) and 4.0 µg/L, respectively. No qualifications were applied based on these contaminants as chloromethane was not detected in the associated samples.

4.4.4 Rinsate Blanks

Rinsate blanks met the frequency criteria. The following contaminants of concern were detected in the rinsate blanks:

VV01RS	arsenic	0.39 µg/L
	chromium	8.8 µg/L
	lead	0.35 µg/L
	manganese	2.0 µg/L
VV02RS	arsenic	0.28 µg/L
	barium	9.61 µg/L
	chromium	6.5 µg/L
	lead	2.66 µg/L
	manganese	3.9 µg/L
	vanadium	3.1 µg/L
	zinc	5.2 µg/L

Aluminum, calcium, iron, magnesium, potassium, and sodium also were detected in the rinsate blanks but are common earth crust elements and were not evaluated in this report. The listed inorganic concentrations in the rinsate blanks were not likely to contribute significantly to the associated samples' results.

5. ANALYTICAL RESULTS REPORTING AND BACKGROUND SAMPLES

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

5.1 ANALYTICAL RESULTS EVALUATION CRITERIA

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

- Equal to or greater than the sample's contract required quantitation limit/contract required detection limit (CRQL/CRDL) or the sample quantitation limit (SQL) when a non-CLP laboratory was used; and
- Equal to or greater than the background sample's CRQL/CRDL or SQL when the background concentration is below detection limits; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the detection limits.

The analytical summary tables present all detected compounds, but only those detected analytes at potential sources or in targets meeting the significant/elevated concentration criteria are discussed in the report text. For the sample from a source type that do not consist of a naturally occurring media, such as spent sandblasting grit, all detected concentrations are discussed. All detected concentrations also are discussed for background samples.

For analytical results that are qualified as estimated, the sample concentration was adjusted as described in *Using Qualified Data to Document and Observed Release and Observed Contamination* (EPA 1996a) before determining whether the concentration was significant or elevated. All hazardous substances detected at target locations and meeting evaluation criteria can be used to document an observed release from the site to the target. When samples were diluted for re-analysis at a laboratory, the dilution results were considered for evaluation and are provided in the tables.

5.1.1 Sample Results Reporting

When four or more analytes are detected or are significant/elevated for an analytical suite (for example, VOCs or TAL metals) in Section 6 and 7, the number of such analytes and the concentration ranges are given. When three or fewer analytes are detected or are significant/elevated for an analytical suite, the specific analyte and its concentration is provided. Based on EPA Region 10 policy, evaluation of aluminum, calcium, iron, magnesium, potassium, and sodium (common earth crust elements) generally is employed only in water mass tracing, which is beyond the scope of this report. For this reason, these elements will not be discussed in this report.

5.2 BACKGROUND SAMPLES

Background samples were collected for each of the naturally occurring media from which PA/SI samples were collected. Those media are soil, intertidal sediment, and subtidal sediment. Results for the appropriate background sample(s) are shown in the first column(s) in the analytical results summary tables in Section 6 and 7 for comparison against source or target results.

5.2.1 Background Surface Soil

5.2.1.1 Sample Locations

Two off-site background surface soil samples (SS14SS and SS15SS) were collected. Sample SS14SS was collected from native soil immediately south of the site (Figure 3-2). Sample SS15SS was collected from a location along the Yaquina River north of the site at Sawyer's Launching, which is situated on fill that is similar to the Hoy's Marine site. The background soil types matched those of samples collected on site. For comparison to on-site soil samples, both of the background soil samples were used; the highest analyte concentration between the two samples was selected for use when evaluating release sample results. As summarized below, background soil sample SS14SS contained several detectable concentrations of SVOCs, inorganic elements, and PCBs. While the material collected for sample SS14SS appeared to be native, un-impacted soil, the detected analyte concentrations in the sample suggests this area may have been impacted by previous site activities. The detections in sample SS14SS likely are not representative of background conditions, however, the results for this sample are used in the release sample results evaluation in Section 6 as a conservative comparison standard.

5.2.1.2 Sample Results

VOCs were not detected in either of the background soil samples. Eleven SVOCs were detected in background sample SS14SS, ranging in concentration from 245 µg/kg (benzo(k)fluoranthene) to 1,400 µg/kg (benzoic acid). SVOCs were not detected in sample SS15SS. Eleven inorganic elements were detected in the background samples, ranging in concentration from 0.535 mg/kg (beryllium, SS15SS) to 503 mg/kg

(manganese, SS15SS). PCB Aroclor 1254 was detected in sample SS14SS at a concentration of 200 µg/kg; PCBs were not detected in sample SS15SS.

5.2.2 Background Intertidal Sediment

5.2.2.1 Sample Locations

One background intertidal sediment sample (IT08SD) was collected approximately 1.6 miles upstream of Hoy's Marine (Figure 3-2). The sample was collected from a depth of 0 to 3 inches bgs and the matrix matched the intertidal sediment samples collected from the site.

5.2.2.2 Sample Results

VOCs, PCBs, and butyltins were not detected in the background intertidal sediment sample. One SVOC, di-n-butylphthalate, was detected in the sample at a concentration of 208 µg/kg. Ten inorganic elements were detected in the sample, ranging in concentration from 0.25 mg/kg (beryllium) to 105 mg/kg (manganese).

5.2.3 Background Subtidal Sediment

5.2.3.1 Sample Locations

Two background subtidal sediment samples were collected approximately two miles upstream of Hoy's Marine (Figure 3-2), near the Oregon Oyster Company. The samples were collected from below the low water line and a depth of 0 to 6 inches bgs. Similar to the downstream subtidal sediment samples (Section 7.2.4), the background samples were collected from a transect perpendicular to the Yaquina River shore. The nearshore subtidal sediment sample (ST25SD) was located approximately 150 feet from shore, and the off-shore subtidal background sediment sample (ST26SD) was located approximately 250 feet from shore. The background sample matrices matched the samples collected near and downstream of the site.

5.2.3.2 Sample Results

In the nearshore subtidal background sediment sample (ST25SD), PCBs and butyltins were not detected. One SVOC, di-n-butylphthalate, was detected at a concentration of 342 µg/kg. Eleven inorganic elements were detected in the sample, ranging in concentration from 0.786 mg/kg (beryllium) to 172 mg/kg (manganese).

In the off-shore subtidal background sediment sample (ST26SD), SVOCs, PCBs, and butyltins were not detected. Eleven inorganic elements were detected in the sample, ranging in concentration from 0.717 mg/kg (beryllium) to 188 mg/kg (manganese).

6. POTENTIAL SOURCES

This section describes sample locations and analytical results of PA/SI samples obtained from potential sources. The sampling locations, sampling rationale, and analytical results are summarized in the following sections; Tables 6-1 and 6-2 summarize analytes detected at each potential source location investigated. Laboratory data sheets of analytical results for all samples are in Appendix C.

6.1 CONTAMINATED SOIL SOURCES

Previous investigations and the START site visit have identified a number of contaminated soil sources, including the former waste oil tank area of approximately 2,500 square feet (100 feet by 25 feet), the former waste and iron shavings disposal area of approximately 100 square feet (10 feet by 10 feet), the soil in front of the main shop of approximately 600 square feet (20 feet by 30 feet), the area of approximately 50 square feet (10 feet by 5 feet) at the entrance to and west slope of the paint shed, and the area of approximately 25 square feet (5 feet by 5 feet) around the diesel AST at the southeast corner of the spent grit shed.

6.1.1 Former Waste Oil Tank Area

6.1.1.1 Sample Locations

A total of three surface soil samples (SS01SS, SS02SS, and SS03SS) were collected from the former waste oil tank area located south of the main shop to determine potential contaminants associated with this source. The samples were collected from a small drainage path across the area that leads to the Yaquina River (Figure 3-1). The surface soil appeared to be fill material of mostly dry sandy silt mixed with gravels. No soil odor or staining was noted during sample collection.

6.1.1.2 Sample Results

Sample results are summarized in Table 6-1. Four SVOCs were detected at significant concentrations, ranging in concentration from 498 µg/kg (phenol) to 2,650 µg/kg (bis(2-ethylhexyl)phthalate). Seven inorganic elements were detected at significant concentrations, ranging from 3.2 mg/kg (silver) to 7,660 mg/kg (zinc).

6.1.2 Former Waste and Metal Shaving Disposal Area

6.1.2.1 Sample Locations

One surface soil sample (SS04SS) was collected from the former waste and metal shaving disposal area adjacent to the waste oil tank area. The sample was collected to determine potential contaminants associated with this source (Figure 3-1). The sample appeared to be a mixture of rusted metal, sandblasting grit, and fill materials of sandy silt mixed with gravel. No odor was noted during sample collection.

6.1.2.2 Sample Results

Sample results are summarized in Table 6-1. Two SVOCs were detected at significant concentrations in the sample, including isophorone (2,010 µg/kg AC) and phenol (857 µg/kg). Five inorganic elements were detected at significant concentrations, ranging from 266 mg/kg (chromium) to 2,750 mg/kg (zinc).

6.1.3 Soil in Front of Main Shop

6.1.3.1 Sample Location

Two surface soil samples (SS05SS and SS06SS) were collected from soil in front of the main shop (Figure 3-1). The samples were collected to determine potential contaminants that may have migrated via stormwater runoff from the concrete pad to the soil. The surface soil appeared to be fill materials of mostly dry sandy silt mixed with gravels. No odor was noted during sample collection.

6.1.3.2 Sample Results

Sample results are summarized in Table 6-1. VOCs were not detected at significant concentrations in either of the samples in front of the main shop. PCBs were not detected at significant concentrations in either sample. Four SVOCs were detected at significant concentrations, ranging from 302 µg/kg (phenol) to 7,370µg/kg (bis(2-ethylhexyl)phthalate). Nine inorganic elements were detected at significant concentrations, ranging from 2.4 mg/kg (silver) to 5,050 mg/kg (zinc).

6.1.4 Paint Storage Shed Area

6.1.4.1 Sample Locations

A total of five surface soil samples were collected from the paint storage shed area to determine potential contaminants associated with this source (Figure 3-1). Two samples (SS07SS and SS08SS) were collected from the surface soil at the entrance (north) of the shed where the soil might be contaminated from the traffic in and out of the paint shed. Three samples (SS09SS, SS10SS, and SS11SS) were collected from the west slope of the paint shed in the overland migration route from the paint shed to the Yaquina River. Samples SS07SS and SS08SS appeared to be a mixture of sandblasting grit and sand gravel fill material. Sample

SS09SS is located adjacent to the dry dock and appeared to be a mixture of sandblasting grit and sandy silt. Samples SS10SS and SS11SS are located underneath the dry dock and appeared to be sandy silt.

6.1.4.2 Sample Results

Sample results are summarized in Table 6-1. Samples SS01SS and SS11SS did not contain any analytes at significant concentrations. Seven VOCs were detected at significant concentrations in samples SS07SS and SS08SS, one VOC was detected at a significant concentration in sample SS09SS, and no VOCs were detected in the other samples collected at the Paint Shed. Significant VOC concentrations ranged from 8.8 µg/kg (1,2,3-trimethylbenzene) to 70.8 µg/kg (1,3,5-trimethylbenzene). Twelve SVOCs were detected at significant concentrations in at least one of the samples, ranging in concentration from 320 µg/kg (isophorone) to 14,600 µg/kg (bis[2-ethylhexyl]phthalate). Nine inorganic elements were detected at significant concentrations, ranging from 35.8 mg/kg (cobalt) to 11,300 mg/kg (copper). PCB Aroclor 1254 was detected at a significant concentration in one sample (SS09SS) at 850 µg/kg.

In general, samples SS08SS and SS09SS contained the most analytes at significant concentrations.

6.1.5 Spent Sandblasting Grit Storage Shed and Diesel AST Area

6.1.5.1 Sample Locations

A total of two surface soil samples were collected at the spent sandblasting grit storage shed and diesel AST area (Figure 3-1) to determine potential contaminants associated with this source. One sample (SS12SS) was collected near the diesel AST. Hydrocarbon odors and staining were noted in the area. The sample appeared to be a mixture of sandblasting grit and sand gravel fill material. The other sample (SS13SS) was collected west of the grit shed where waste oil drums were reportedly stored in the area. The sample appeared to be sandy clay mixed with sandblasting grit. No odor or stain were noted during sample collection.

6.1.5.2 Sample Results

Sample results are summarized in Table 6-1. Five SVOCs were detected at significant concentrations in sample SS12SS, SVOCs were not detected at significant concentrations in sample SS13SS. Significant SVOC concentrations ranged from 637 µg/kg (chrysene) to 13,600 µg/kg (bis[2-ethylhexyl]phthalate). Seven inorganic elements were detected at significant concentrations in sample SS12SS, inorganic elements were not detected at significant concentrations in sample SS13SS. Significant inorganic element concentrations ranged from 38.2 mg/kg (cobalt) to 2,540 mg/kg (zinc).

6.2 SPENT SANDBLASTING GRIT

Since the sandblasting operation is conducted outside on a dry dock without containment, spent sandblasting grit is pervasive throughout the site. A pile of approximately 300 cubic feet of spent sandblasting grit is stored in a dilapidating shed. The hazardous substances potentially associated with sandblasting grit and paint chips are discussed in Section 2.4. An important potential hazardous substance constituent of paint chips is TBT, associated with anti-foulant in the marine paints, as well as the degradation products of TBT, including DBT and MBT.

6.2.1 Sample Location

One spent sandblasting grit sample was collected from the grit pile in the storage shed to determine potential contaminants associated with this source. The sample was collected from a depth of 0 to 3 inches below the surface of the pile of spent grit.

6.2.2 Sample Results

Sample results are summarized in Table 6-2. Eleven SVOCs were detected above the CRQL in the spent grit sample, ranging in concentration from 172 µg/kg (di-n-butylphthalate) to 2,620 µg/kg (bis[2-ethylhexyl]phthalate). Eleven inorganic elements were detected in the grit sample, ranging in concentration from 1 mg/kg (beryllium) to 3,780 mg/kg (copper). Butyltins detected in the grit sample include MBT (210 µg/kg), DBT (1,600 µg/kg), TBT (4,800 µg/kg), and tetrabutyltin (40 µg/kg).

Insert Table 6-1

Insert Table 6-2

7. MIGRATION/EXPOSURE PATHWAYS AND TARGETS

The following sections describe migration/exposure pathways and potential targets within the site's range of influence (Figures 7-1 and 7-2). Analytical data QA forms from laboratory analyses are in Appendix C. This section discusses the groundwater migration pathway (7.1), surface water migration pathway (Section 7.2), soil exposure pathway (Section 7.3), and air migration pathway (Section 7.4).

7.1 GROUNDWATER MIGRATION PATHWAY

Hoy's Marine is underlain by well drained silty loam soils that formed in colluvium weathered from sedimentary rock. The depth to bedrock in the site area is relatively shallow, ranging from 3.5 to 6 feet below the ground surface (USDA 1997). In 1996, Hoy's Marine drilled a well on the site to supply the facility with water for drinking and industrial uses. The total well depth is not known, but the well reportedly is completed in bedrock. The well has never been used because the groundwater is brackish (E & E 1999a).

Groundwater is not used as a public drinking water source within 4 miles of the site (EPA 1998). Groundwater is used as a domestic source of drinking water within 4 miles of the site. The total estimated population served by groundwater wells within 4 miles of the site is 638 persons; however, all of the domestic wells are located in upland locations, hydraulically upgradient from the site. (ODWR 1999). Table 7-1 summarizes the groundwater drinking water population within 4 miles of the site.

7.2 SURFACE WATER MIGRATION PATHWAY

This section presents the pathway description, targets, sample locations, and sample results for the surface water migration pathway.

7.2.1 Pathway Description

Hoy's Marine is located on the bank of the Yaquina River. The dry dock where sandblasting operations are conducted is located over the high water line. During sandblasting operations, spent sandblasting grit and paint chips fall into the Yaquina River directly or are washed into the river during pressure washing of vessels. The intertidal area beneath the dry dock is the main probable point of entry (PPE) for contaminants from spent sandblasting grit and paint chips.

Stormwater runoff from the site is mainly sheet flow to the Yaquina River. The total drainage area of the site is approximately 0.75 acres. A road site ditch which connects to a buried culvert beneath the northern property line of the site collects stormwater runoff from the hill above the site and discharges into the Yaquina

River. Contaminants from various on-site sources as discussed in Section 6 may migrate to the Yaquina River by stormwater runoff across the site.

The Yaquina River flows north past the site and discharges into the Pacific Ocean approximately 4.7 miles downstream of Hoy's Marine (USGS 1984). The flow rate of the Yaquina River is 243 cubic feet per second (cfs) measured at the Yaquina Chitwood gaging station which is approximately 30 miles upstream of the site (USGS 1999). The river is tidally influenced adjacent to the site; tidal influence in the river reportedly extends up to 23 miles upstream from the river's mouth at the Pacific Ocean (Buckman 1999)..

The site is located on the 100-year flood plain (FIRM 1980). The native soil type in the site area is silty loam soils, however, the entire site itself is situated on artificial fill (USDA 1997; E & E 1999). The mean annual precipitation in Newport is 68.09 inches and annual snowfall is 1.1 inches (WRCC 1998). The 2-year, 24-hour rainfall average is 4.99 inches (WRCC 1998).

7.2.2 Targets

The 15-mile surface water pathway target distance limit (TDL) consists of 4.7 miles from the site downstream to the Pacific Ocean, and a 10.3-mile arc extending into the Pacific Ocean (Figure 7-2). The Yaquina River is tidally influenced and the extent of tidal influence is reportedly 23 miles upstream from the ocean; however, full reversal of the Yaquina River flow in the vicinity of the site has not been documented.

Within the 15-mile TDL, no drinking water is drawn from the Yaquina River (ODWR 1999). Local residents draw drinking water from several nearby creeks or springs which are tributaries of the Yaquina River (EPA 1998, ODWR 1999). None of these creeks or springs are hydraulically downgradient of the site. No municipal drinking water intakes are located in the Yaquina River downstream of the site (EPA 1998). The Yaquina River is not used for irrigation or commercial livestock watering downstream of the site (ODWR 1999).

Within the 15-mile TDL, the Yaquina River is used for sport fishing and other recreational and commercial activities, such as sailing, bank crabbing, and oyster farming. In 1996, the number of fish caught for sport in the Yaquina River included 17 spring Chinook salmon (*Oncorhynchus tsawytscha*), 3,603 fall Chinook salmon (*O. tsawytscha*), and 108 winter Steelhead *(O. mykiss*; ODFW 1998a). These data do not include the weight of fish caught by sport anglers. Coho salmon (*O. kisutch)* angling is no longer allowed in the Yaquina River due to its status as a federally listed endangered species (ONHP 1999). Shellfish such as Dungeness crab and red rock crab are also species targeted by sport fishermen in the Yaquina River. During the sampling event, the START observed two crab pots approximately 2,000 feet downstream of the site (Figure 3-2). No harvest data is available for shellfish.

Commercial fishing was eliminated from the Yaquina River in 1994 to allow it to be used only for recreational purposes. Commercial fishing is conducted in the Yaquina River near the ocean, approximately 4 miles downstream from the site; mainly for Pacific Herring. According to the ODFW, approximately 19,331

pounds of Pacific Herring were harvested within the Yaquina River at Newport, Oregon in 1998. Nineteen other species were harvested with the amount exceeding 100,000 pounds in 1998 (ODFW 1998b).

A commercial oyster farm is located on the Yaquina River approximately one mile upstream of the site. The annual production of oyster is approximately 120,000 pounds (Becker 1999)

Within the 15-mile TDL, the Yaquina River was proposed in May 1999 as a critical habitat for the federally listed threatened Coho salmon (Carlon 1999). The Yaquina River also is considered a critical migratory pathway, but not a spawning habitat, for Coho salmon (Buckman 1999). Approximately 4.7 miles downstream of the site, the Pacific Ocean coast is designated as the Oregon Islands National Wildlife Refuge and Oregon Islands Wilderness. The ocean beach south of the mouth of the Yaquina River is also designated the South Beach State Park, and Yaquina Bay State Park is located near the north side of the mouth of the Yaquina River (USGS 1984).

Within the 15-mile TDL, one regularly flooded emergent intertidal estuarine wetland is located approximately 0.3 mile across the river from the site. The total river frontage of this wetland is approximately 0.1 mile, which represents the total wetland frontage within the surface water TDL (USDI 1995).

7.2.4 Sample Locations

Eight intertidal sediment samples and twenty-six subtidal sediment samples were collected from the Yaquina River (Figure 3-2). The intertidal sediment samples included four samples adjacent to and underneath the marine ways at the site (IT01SD, IT02SD, IT03SD, and IT04SD), three samples in the intertidal zone of wetlands bordering the Yaquina River near the site (IT05SD, IT06SD, and IT07SD), and a background location approximately 1.6 miles upstream of the site (IT08SD).

The subtidal sediment samples were collected from locations downstream, adjacent to, and upstream of Hoy's Marine in the Yaquina River. The subtidal sediment samples were collected on transects perpendicular to the shore of the river, each transect contained two sample locations. The near-shore samples were collected at distances ranging from approximately 50 feet to 150 feet from the river bank on each transect, and the off-shore samples were collected at distances ranging from approximately 100 feet to 500 feet from the river bank on each transect. The distance of the subtidal sediment sample locations from the river bank was dependent on boat access, currents, and the presence of suitable sediment material for sampling.

7.2.5 Intertidal Sediment Sample Results

Sample results are summarized in Table 7-2. Four VOCs were detected at elevated concentrations with respect to background, all in sample IT01SD, ranging from 4.8 µg/kg (1,2-dichloroethene) to 7.2 µg/kg (trimethylbenzene). Twenty one SVOCs were detected at elevated concentrations in at least one of the samples, ranging in concentration from 158 µg/kg (9H fluorene) to 3,920 µg/kg (fluoranthene). Seven of these SVOCs, including acenaphthene, anthracene, benzo(b)fluoranthene, benzo(k)flouranthene, 2-chlorophenol, carbazole,

and dibenzofuran, were not detected at significant concentrations in the on-site sources and are not considered attributable to a release from the site. Twelve inorganic elements were detected at elevated concentrations in at least one of the samples, ranging in concentration from 11.6 mg/kg AC (antimony) to 5,370 mg/kg (copper). Antimony was not detected at significant concentrations in the on-site sources and is not considered attributable to a release from the site. PCB Aroclor 1254 was detected at elevated concentrations in all of the samples, ranging in concentration from 47 µg/kg to 290 µg/kg. Butyltins associated with spent grit were detected at elevated concentrations in all the samples, including MBT ranging from 140 µg/kg to 450 µg/kg, DBT ranging from 2,200 µg/kg to 3,400 µg/kg, TBT ranging from 4,100 µg/kg to 7,300 µg/kg, and tetrabutyltin ranging from 41 µg/kg to 96 µg/kg.

Elevated concentrations of metals, SVOCs, PCBs, and butyltins with respect to background are pervasive throughout the intertidal area of the site. Butyltins were not detected at elevated concentrations in the wetland intertidal sediment samples. The SVOCs benzoic acid (1,380 µg/kg) and, di-n-butylphthalate (635 µg/kg) were detected at elevated concentrations in wetland sample IT05SD. Chromium in wetland samples IT05SD (31 mg/kg) and IT07SD (26.8 mg/kg), and nickel in sample IT07SD (21.3 mg/kg) were detected at elevated concentrations.

7.2.6 Near-shore Subtidal Sediment Sample Results

Sample results are summarized in Table 7-3. Eighteen SVOCs were detected at elevated concentrations with respect to background in the samples, ranging in concentration from 208 µg/kg (fluoranthene) to 2,460 µg/kg (phenanthrene). Four of these SVOCs, including acenaphthene, anthracene, benzo(b)fluoranthene, and retene, were not detected at significant concentrations in the on-site sources and are not considered attributable to a release from the site. Nine inorganic elements were detected at elevated concentrations, ranging in concentration from 2.29 mg/kg (cadmium) to 2,440 mg/kg (copper). Cadmium was not detected in the on-site sources and is not considered attributable to a release from the site. PCB Aroclor 1254 was detected at elevated concentrations in two samples, both at a concentration of 160 µg/kg. Butyltins associated with spent grit were detected at elevated concentrations in the samples, including MBT ranging from 4.6 µg/kg to 160 µg/kg, DBT ranging from 15 µg/kg to 2,100 µg/kg, TBT ranging from 20 µg/kg to 3,000 µg/kg, and tetrabutyltin ranging from 18 µg/kg to 70 µg/kg.

For nearly all analytes detected in the nearshore subtidal sediment samples, a concentration gradient trend is evident with decreasing concentrations as distance from the site increases. The concentration gradient trend is effectively illustrated by three of the primary contaminants of concern: copper, TBT, and the PCB Aroclor 1254 (tracer analytes). Samples collected upstream of the site contained the tracer analytes at concentrations similar to the background concentrations. In the three nearshore subtidal sediment samples immediately adjacent to the site (ST11SD, ST13SD, ST15SD), the tracer analyte concentrations increase up to several orders of magnitude greater than upstream samples. The tracer analyte concentrations gradually

decrease with increasing distance downstream of the site. The farthest downstream samples contained tracer analyte concentrations at virtually the same concentration as the background nearshore subtidal sediment sample. Figure 7-3 illustrates the concentration trends for the three tracer analytes in the nearshore subtidal sediment samples.

It should be noted that SVOCs and butyltins were detected at elevated concentrations in all of the nearshore sediment samples downstream of the site, including fluoranthene, phenanthrene, and MBT in the most downstream sample (ST01SD). This location is approximately 3,000 feet downstream of the site, and is downstream of the crab pot locations observed during the fieldwork.

7.2.7 Off-shore Subtidal Sediment Samples

Sample results are summarized in Table 7-4. Twelve SVOCs were detected at elevated concentrations with respect to background in at least one of the samples, ranging in concentration from 184 µg/kg (benzo[g,h,i]perylene) to 3,400 µg/kg (dimethylphthalate). Two SVOCs detected at elevated concentrations, benz(a)anthracene and retene, were not detected at significant concentrations in the on-site sources and are not considered attributable to a release from the site. Six inorganic elements were detected at elevated concentrations, ranging from 138 mg/kg (nickel) to 576 mg/kg (manganese). The PCB Aroclor 1254 was detected at an elevated concentration in one sample at 29 mg/kg JL. Butyltins associated with spent grit were detected at elevated concentrations in several samples, including MBT ranging from 7.1 µg/kg to 130 µg/kg, DBT ranging from 17 µg/kg to 440 µg/kg, TBT ranging from 18 µg/kg to 1,400 µg/kg, and tetrabutyltin in one sample at a concentration of 31 µg/kg.

While the existence of a clearly definable trend of contaminant concentrations with distance from the site is not exhibited by the off-shore subtidal sediment sample data, the highest contaminant concentrations were detected in sample ST12SD, located off-shore of the Hoy's Marine site.

7.3 SOIL EXPOSURE PATHWAY

The site is readily accessible to passer-bys. No fence is installed around the property. During the START site visit, the START observed that vehicles on the Yaquina Bay Road were dusted by the spent sandblasting grit dispersed on the site (E & E 1999a).

Three to 20 on-site workers are employed at the Hoy's Marine, depending on the work load. No resident individuals, students, or terrestrial sensitive environments are located within 200 feet of the property (E & E 1999a).

No commercial agriculture or commercial livestock grazing, watering or production is conducted within the boundaries of the property, or near the site.

Table 7-5 provides population figures within a one mile radius of the site.

7.4 AIR MIGRATION PATHWAY

Sandblasting generates significant amounts of dust. In addition, the volatile organic compounds from open waste paint/thinner containers evaporate into the air. Approximately 10,407 people reside within a 4-mile radius of the site. Up to 20 workers are employed at the site, depending on the facility's work load. The nearest residence to the site is located approximately 1,000 feet south of the site along Yaquina Bay Road (USGS 1984; E & E 1999a).

Within the 4-mile air migration pathway TDL, three federal-listed threatened species and two federal-listed endangered species have been identified. Federal-listed threatened species include the western snowy plover (*Charadrius alexandrinus nivosus*), the bald eagle (*Haliaeetus leucocephalus*), and the Oregon silverspot butterfly *(Speyeria zerene hippolyta*). The bald eagle has been proposed to be removed from the federal threatened species list. Federal-listed endangered species include the salt-marsh bird's-beak (*Cordylanthus maritimus ssp palustris*) and the brown pelican (*Pelecaus occidentalis*; ONHP 1999). Approximately 3 miles west of the site, the entire Pacific ocean coast is designated as the Oregon Islands National Wildlife Refuge and Oregon Islands Wilderness. This area is also designated the South Beach State Park (south of the Yaquina River) and the Yaquina Bay State Park (north of the Yaquina River) (USGS 1984). Within the 4-mile TDL, a total of 468 acres of wetland are identified (EPA 1998). Table 7-6 provides population and wetland acreage within a 4-mile radius of the site. No commercial agriculture or silverculture are located within one-half mile of the site.

Insert Table 7-1

Insert Table 7-2

Insert Table 7-3

Insert Table 7-4

Insert Table 7-5

Insert Table 7-6

Insert Figure 7-1

Insert Figure 7-2

Insert Figure 7-3

8. SUMMARY AND CONCLUSIONS

In May 1999, the START conducted PA/SI sampling activities at the Hoy's Marine site located in Newport, Oregon. The site is used for boat repairing and refurbishing. Operations conducted at the site include sandblasting boat hulls, boat hull painting, and minor boat repairs. Ships are brought onto the facility's dry docks by marine ways that run into the adjacent Yaquina River. Grit used in the sandblasting operation is not contained, and spent grit covers much of the site surface, including the intertidal sediments of the Yaquina River beneath the dry dock and marine ways. Stained soils also exist throughout the site, particularly in areas immediately surrounding the main shop, the paint shed, and an area used for storage and dispensing of petroleum products.

The PA/SI involved the collection of samples from potential hazardous substance sources on-site, and from target areas potentially impacted through contaminant migration. A total of 54 samples were collected for the PA/SI, including background and QA samples. Samples were collected from on-site soil, spent grit, and from intertidal and subtidal sediments in target areas. Samples were analyzed by a commercial laboratory under subcontract to the START and by the EPA Manchester Laboratory.

8.1 SOURCES

Samples were collected from five on-site soil source areas, and from the spent grit stored in an on-site shed.

The on-site soil sources contained significant concentrations of VOCs, SVOCs, inorganic elements, and PCBs. VOCs were most prevalent at the paint storage shed area. SVOCs and inorganic elements were detected at significant concentrations in all of the on-site soil sources. PCB Aroclor 1254 was detected at signficant concentrations at the paint storage shed area.

The spent grit sample concentrations were not compared to a background sample, however, examination of the spent grit analytical data indicates this material is a source of SVOCs, inorganic elements, and butyltins. The most notable constituents of the spent grit sample include copper (3,780 mg/kg), manganese (2,850 mg/kg), zinc (1,710 mg/kg), DBT (1,600 µg/kg), and TBT (4,800 µg/kg).

8.2 TARGETS

This section addresses the sample results as they relate to the surface water migration pathway. Intertidal and subtidal sediment samples collected from the Yaquina River contain elevated concentrations of

SVOCs, inorganic elements, and butyltins. With a few exceptions, all were detected in the on-site soil sources and/or the spent grit.

The intertidal sediment samples collected at Hoy's Marine indicate that contaminants from the site are entering the Yaquina River through runoff and sandblasting operations at the site. This conclusion is supported by visual observations of spent grit and sheens on the intertidal sediments below the site's marine ways. Two SVOCs and two inorganic elements were detected at elevated concentrations in the intertidal wetland sediment samples collected across the Yaquina River from the site.

The nearshore subtidal sediment samples reveal an obvious concentration trend. Contaminant concentrations upstream of the site are at or near background concentrations. These same contaminants increase in concentration by orders of magnitude in the samples collected immediately adjacent to the site, and then decrease in concentration with increasing distance downstream of the site. While the existence of a similar trend in the offshore subtidal sediment samples is not as evident as in the nearshore samples, the highest contaminant concentrations detected in the offshore sediment samples were found in the sample immediately offshore of the site.

To further characterize the magnitude of the intertidal and subtidal sediment contamination adjacent to the site in the Yaquina River, a comparison was conducted of the maximum contaminant concentrations detected during the PA/SI to potentially relevant sediment quality benchmarks (SQBs). Published SQBs are not available for all contaminants associated with the Hoy's Marine site, including benchmarks for butyltin bulk sediment chemistry data. All positive results, regardless of whether they were above or below their respective CRQL/CRDLs were included in this evaluation.

Table 8-1 presents the comparison of the maximum sediment concentrations for contaminants attributable to the site to SQBs developed for the National Oceanic and Atmospheric Administration (NOAA). NOAA's Effects Range-Low (ER-L) values for marine and estuarine sediments predict adverse biological effects from contaminants in sediments, and maybe appropriate SQBs for the Yaquina River (Jones and Suter 1997). Six SVOCs, six inorganic elements, and PCB Aroclor 1254 exceeded the NOAA ER-L SQBs in at least one of the sediment samples collected for the PA/SI. Nearly all of the SQB exceedences were in samples collected from the intertidal zone at Hoy's Marine, or in nearshore sediment samples collected adjacent to and downstream of the site. Nickel in one of the wetland intertidal sediment samples was detected above the SQB.

8.3 CONCLUSIONS

Results of the PA/SI indicate that the Hoy's Marine site is a source of hazardous substance contamination, including VOCs, SVOCs, inorganic elements, PCBs, and butyltins. Riverbend Marine, an upstream boat refurbishing facility, does not appear to be contributing to downstream contamination based on the sediment concentration gradients. The PA/SI documented that contaminants have been and continue to be released to the Yaquina River through site runoff and facility practices. Elevated levels of contaminants

documented during the PA/SI have impacted an approximately 0.6 mile linear stretch of the Yaquina River adjacent to and downstream of the site, and includes areas where sport crab pots were observed during the PA/SI fieldwork. This contaminantion could potentially impact the sport and commerical fisheries, and sensitive environments in the site area, and the oyster farming industry in the Yaquina River.

Insert Table 8-1

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APPENDIX A
PHOTOGRAPHIC DOCUMENTATION

Insert photographic documentation sheets

Insert photographs

APPENDIX B

GPS DATA

This appendix Available upon request

APPENDIX C

DATA VALIDATION MEMORANDA AND ANALYTICAL RESULTS

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