Independent Remedial Action Report
Underground Storage Tank Closure

Duwamish Shipyard
Seattle, Washington

October 6, 2000

Submitted to:	Department of Ecology, Northwest Region
Prepared for:	Duwamish Shipyard, Inc.
Prepared by:	RK Kuroiwa, PE

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Prepared by
RK Kuroiwa, PE
7053 7th Avenue NW
Seattle, Washington 98117

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UNDERGROUND STORAGE TANK CLOSURE
DUWAMISH SHIPYARD
SEATTLE, WASHINGTON

PROJECT BACKGROUND / SITE DESCRIPTION

Introduction and Summary

The Independent Remedial Action conducted at the Duwamish Shipyard underground storage tank (UST) site was performed in general accordance with the Washington State Department of Ecology's (Ecology) Model Toxics Control Act Cleanup Regulation (MTCA), its proposed amendments, and its Guidance for Remediation of Releases from Underground Storage Tanks. Figure 1 provides a site vicinity map for the Duwamish Shipyard, which is located on West Marginal Way along the Duwamish River.

Excavation of petroleum-contaminated soil (PCS) was performed at the UST site to address the discovery of petroleum-affected soils during the closure of four USTs. As detailed later in this report, petroleum contamination was discovered in soil by Quality Tank Service, Inc. during the permanent removal and closure of the USTs. Following the removal of the four tanks, the RK Kuroiwa, PE company (RKK Company) returned to the site to further excavate and sample excavation sidewalls and bottoms as an Independent Remedial Action.

Using Ecology's MTCA Method A soil cleanup levels for industrial properties (restricted uses), soil excavation and confirmation soil sampling continued from the former UST excavation bottoms and sidewalls until removal of the PCS was completed. A total of 18 bottom and sidewall confirmation soil samples were collected from the approximately 30-foot by 40-foot-wide and 7-foot deep UST excavation area. And except for bottom sample B4(1) and sidewall sample SS-3(2), which contained total petroleum hydrocarbons (TPH) quantified as gasoline slightly above the site's cleanup level of 100 mg/kg, all confirmation soil samples contained the target chemical compounds (TPH-G, TPH-D, BETX, and total lead) at or below the site soil cleanup levels.

As the available and tabulated chemical data indicate (Table 1), the analytical results of sidewall and bottom samples collected at the final UST excavation limits are at or below the site's cleanup levels for target chemical compounds. Based on these data, it is concluded that remediation at the Duwamish Shipyard UST site is complete and that no further action is required.

Site Location and Tank Information

Site Name:	Duwamish Shipyard, UST Closure Location
Street Address:	5658 West Marginal Way, Seattle, Wa 98106
County:	King
Site Contact:	Mr. Kyle McCleary, (206) 767-4880
Map of Site Location:	See Figure 1
Quarter/Quarter:	Section 30 of Township 24 north, and Range 4 east
Detailed Site Map:	See Figure 2
UST Information:	Tank 01 – 1,000 gallon leaded gasoline Tank 02 – 3,000 gallon diesel Tank 03 – 3,000 gallon unleaded gasoline Tank 04 – 3,000 gallon unleaded gasoline
UST Closure Date:	June 26, 2000 by removal
Ecology Site ID:	1429

Site Setting

The Duwamish Shipyard site is located within an industrial corridor along the west side of the Duwamish River, which supports other marine repair, portland cement production, and related activities (Figure 1). The former USTs were located within the central area of the property, immediately adjacent to an office building and along an asphalt roadway. The former USTs provided diesel and gasoline fuel for Duwamish Shipyard vehicles and equipment.

The shipyard is essentially flat and completely paved with asphalt or concrete foundation buildings. Site surficial soil consists of fill (river dredge spoils) to a depth of at least 7 feet below ground surface (bgs). The USTs were installed in an excavation approximately 6 feet deep.

During UST removal and subsequent remedial action, water was encountered in the bottom of the excavation at a depth of approximately 5 to 6 feet bgs. This water accumulated at the bottom of the UST excavation and was subsequently pumped out in order to continue soil overexcavation and confirmation sampling. The observed water is likely a shallow groundwater occurrence. No tidal effects from the Duwamish River were observed during remedial activities.

UST REMOVAL AND REMEDIAL ACTION

UST Closure and Site Assessment

The Duwamish Shipyard supported four USTs and associated product piping to provide in-house fueling for vehicles and equipment. Temporary UST decommissioning for UST Nos. 02, 03, and 04 was reported to Ecology in January 1999 (Appendix A). On June 28, 2000, all four USTs and associated piping were uncovered and removed by Quality Tank Services, Inc., a licensed site assessor and tank decommission service company. Permanent tank decommissioning and closure activities were reported to Ecology on September 18, 2000 (see Appendix A for a copy of the Ecology Closure Notice).

As reported by the Duwamish Shipyard, petroleum contamination was observed and measured at the time of UST removal and closure. Two soil samples collected during UST decommissioning contained TPH quantified as gasoline at concentrations of 130 and 650 mg/kg. The four USTs were decommissioned and transported off the site; all associated excavation soils and spoils were placed on site within a protected area. Approximately 60 cubic yards of soil was excavated during the UST removal and stored on site.

As a result of the tank decommissioning findings, the Duwamish Shipyard elected to perform independent remedial action within the former UST area, as detailed and summarized herein.

Petroleum-Contaminated Soil Excavation

On August 31, 2000, the RKK Company returned to the Duwamish Shipyard UST site to perform independent remedial action activities. In cooperation with a Duwamish Shipyard subcontractor, PCS (as identified in the field using head-space readings and visual observations) was overexcavated from the sidewalls and bottoms of the former UST excavation area. Any water accumulating at the bottom of the excavation was immediately removed from the excavation by a sump pump.

Following the initial excavation activities, confirmation soil samples were collected from the sidewalls and bottom of the excavation (as described in the next section). For locations where soil samples exceeded the site cleanup levels, overexcavation of the subject sidewall and bottom was performed and the area was resampled. This procedure was repeated until soil samples contained target constituent concentrations at or below the site cleanup levels.

A total of approximately 20 cubic yards of overexcavation PCS was removed from the former UST area and stockpiled separately. The final UST excavation footprint and depth are shown on Figure 2.

Confirmation Soil Sampling and Analysis

In total, 18 confirmation soil samples were collected from the UST overexcavation area during site remediation. The analytical results for all confirmation samples, arranged by sidewall and bottom samples, are summarized in Table 1. In general, one bottom sample was collected immediately below the former location of each UST; in addition, two soil samples from each sidewall of the excavation were collected at approximately 5 to 7 feet bgs. The approximate location and depth of each sidewall and bottom sample are shown on Figure 2.

Except for soil sample B4(1) which contained TPH quantified as gasoline at 800 mg/kg, all bottom samples contained TPH-G, TPH-D and –Oil, BETX, and total lead concentrations at or below the site cleanup levels. Confirmation soil sample B1(2) contained benzene at 0.7 mg/kg, just slightly above the cleanup level of 0.5 mg/kg.

Except for soil sample SS-3(2) which contained TPH quantified as gasoline at 300 mg/kg, all sidewall samples contained TPH-G, TPH-D and –Oil, BETX, and total lead concentrations at or below the site's cleanup levels.

All soil samples were collected and analyzed in conformance with Ecology's MTCA and its Guidance for Remediation of Releases from Underground Storage Tanks. Confirmation soil samples were analyzed by an Ecology certified mobile laboratory provided by Transglobal Environmental Geosciences, Inc. of Lacey, Washington. Copies of laboratory certificates of analysis for soil sampling are available in Appendix B.

PCS Treatment by Landfarming

Approximately 60 cubic yards of petroleum-contaminated soil generated during UST removal (generated on June 28, 2000 by Quality Tank Service, Inc.) was immediately placed in an on-site landfarm. The landfarm was constructed on an existing asphalt pavement and protected on the sides with ecology blocks. The soil was placed in a 24- to 36-inch lift and tilled and turned approximately every 2 weeks for 10 weeks.

On August 31, 2000, the landfarm soil was sampled and analyzed. The landfarm was divided into three equal sections and 3 six-point composite soil samples were collected. Landfarm profile soil samples SP-1, SP-2, and SP-3 were

analyzed for TPH-G, TPH-D and –Oil, BETX, and total lead; all soil samples contained target chemical constituents below the site cleanup levels. A presentation of the soil analysis results is provided in Table 1.

Based on the results of landfarm profile soil sampling and analysis, the treated soil was returned to the former UST excavation as backfill material.

PCS Treatment by Recycling

Industrial Services, Inc. hauled the remaining 20 cubic yards of PCS off site for recycling, which was generated during subsequent remedial activities performed by RKK COMPANY. The PCS was treated by thermal incineration by a local Portland cement producer, La Farge Cement Company. The treated soil will be recycled as part of their cement production process.

Accumulated Water within Excavation

Approximately 100 gallons of accumulated water were removed from the excavation during remediation activities to allow overexcavation and soil sampling. Duwamish Shipyard handled the collected water either by an on-site treatment facility or by an off-site treatment service.

CONCLUSIONS

Between June and September 2000, the Duwamish Shipyard completed the decommissioning of four on-site USTs and subsequent independent remedial action of the UST area.

In summary the following activities were accomplished during the decommissioning of the USTs and associated piping and independent remedial action:

- Temporary decommissioning of Tanks 02, 03, and 04, as reported to Ecology in June 1999 (see Appendix A).
- Permanent decommissioning of Tanks 01, 02, 03, and 04 as reported to Ecology in September 2000 (see Appendix A). The tanks and associate piping were inerted and hauled off site. PCS was placed in an on-site landfarm and treated.
- Performed independent remedial action on the former UST area on August 31, 2000.
- Overexcavated PCS was treated at an on-site landfarm by bioremediation and off site by recycling.
- Backfilled and compacted the excavation after completing independent remedial action.
- Prepared this IRAP report and submit the report to Ecology.

Based on the information provided in this UST Closure report, it is concluded that independent remedial action at the Duwamish Shipyard UST site is complete and that no further action is required.

LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Duwamish Shipyard for specific application to the referenced property. This report is not intended to represent a legal opinion. No other warranty, expressed or implied, is made.

Any questions regarding the work and this report, the presentation of the information, and the interpretation of the data should be referred to RK Kuroiwa, PE.

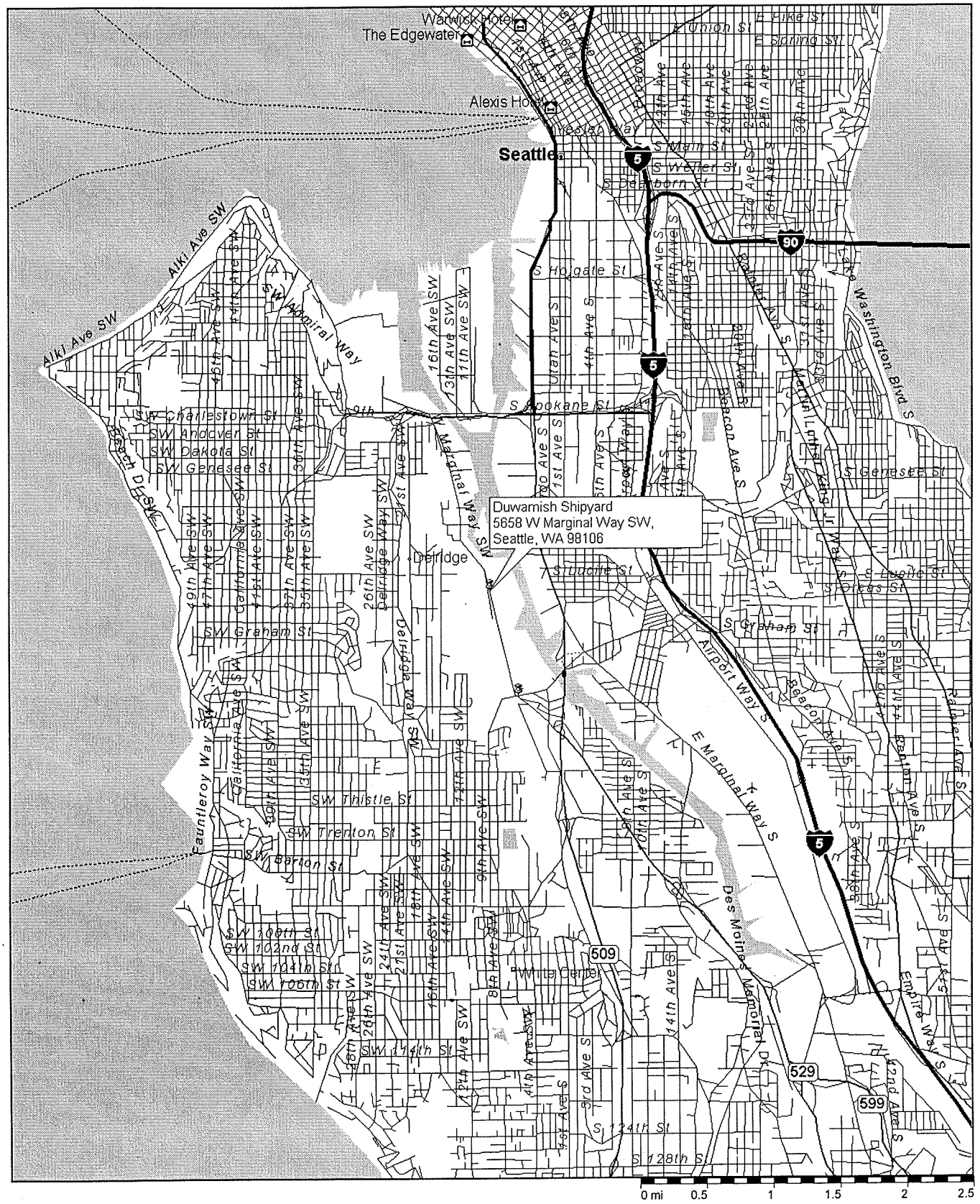
Table 1
Summary of Confirmation Soil Sample Analytical Results
Duwamish Shipyard UST Closure and Site Remediation
August 31, 2000

Sample ID	Sample Depth	Sample Location Description	Concentration in mg/kg					
			TPH-G	TPH-D	TPH-Oil	Benzene	Toluene	Ethylben
Bottom Confirmation Soil Samples								
B1	6.5	Former Tank No. 02 bottom	3,200	-	-	-	-	-
B1 (2)	7.0	Former Tank No. 02 bottom	<10	560	<40	0.7	<0.05	0.6
B2	6.0	Former Tank No. 01 bottom	<10	330	200	<0.05	<0.05	<0.0
B3	6.5	Center of UST area bottom	170	460	<40	0.4	1.4	<0.0
B3 (2)	6.5	Center of UST area bottom	-	4,000	-	-	-	-
B4	6.5	Former Tank No. 03 bottom	88	<20	<40	3.5	1.2	0.81
B4 (1)	7.0	Former Tank No. 03 bottom	800	340	<40	<0.05	0.2	3.3
B5	5.5	Former Tank No. 04 bottom	<10	<20	<40	<0.05	<0.05	<0.0
Sidewall Confirmation Soil Samples								
SS-1	6.0	North-west sidewall	140	900	100	-	-	-
SS-2	5.5	North-east sidewall	1,900	210	<40	1.6	2.0	<0.0
SS-2 (2)	6.0	North-east sidewall	76	225	<40	<0.05	<0.05	<0.0
SS-3	5.5	East-north sidewall	3,400	-	-	-	-	-
SS-3 (2)	5.5	East-north sidewall	300	130	<40	0.38	<0.05	<0.0
SS-4	5.0	East-south sidewall	<10	39	<40	<0.05	<0.05	<0.0
SS-5	5.5	South-east sidewall	<10	<20	<40	<0.05	<0.05	<0.0
SS-6	5.5	South-west sidewall	<10	<20	<40	<0.05	<0.05	<0.0
SS-7	6.0	West-south sidewall	<10	<20	<40	<0.05	<0.05	<0.0
SS-8	6.0	West-east sidewall	<10	64	<40	<0.05	<0.05	<0.0
Landfarm Profile Soil Samples								
SP-1	-	Section 1 landfarm	<10	200	<40	<0.05	<0.05	<0.0
SP-2	-	Section 2 landfarm	<10	96	<40	<0.05	<0.05	<0.0
SP-3	-	Section 3 landfarm	<10	<20	<40	<0.05	<0.05	<0.0
MTCA Method A Residential (Current)			100	200	200	0.5	40	20
MTCA Method A Industrial (Current)			100	200	200	0.5	40	20
MTCA Method A Un-Restricted (Proposed)			100	2,000	2,000	0.5	7.1	6.0
MTCA Method A Restricted (Proposed)			100	2,000	2,000	0.5	40	20

< Not detected above laboratory detection limit indicated.

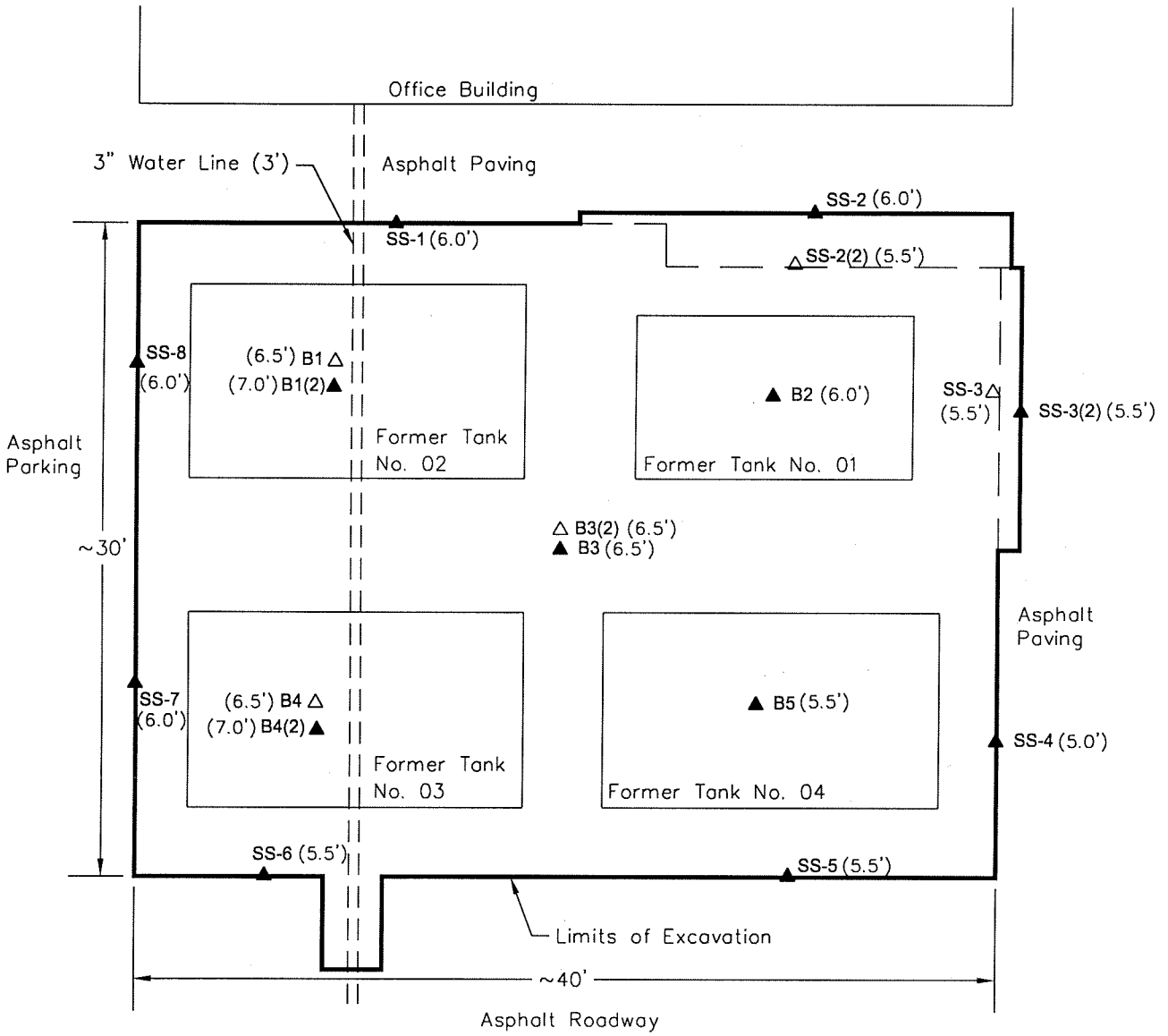
\- Indicates sample not collected or analyzed.

Indicates sample location overexcavated.



MICROSOFT AUTOMAP
Streets Plus

Figure 1 - Site Vicinity Map



Legend

▲ B1(2) (7.0') Confirmation Sample Location and Designation (Sample Depth bgs)

△ B1 (6.5') Overexcavated Sample Location and Designation (Sample Depth bgs)

Limit of Excavation

N

0 8 16

Approximate Scale in Feet

DATE: 09/21/00 11:23am
DWG NAME: G:\project\Clients\Kuroiwa\duwamish\vrkduw01.dwg

FIGURE 2

Site Sampling Plan

DUWAMISH SHIPYARD
INDEPENDENT REMEDIAL ACTION
SEATTLE, WASHINGTON

RK Kuroiwa, PE September 25, 2000

Appendix A

Notice for UST Closure and Decommissioning Washington State Department of Ecology

Independent Remedial Action Report
Underground Storage Tank Closure

Duwamish Shipyard
Seattle, Washington

UNDERGROUND STORAGE TANK
Closure and Site Assessment Notice

WASHINGTON STATE DEPARTMENT OF ECOLOGY

See back of form for instructions

FOR OFFICE USE ONLY
Site ID #: _____
Owner ID #: _____

Please ✓ the appropriate box(es)
☐ Temporary Tank Closure ☐ Change-In-Service ☑ Permanent Tank Closure ☐ Site Check/Site Assessment

Site Information

Site ID Number _____
(Available from Ecology if the tanks are registered)
Site/Business Name Duwamish Shipyard
Site Address 5658 W Marginal (Street)
City/State Seattle WA
Zip Code 98106 Telephone 206 767-4880

Owner Information

(This form will be returned to this address)
UST Owner/Operator Duwamish Shipyard
Mailing Address 5658 W Marginal Wy SW (Street)
(P.O. Box)
City/State Seattle WA
Zip Code 98106 Telephone ( ) _____

X Owner's Signature K L McClary

Tank Closure/Change-In-Service Company

Service Company Quality Tank Service, Inc
Certified Supervisor Todd Salamonsen Decommissioning Certification No. _____
Supervisor's Signature Todd Salamonsen
Address 13739 (P.O. Box)
Mill Creek (City) WA (State) 98082 (Zip Code) Telephone (425) 337-1564

Site Check/Site Assessor

Certified Site Assessor Todd Salamonsen
Address (Street) P.O. Box 13739
City Mill Creek State WA Zip Code 98082 Telephone (425) 337-1564

Tank Information

Tank ID	Closure Date	Closure Method	Tank Capacity	Substance Stored
01	06/28/00	removal	3000	diesel
02	06/28/00	removal	1000	gasoline
03	06/28/00	removal	3000	gasoline
04	06/28/00	removal	3000	gasoline

Contamination Present at the Time of Closure

☑ Yes ☐ No ☐ Unknown

Check unknown if no obvious contamination was observed and sample results have not yet been received from analytical lab.

☑ Yes ☐ No

If contamination is present, has the release been reported to the appropriate regional office?

To receive this document in an alternative format, contact the TOXICS CLEANUP PROGRAM at 1-800-826-7716 (voice) OR (360) 407-6006 (TDD).

UNDERGROUND STORAGE TANK
Site Check/Site Assessment Checklist

ECOLOGY

For Office Use Only	
Owner #	
Site #	

INSTRUCTIONS:

When a release has **not** been confirmed and reported, this Site Check/Site Assessment Checklist must be completed and signed by a person registered with Ecology. **The results of the site check or site assessment must be included with this checklist.** This form must be submitted to Ecology at the address shown below within 30 days after completion of the site check/site assessment.

SITE INFORMATION: Include the Ecology site ID number if the tanks are registered with Ecology. This number may be found on the tank owner's invoice or tank permit.

TANK INFORMATION: Please list all tanks for which the site check or site assessment is being conducted. Use the owner's tank ID numbers if available, and indicate tank capacity and substance stored.

REASON FOR CONDUCTING SITE CHECK/SITE ASSESSMENT: Please check the appropriate item.

CHECKLIST: Please initial each item in the appropriate box.

SITE ASSESSOR INFORMATION: This form must be signed by the registered site assessor who is responsible for conducting the site check/site assessment.

Underground Storage Tank Section
Department of Ecology
P. O. Box 47655
Olympia, WA 98504-7655

SITE INFORMATION

Site ID Number (on invoice or available from Ecology if the tanks are registered): _____

Site/Business Name: Duwamish Shipyard

Site Address: 5658 W Marginal Wy SW (Street) Telephone: (206) 767-4880

Seattle (City) WA (State) 98106 (ZIP Code)

TANK INFORMATION

Tank ID No.	Tank Capacity	Substance Stored
01	3000 gallon	diesel
02	1000 gallon	gasoline
03	3000 gallon	gasoline
04	3000 gallon	gasoline

REASON FOR CONDUCTING SITE CHECK/SITE ASSESSMENT

Check one:

- ____ Investigate suspected release due to on-site environmental contamination
- ____ Investigate suspected release due to off-site environmental contamination.
- ____ Extend temporary closure of UST system for more than 12 months.
- ____ UST system undergoing change-in-service.
- ____ UST system permanently closed-in-place.
- ✓ UST system permanently closed with tank removed.
- ____ Abandoned tank containing product.
- ____ Required by Ecology or delegated agency for UST system closed before 12/22/88.
- ____ Other (describe): _____

UNDERGROUND STORAGE TANK
Closure and Site Assessment Notice

See back of form for instructions

FOR OFFICE USE ONLY
Site ID #:
Owner ID #:

Please ✓ the appropriate box(es)
☒ Temporary Tank Closure ☐ Change-in-Service ☐ Permanent Tank Closure ☐ Site Check/Site Assessment

Site Information

Site ID Number 1429
(Available from Ecology if the tanks are registered)
Site/Business Name Duwamish Shipyard
Site Address 5658 West Marginal Way SW (Street)
City/State Seattle, WA
Zip Code 98106 Telephone (206) 767-4880
Owner's Signature Kelly McClay

Owner Information
(This form will be returned to this address)

UST Owner/Operator Duwamish Shipyard
Mailing Address 5658 West Marginal Way SW (Street)
(P.O. Box)
City/State Seattle, WA
Zip Code 98106 Telephone (206) 767-4880

Tank Closure/Change-in-Service Company

Service Company Evergreen Environmental Services, Inc.
Certified Supervisor Guy W. Forgey Decommissioning Certification No. 0875169-26
Supervisor's Signature Guy Forgey
Address 17108 9th Ave. SE (Street) (P.O. Box)
Mill Creek (City) WA (State) 98012 (Zip Code) Telephone (425) 787-8987

Site Check/Site Assessor

Certified Site Assessor
Address (Street) (P.O. Box)
City State Zip Code Telephone ( )

Tank Information

Tank ID	Closure Date	Closure Method	Tank Capacity	Substance Stored
# 2	12/22/98	TEMPORARY	1,000	DIESEL
# 3	12/22/98	TEMPORARY	3,000	UL
# 4	12/12/98	TEMPORARY	3,000	UL

Contamination Present at the Time of Closure

☐ Yes ☐ No ☒ Unknown

Check unknown if no obvious contamination was observed and sample results have not yet been received from analytical lab.

☐ Yes ☐ No

If contamination is present, has the release been reported to the appropriate regional office?

To receive this document in an alternative format, contact the TOXICS CLEANUP PROGRAM at 1-800-826-7716 (voice) OR (360) 407-6006 (TDD).

DUWAMISH SHIPYARD, INC.

11/13/1998

Site I.D.: 1429 DUWAMISH SHIPYARD, INC.
Site UBI Number: 1780446110010001 Phone #: (206) 767-4880
Address: 5658 W MARGINAL WY SW City: SEATTLE

Total Tanks at Site: 4 **Tanks Not in Compliance: 4**

Tank: 1 Status: Temporarily Closed Permit Date: 6/30/99 Upgrade Date: Install Date: 1/1/68

Tank Construction	Tank Material	Tank Corrosion Protection	Pipe Construction	Pipe Material	Pipe Corrosion Protection
Single Wall Tank	Steel-Unprotected	None	Steel - Unprotected	Single Wall Pipe	None

Spill Prevention: None Overfill Prevention: None Tank Pass: No

Tank: 2 Status: Operational Permit Date: 6/30/99 Upgrade Date: Install Date: 7/30/75

Tank Construction	Tank Material	Tank Corrosion Protection	Pipe Construction	Pipe Material	Pipe Corrosion Protection
Single Wall Tank	Steel-Unprotected	None	Steel - Unprotected	Single Wall Pipe	None

Spill Prevention: None Overfill Prevention: None Tank Pass: No

Tank: 3 Status: Operational Permit Date: 6/30/99 Upgrade Date: Install Date: 11/5/79

Tank Construction	Tank Material	Tank Corrosion Protection	Pipe Construction	Pipe Material	Pipe Corrosion Protection
Single Wall Tank	Steel-Unprotected	None	Steel - Unprotected	Single Wall Pipe	None

Spill Prevention: None Overfill Prevention: None Tank Pass: No

Tank: 4 Status: Operational Permit Date: 6/30/99 Upgrade Date: Install Date: 11/5/79

Tank Construction	Tank Material	Tank Corrosion Protection	Pipe Construction	Pipe Material	Pipe Corrosion Protection
Single Wall Tank	Steel-Unprotected	None	Steel - Unprotected	Single Wall Pipe	None

Spill Prevention: None Overfill Prevention: None Tank Pass: No

Facility Compliance Tag: No

Tank #2 - Diesel 1,000 gal

Tank #3 Unleaded 3,000 gal

Tank #4 Unleaded 3,000 gal

International Fire Code Institute

GUY W. FORGEY

is CERTIFIED in UNDERGROUND STORAGE TANK DECOMMISSIONING

The International Fire Code Institute attests that the individual named on this certificate has satisfactorily demonstrated knowledge of national underground storage tank regulations and industry standards in effect on this date in the category shown above by successfully completing the prescribed written examination.

Witnessed by our hand

Certificate No. 0875169-26

Issued April 18, 1998

For the International Fire Code Institute

Chairman

Appendix B

Laboratory Certificates of Analysis
Transglobal Environmental Geosciences, Inc.

Independent Remedial Action Report
Underground Storage Tank Closure

Duwamish Shipyard
Seattle, Washington

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC

800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127

Mobile Environmental Laboratories
Environmental Sampling Services

Telephone: 360-459-4670
Fax: 360-459-3432

September 11, 2000

Roy Kuroiwa
RK Kuroiwa, PE
7053 7th Avenue NW
Seattle, WA 98117

Dear Mr. Kuroiwa:

Please find enclosed the analytical data report for the Duwamish Shipyard Project in Seattle, Washington. Mobile Laboratory services were conducted on August 31, 2000. Soil samples were analyzed on site for Diesel and Oil by NWTPH-Dx/Dx Extended, Gasoline by NWTPH-Gx, and BTEX by Method 8021B. Soil samples were analyzed off site for Pb by Method 7420 on September 1, 2000.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this work is also enclosed.

TEG Northwest appreciates the opportunity to have provided geosampling and analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A. Korosec
President

QA/QC FOR ANALYTICAL METHODS

GENERAL

The TEG Northwest Laboratory quality assurance and quality control (QA/QC) procedures are conducted following the guidelines and objectives which meet or exceed certification/-accreditation requirements of California DOHS, Washington DOE, and Oregon DEQ. The Quality Control Program is a consistent set of procedures which assures data quality through the use of appropriate blanks, replicate analyses, surrogate spikes, and matrix spikes, and with the use of reference standards that meet or exceed EPA standards.

When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4^{O} C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

TPH-Gasoline, TPH-Diesel
(Gasoline and/or Diesel, Modified EPA 8015, NWTPH-Gx and NWTPH-Dx)

A check standard is run at the beginning of the day. 1) A close standard is run at the end of the day. 2) Both open and close standards must be within 15% of the continuing calibration curve value. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135% unless high sample concentrations interfere with the determination of the recovery percentage. A duplicate sample is run at a rate of 1 per 10 samples. At least 1 method blank is run per 20 samples analyzed.

Purgeable Volatile Aromatics
(BTEX, EPA 8021B)

A check standard is run at the beginning of the day. The check standard is run at the end of the day. Both open and close standards must be within 15% of the continuing calibration curve value. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135% unless high sample concentrations interfere with the determination of the recovery percentage. At least 1 method blank is run per day.

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

DUWAMISH SHIPYARD PROJECT
Seattle, Washington
Roy Kuroiwa, P.E.

Analyses of BTEX (EPA 8021B) & Gasoline (NWTPH-Gx) in Soil.

Sample Number	Date Analyzed	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	Gasoline (mg/kg)	Surrogate Recovery(%)
Method Blank	8/31/00	nd	nd	nd	nd	nd	98
B2	8/31/00	nd	nd	nd	nd	nd	103
SS-2	8/31/00	1.6	2.0	nd	0.3	1900	105
B1	8/31/00	--	--	--	--	3200	int
B4	8/31/00	3.5	1.2	0.81	2.1	88	108
B3	8/31/00	0.4	1.4	nd	nd	170	100
SS-1	8/31/00	--	--	--	--	140	108
SS-2(2)	8/31/00	nd	nd	nd	nd	76	111
SS-3	8/31/00	--	--	--	--	3400	int
SS-4	8/31/00	nd	nd	nd	nd	nd	100
SS-5	8/31/00	nd	nd	nd	nd	nd	98
SS-3(2)	8/31/00	0.38	nd	nd	nd	300	115
B1(2)	8/31/00	0.70	nd	0.64	1.3	nd	112
B5	8/31/00	nd	nd	nd	nd	nd	96
B5 Dupl	8/31/00	nd	nd	nd	nd	nd	91
SS-6	8/31/00	nd	nd	nd	nd	nd	106
SS-6 Dupl	8/31/00	nd	nd	nd	nd	nd	86
SS-7	8/31/00	nd	nd	nd	nd	nd	102
SS-8	8/31/00	nd	nd	nd	nd	nd	112
SP-1	8/31/00	nd	nd	nd	nd	nd	96
SP-2	8/31/00	nd	nd	nd	nd	nd	98
SP-3	8/31/00	nd	nd	nd	nd	nd	91
SP-3 Dupl	8/31/00	nd	nd	nd	nd	nd	109
B4(1)	8/31/00	--	--	--	--	800	int
Detection Limits		0.05	0.05	0.05	0.05	10	

" -- " Indicates analysis not performed.
"nd" Indicates no detection at listed detection limits.
"int" Indicates interferences prevent determination.

Analyses Performed by : Michael Dee

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

DUWAMISH SHIPYARD PROJECT
Port Angeles, Washington
KHM Environmental Management, Inc.

Diesel and Oil in Soil by NWTPH-Dx/Dextended.

Sample Number	Date Analyzed	Surrogate Recovery (%)	Diesel (mg/kg)	Oil (mg/kg)
Method Blank	8/31/00	106	nd	nd
B2	8/31/00	106	330	200
SS-2	8/31/00	106	210	--
B1	8/31/00	int	--	--
B4	8/31/00	102	nd	--
B3	8/31/00	int	460	--
SS-1	8/31/00	108	900	100
SS-2(2)	8/31/00	109	225	nd
SS-3	8/31/00	int	--	--
SS-4	8/31/00	104	39	--
B3(2)	8/31/00	105	4000	--
SS-5	8/31/00	110	nd	--
SS-3(2)	8/31/00	102	130	--
B1(2)	8/31/00	111	560	--
B5	8/31/00	113	nd	--
B5 Dupl	8/31/00	102	nd	--
SS-6	8/31/00	123	nd	--
SS-6 Dupl	8/31/00	90	nd	--
SS-7	8/31/00	108	nd	--
SS-8	8/31/00	100	64	--
SP-1	8/31/00	110	200	--
SP-2	8/31/00	102	96	--
SP-3	8/31/00	104	nd	--
SP-3 Dupl	8/31/00	106	nd	--
B4(1)	8/31/00	int	340	--
Detection Limits			20	40

" -- " Indicates analysis not performed.
"nd" Indicates no detection at listed detection limits.
"int" Indicates interferences prevent determination.

Analyses Performed by : Michael Dee

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

DUWAMISH SHIPYARD PROJECT
Seattle, Washinton
RK Kuroiwa, PE
Client Project #DW

Heavy Metals in Soil by EPA-7000 Series

Sample Number	Date Analyzed	Lead (Pb) EPA 7420 (mg/kg)
Method Blank	9/1/00	nd
SS-1	9/1/00	25
SS-1 Dup.	9/1/00	27
SS-2 (2)	9/1/00	61
SS-3 (2)	9/1/00	48
SS-5	9/1/00	22
SP-1	9/1/00	41
SP-3	9/1/00	56
B-1 (2)	9/1/00	37
B-2	9/1/00	62
B-3	9/1/00	28
B-5	9/1/00	70
Method Detection Limits		5

"nd" Indicates not detected at listed detection limits.

ANALYSES PERFORMED BY: Tim McCall

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

DUWAMISH SHIPYARD PROJECT
Seattle, Washinton
RK Kuroiwa, PE
Client Project #DW

QA/QC Data - Total Metals EPA-7000 Series Analyses

Sample Number: SS-1

	Matrix Spike			Matrix Spike Duplicate			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	(%)
Lead	250	269	108	250	253	101	6.13

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
Lead	250	241	96

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 20%

ANALYSES PERFORMED BY: Tim McCall
DATA REVIEWED BY: Sherry Chilcutt

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

CHAIN-OF-CUSTODY RECORD

CLIENT: RK Kuroiwa, PE

ADDRESS: 7053 7th Ave NW Seattle WA 98117

PHONE: (206) 310.7446 FAX:

CLIENT PROJECT #: DW PROJECT MANAGER: Roy K

DATE: 8/31/00 PAGE 1 OF

PROJECT NAME: Duwamish Shipyard

LOCATION: Seattle, WA

COLLECTOR: Roy Kuroiwa DATE OF COLLECTION 8/31

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH	NOTES	Total Number of Containers	Laboratory Note Number
1. B-2			Soil	4oz Jar	X				X	X					X					
2. B-4					X				X											
3. SS-2					X				X	X										
4. SS-4					X				X	X										
5. SS-5					X				X	X					X					
6. SS-6					X				X	X										
7. SS-7					X				X	X										
8. Sp1					X				X											
9. Sp2					X				X											
10. Sp3					X				X											
11. B-1					X				X											
12. SS-8					X				X	X										
13. B-3					X				X	X					X					
14. SS-1					X				X	X					X					
15. SS-3					X				X	X										
16. SS-2 (2)					X				X	X					X					
17. B-3 (2)					X				X											
18. SS-3 (2)					X				X	X					X					

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[signature]	17:45 8/31	[signature]	8/31/00
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Do Not Run BTEX if gas > 500. Do Not Run BTEX if Diesel > 1000.

Turn Around Time (SP Samples exempt)

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

CHAIN-OF-CUSTODY RECORD

CLIENT: RK Kuroiwa, PE

ADDRESS: 7053 7 Ave NW Seattle, WA 98117

PHONE: (206) 310-7446 FAX:

CLIENT PROJECT #: PROJECT MANAGER: Roy K

DATE: 8/31/00 PAGE 2 OF

PROJECT NAME: Duwamish Shipyard

LOCATION: Seattle, WA

COLLECTOR: Roy Kuroiwa DATE OF COLLECTION

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH	NOTES	Total Number of Containers	Laboratory Note Number
1. B1 - (2)			Soil	4oz Jr	X				X	X					X					
2. B-5					X				X	X					X					
3. SS-6					X				X	X										
4. SS-7					X				X	X										
5. SS-8					X				X	X										
6. SP-1					X				X	X					X					
7. SP-2					X				X	X										
8. SP-3					X				X	X					X					
9. B-4(1)					X				X	X										
10.																				
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SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Turn Around Time:

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC

800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127

Mobile Environmental Laboratories
Environmental Sampling Services

Telephone: 360-459-4670
Fax: 360-459-3432

September 7, 2000

Roy Kuroiwa
RK Kuroiwa, PE
7053 7th Avenue NW
Seattle, WA 98117

Dear Mr. Kuroiwa:

Please find enclosed the analytical data report for the Duwamish Shipyard Project in Seattle, Washington. One soil sample was analyzed for BTEX by Method 8021B on September 1, 2000.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this work is also enclosed.

TEG Northwest appreciates the opportunity to have provided geosampling and analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A. Korosec
President

QA/QC FOR ANALYTICAL METHODS

GENERAL

The TEG Northwest Laboratory quality assurance and quality control (QA/QC) procedures are conducted following the guidelines and objectives which meet or exceed certification/-accreditation requirements of California DOHS, Washington DOE, and Oregon DEQ. The Quality Control Program is a consistent set of procedures which assures data quality through the use of appropriate blanks, replicate analyses, surrogate spikes, and matrix spikes, and with the use of reference standards that meet or exceed EPA standards.

When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4^{o} C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

Purgeable Volatile Aromatics (BTEX, EPA 8021B)

A check standard is run at the beginning of the day. The check standard is run at the end of the day. Both open and close standards must be within 15% of the continuing calibration curve value. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135% unless high sample concentrations interfere with the determination of the recovery percentage. At least 1 method blank is run per day.

TEG NW SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

TEG Job Number:	S00901-1
Client:	RK KUROIWA, PE
Client Job Name:	DUWAMISH SHIPYARD
Client Job Number:	NA

Analytical Results

BTEX		MTH BLK	LCS	B-4(1)
Matrix	Soil	Soil	Soil	Soil
Date extracted	Reporting	09/01/00	09/01/00	09/01/00
Date analyzed	Limits	09/01/00	09/01/00	09/01/00
Moisture, %				15%
BTEX , µg/kg				
Benzene	50	nd	72%	nd
Toluene	50	nd	81%	230
Ethylbenzene	50	nd		3,300
Xylenes	50	nd		13,000
Surrogate recoveries:				
Trifluorotoluene		91%	84%	127%
Bromofluorobenzene		98%	92%	C

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

30u101-1

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

CHAIN-OF-CUSTODY RECOR

CLIENT: RK Kuroiwa, PE

ADDRESS: 7053 7 Ave NW Seattle, WA 98117

PHONE: (206) 310-7446 FAX (425) 869 6474.

CLIENT PROJECT #: PROJECT MANAGER: Roy K

DATE: 8/31/00 PAGE 2 OF

PROJECT NAME: Duwamish Shipyard

LOCATION: Seattle, WA

COLLECTOR: Roy Kuroiwa DATE OF COLLECTION

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH	NOTES	Total Number of Containers	Laboratory
1. B1 - (2)			Soil	4oz Jr		X				X	X					X				
2. B-5						X				X	X					X				
3. SS-6						X				X	X									
4. SS-7						X				X	X									
5. SS-8						X				X	X									
6. SP-1						X				X	X					X				
7. SP-2						X				X	X									
8. SP-3						X				X	X					X				
9. B-4(1)						X				X	X									
10.																				
11.																				
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SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS

CHAIN OF CUSTODY SEALS Y/N/NA

SEALS INTACT? Y/N/NA

RECEIVED GOOD COND./COLD

NOTES:

LABORATORY NOTES:

BTEX only

Turn Around Time: 5d

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

CHAIN-OF-CUSTODY RECORD

CLIENT: RK Kurowa, PE

ADDRESS: 7053 7 Ave NW Seattle, WA 98117

PHONE: (206) 310-7446 FAX:

CLIENT PROJECT #: PROJECT MANAGER: Roy K

DATE: 8/31/00 PAGE 2 OF

PROJECT NAME: Duwamish Shipyard

LOCATION: Seattle, WA

COLLECTOR: Roy Kurowa DATE OF COLLECTION

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH							NOTES	Total Number of Containers	Laboratory Note Number
1. B1 - (2)			Soil	4oz Jar	X				X	X					X											
2. B-5					X				X	X					X											
3. SS-6					X				X	X																
4. SS-7					X				X	X																
5. SS-8					X				X	X																
6. SP-1					X				X	X					X											
7. SP-2					X				X	X																
8. SP-3					X				X	X					X											
9. B-4(1)																										
10.																										
11.																										
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SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Turn Around Time:

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

CHAIN-OF-CUSTODY RECORD

CLIENT: RK Kuroiwa, PE

ADDRESS: 7053 7th Ave NW Seattle WA 98117

PHONE: (206) 310-7446 FAX:

CLIENT PROJECT #: DW PROJECT MANAGER: RayK

DATE: 8/31/00 PAGE 1 OF

PROJECT NAME: Duwamish Shipyard

LOCATION: Seattle, WA

COLLECTOR: Roy Kuroiwa DATE OF COLLECTION 8/31

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH	NOTES	Total Number of Containers	Laboratory Note Number
1. B-2			Soil	4oz Jar	X				X	X					X					
2. B-4					X				X											
3. SS-2					X				X	X										
4. SS-4					X				X	X										
5. SS-5					X				X	X					X					
6. SS-6					X				X	X										
7. SS-7					X				X	X										
8. Sp1					X				X											
9. Sp2					X				X											
10. Sp3					X				X											
11. B-1					X				X											
12. SS-8					X				X	X										
13. B-3					X				X	X					X					
14. SS-1					X				X	X					X					
15. SS-3					X				X	X										
16. SS-2 (2)					X				X	X					X					
17. B-3 (2)					X				X											
18. SS-3 (2)					X				X	X					X					

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
[signature]	17:45 8/31/00	[signature]	8/31/00
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Do Not Run BTEX if gas > 500. Do Not Run BTEX if Diesel > 1000.

Turn Around Time (SP Samples exempt)