CONESTOGA-ROVERS
& ASSOCIATES

20818 44th Ave. West, Suite 190, Seattle, Washington 98036
Telephone: (425) 563-6500 Fax: (425) 563-6599
http://www.craworld.com

February 28, 2011 Reference No. 070496-003

Mr. Jerome Cruz
Department of Ecology
3190 160th Avenue Southeast
Bellevue, Washington 98008-5452

Dear Mr. Cruz:

Re: Addendum to the Interim Action Work Plans, ConocoPhillips Renton Terminal
Compliance Monitoring Plan
Agreed Order No. DE 7882

Conestoga-Rovers & Associates has prepared this proposed Compliance Monitoring Plan (CMP) on Behalf of ConocoPhillips (CoP) and Atlantic Richfield (BP). This CMP is written in response to comments received by the Washington State Department of Ecology (Ecology) following review of the Interim Action Work Plans (IAWPs) for the ConocoPhillips Renton Terminal located at 2423 Lind Avenue Southwest, Renton, Washington (Site). The IAWPs are part of the Agreed Order (No. DE 7882) between Ecology, ConocoPhillips, and ExxonMobil/BP Dated August 5, 2010. This document is meant to serve as an addendum to the existing IAWPs. The purpose of the CMP is to provide a description of the groundwater monitoring, system performance monitoring, and reporting activities to demonstrate compliance with the conditions of the Agreed Order. These activities will be conducted at the Site until a final Cleanup Action Plan and post-remediation compliance monitoring are implemented.

Groundwater Monitoring

Groundwater monitoring will be conducted on a quarterly basis at the Site. During the first and third quarters, 33 wells will be sampled. During the second and fourth quarters, 21 wells will be sampled. The wells to be sampled and the sampling frequency are presented on the attached Table 1. The locations of the wells are presented on the attached figure (Figure 2).

The purpose of the proposed groundwater monitoring plan is to evaluate groundwater quality in the vicinity, along the perimeter, and downgradient of the groundwater contaminant plume(s). Contaminant concentrations will be compared to historic concentrations for each well to determine if concentration trends are decreasing, increasing, or not changing. Concentration trends will be used to gauge the performance of the existing remediation systems and to determine if the systems are maintaining adequate control of the plume(s) and preventing further migration. Seasonal groundwater variation will also be considered.

All groundwater monitoring activities will be performed in accordance with the procedures outlined in the Site Sampling and Analysis Plan (Attachment 1), Quality Assurance Project Plan (Attachment 2), and Site Health and Safety Plan.

System Performance Monitoring

System performance monitoring will be conducted on an ongoing basis for both the BP and CoP remediation systems and will consist of the following activities:

i) Hydraulic monitoring (quarterly);
ii) Product thickness gauging (quarterly);
iii) Monitoring of system operational parameters (weekly);
iv) System groundwater and vapor sampling (monthly); and
v) Evaluation of individual extraction wells (monthly).

The purpose of the system performance monitoring is to evaluate the performance of the two remediation systems to determine if 1) the systems' are maintaining adequate control of the plume(s) and preventing further migration and 2) the systems' are removing contaminant mass from the plume(s). The results of the performance monitoring will be used to determine if modifications or adjustments can be made to optimize performance until a final remedial action is implemented.

Hydraulic Monitoring and product thickness gauging

Hydraulic monitoring and production thickness gauging will be conducted on a quarterly basis at the Site. During the first and third quarters, 61 wells will be gauged for product thickness water table elevation. During the second and fourth quarters, 36 wells will be gauged for product thickness and water table elevation. During these two sampling events, data will be collected immediately prior to the sampling events and will occur while the two systems are operating and have been operating consistently for a period of 1 week. The wells to be monitored and the monitoring frequency are presented on the attached table 1. The locations of the wells are presented the attached figure.

Hydraulic monitoring and product thickness gauging will be conducted in accordance with the Site Sampling and Analysis Plan and the Site Health and Safety Plan.

Monitoring of System operational parameters

Monitoring of system operational parameters will be conducted on a weekly basis and will consist of the following:

- Groundwater extraction flow rates, totals, and run times
- Soil vapor extraction (SVE) flow rates, vacuum, and run times
- SVE VOC influent and effluent concentrations
- Air stripper effluent VOC concentrations

Effluent and vapor sampling

Effluent groundwater and vapor samples for laboratory analysis will be collected from the systems on a monthly basis. Samples will be collected upstream and downstream of each control point (air stripper, carbon vessel, etc.) for both systems. The data will be used to analyze contaminant reduction across each control point and to calculate contaminant mass removal rates.

Evaluation of individual extraction wells

Individual vapor extraction and groundwater extraction wells will be evaluated on a monthly basis. Vapor extraction wells will be monitored for flow rate, vacuum, and VOC concentrations using a PID. Groundwater extraction wells will be monitored for flow rate and drawdown. Groundwater samples may be collected from each well if necessary.

Reporting

Groundwater and system performance monitoring reports will be provided to Ecology on a Quarterly basis. Each report will include of the following:

- Description of activities completed during the reporting period
- Groundwater monitoring results
- Hydraulic monitoring results
- Isoconcentration contours
- Contaminant time series for individual wells
- Product thickness mapping
- Potentiometric contours with systems off and on

CONESTOGA-ROVERS
& ASSOCIATES

- Results of the weekly system monitoring and O&M activities for both systems
- Results of the systems' groundwater and vapor sampling
- Results of individual extraction well analyses
- Evaluation of system performance
- Description of modifications or adjustments made to improve performance

The field activities and reporting described in this CMP may change as additional data are collected to characterize the site or if significant modifications or adjustments are made to the existing remediation systems. Ecology will be notified of such changes as they occur. If you have any questions or comments regarding this CMP please contact Ed Turner at (425) 563-6519.

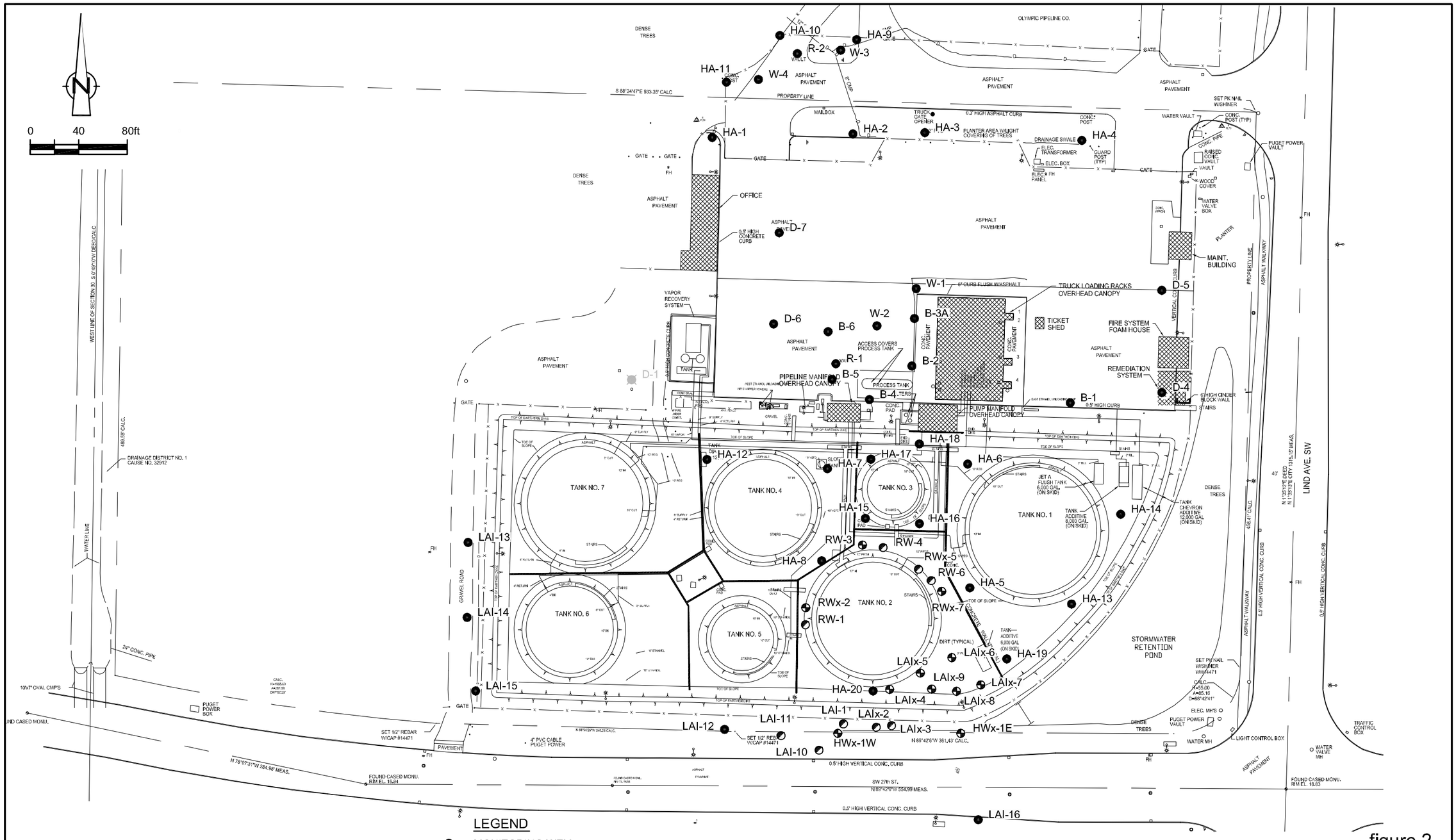
Yours truly,

Edwin J Turner, LG
CONESTOGA-ROVERS & ASSOCIATES

EJT/mm/003

Encl.

cc: Rich Solomon, ConocoPhillips
Paul Supple, Atlantic Richfield Company



LEGEND

- MONITORING WELL
- ABANDONDED OR DESTROYED MONITORING WELL LOCATION
- 4" DIAMETER VERTICAL RECOVERY WELL (ACTIVELY PUMPING)
- 4" DIAMETER VERTICAL RECOVERY WELL (INACTIVE- NOT PUMPING)

SOURCE: STANTEC, FIGURE 2, SITE PLAN, DATED 09/16/2010.

figure 2

SITE PLAN
CONOCOPHILLIPS RENTON TERMINAL
2423 LIND AVENUE SW
Renton, Washington

70496-AS00(002)GN-WA002 FEB 01/2011

TABLE 1

COMPLIANCE MONITORING WELLS AND MONITORING FREQUENCY
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Well	*Hydraulic Monitoring and Product Thickness Gauging*		*Groundwater Monitoring*	
	1st and 3rd Quarters	*2nd and 4th Quarters*	*1st and 3rd Quarters*	*2nd and 4th Quarters*
LAI-1	X	X	X	
LAIx-2	X	X	X	
LAIx-3	X		X	X
LAIx-4	X[1]			
LAIx-5	X[1]			
LAIx-6	X[1]			
LAIx-7	X[1]			
LAIx-8	X[1]			
LAIx-9	X[1]			
LAI-10	X	X	X	X
LAI-11	X		X	
LAI-12	X	X	X	X
LAI-13	X		X	
LAI-14	X	X	X	
LAI-15	X		X	
LAI-16	X	X		
RW-1	X	X		
RWx-2	X[1]			
RW-3	X	X		
RW-4	X		X	
RWx-5	X	X	X	X
RW-6	X			
RWx-7	X	X	X	
HWx-1East	X[1]			
HWx-1West	X[1]			
B-1	X	X		X
B-2	X	X	X	
B-3A	X	X		
B-4	X	X		
B-5	X	X		
B-6	X	X	X	X
D-4	X	X		X
D-5	X			
D-6	X	X	X	X
D-7	X	X	X	
HA-1	X	X	X	X
HA-2	X	X	X	
HA-3	X	X	X	X
HA-4	X	X	X	X
HA-5	X		X	

TABLE 1

COMPLIANCE MONITORING WELLS AND MONITORING FREQUENCY
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

HA-6	X	X	X	X
HA-7	X	X	X	X
HA-8	X		X	
HA-9	X	X	X	X
HA-10	X	X	X	X
HA-11	X	X	X	X
HA-12	X	X		X
HA-13	X	X	X	
HA-14	X	X	X	X
HA-15	X			
HA-16	X	X	X	
HA-17	X			
HA-18	X			
HA-19	X	X		X
HA-20	X	X	X	X
R-1	X[1]			
R-2	X[1]			
W-1	X	X	X	X
W-2	X	X	X	
W-3	X			
W-4	X			

Notes:
[1] Groundwater extraction well. Well is only gauged when the system is off.

ATTACHMENT 1
SAMPLING AND ANALYSIS PLAN

GROUNDWATER MONITORING SAMPLING AND ANALYSIS PLAN

CONOCOPHILLIPS RENTON TERMINAL
2423 LIND AVENUE SOUTHWEST
RENTON, WASHINGTON

AGREED ORDER NO. DE 7882
AGENCY NO. 2070

Prepared by:
Conestoga-Rovers & Associates

1117 Tacoma Avenue South
Tacoma, Washington
U.S.A. 98402

Office: (253) 573-1218
Fax: (253) 573-1663
web: www.CRAworld.com

FEBRUARY 2011
REF. NO. 070496 (2)
This report is printed on recycled paper.

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	HYDRAULIC MONITORING	2
2.1	HYDRAULIC MONITORING PROCEDURES	2
2.2	DECONTAMINATION PROCEDURES	3
3.0	GROUNDWATER SAMPLING	4
3.1	GROUNDWATER SAMPLING PROCEDURES	4
3.2	DECONTAMINATION PROCEDURES	6
3.3	INVESTIGATION DERIVED WASTE	6
3.4	SAMPLE HANDLING PROCEDURES	6
3.4.1	LABELING AND PACKAGING	6
3.4.2	CHAIN OF CUSTODY PROCEDURES	7
3.5	LABORATORY ANALYSIS	8

LIST OF FIGURES
(Following Text)

FIGURE 1 VICINITY MAP

FIGURE 2 SITE PLAN WITH MONITORING WELL LOCATIONS

LIST OF TABLES

TABLE 2.1 HYDRAULIC MONITORING WELLS

TABLE 3.1 GROUNDWATER MONITORING WELLS

TABLE 3.2 GROUNDWATER CONSTITUENTS OF CONCERN

TABLE 3.3 SAMPLING AND ANALYSIS SUMMARY

TABLE 3.4 SAMPLE CONTAINER, PRESERVATION AND HOLDING TIMES

LIST OF APPENDICES

APPENDIX A QUALITY ASSURANCE PROJECT PLAN (QAPP)

1.0 INTRODUCTION

On August 5, 2010 ExxonMobil Oil Corporation, ConocoPhillips Risk Management and Remediation, and The Washington State Department of Ecology (Ecology) entered into an Agreed Order (Order No. DE 7882). The purpose of the semi-annual groundwater monitoring is to meet the requirements of the agreed order by monitoring groundwater quality to assist in the determination of a final remedial action and to assess the performance of the existing remediation systems.

This sampling and analysis plan (SAP) describes the field procedures and sampling methods to be applied in the performance of the semi-annual groundwater monitoring at the ConocoPhillips Renton Terminal located at 2423 Lind Avenue Southwest, Renton, Washington (Site, Figure 1). The field procedures presented in this plan, when possible, follow the Unites States Environmental Protection Agency's (EPA) procedures for low-flow groundwater sampling (Puls and Barcelona, 1996)[1] and are consistent with sampling procedures used previously at the Site. The objectives of the SAP are to provide field procedures that will result in data of sufficient quality to plan and evaluate remedial actions at the Site. All activities will be conducted in accordance with the "Quality Assurance Project Plan" (Appendix A) and Site Specific Health and Safety Plan (HASP).

PROJECT SCHEDULE

Groundwater sampling is to be performed on a semi-annual basis, once during the winter months and once during the summer months. Monitoring will continue on this schedule until a final remedial action is completed or an alternate schedule is agreed upon.

Puls, R.W., and Barcelona M.J., 1996. EPA Groundwater Issue Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures, EPA/540/S-95/504

2.0 HYDRAULIC MONITORING

Hydraulic Monitoring is conducted on all wells at the Site. The purpose of the hydraulic monitoring is to determine groundwater flow direction(s) and gradients at the Site to assess the migration of contaminants in groundwater beneath the site, assess the performance of the current remediation systems, and assist in the determination of a final remedial action. The hydraulic monitoring well network consists of the 61 wells located at the Site. The wells used in the hydraulic monitoring are presented on Figure 2 and in Table 2.1.

2.1 HYDRAULIC MONITORING PROCEDURES

Each well has a permanent, surveyed, vertical reference point on the casing (the north rim) from which water levels are measured. The vertical reference points for each well are presented in Table 2.1. An electric oil-water interface probe capable of collecting measurements to 0.01 feet shall be used to determine the depth to free product, if present, and to groundwater. In order to provide reliable data, water levels must be collected over as short a period of time as possible. **Additionally, both groundwater extraction systems must be shut off 2 days prior to hydraulic monitoring to eliminate any hydraulic influence caused by the extraction wells.**

The following procedures will be used to collect free product thicknesses and groundwater elevations:

i) Prior to hydraulic monitoring, remove the sealed j-plugs from all of the wells and allow the wells to stabilize for 3- minutes prior to hydraulic monitoring.

ii) Once stabilized, measurements may be collected from each well by slowly lowering the interface probe into the well until a discontinuous beeping is heard. This represents the top of the free product in the well. The depth to free product is the point on the measuring tape at the reference point on the well casing. Record this value on the water level data collection sheet. Double check your measurement before continuing. If free product is not encountered, continue to step iii.

iii) Lower the probe slowly until a continuous beeping is heard. This represents the bottom of the free product in the well, if present, and the top of the groundwater in the well. Record the depth from the measuring tape on the water level data collection sheet. Double check your measurement before continuing.

iv) Remove the probe from the well. If free product was encountered, slowly lower a clear disposable bailer into the well until the bottom of the bailer inters the groundwater. Slowly remove the bailer and record the thickness of the product in the bailer and any other observations. Transfer the contents of the bailer to bucket for later disposal. Install the j-plug on the well when finished.

v) To determine the product thickness, if present, subtract the free product depth from the groundwater depth. To determine the groundwater elevation; subtract the groundwater depth from the reference elevation on the well casing.

vi) Decontaminate the interface probe following the procedures in section 2.2 before continuing to the next well.

2.2 DECONTAMINATION PROCEDURES

Prior to being placed in a well, all equipment will be cleaned according to the following procedures:

i) Disassemble the equipment if necessary;
ii) Non-phosphate detergent wash;
iii) Tap water rinse; and
iv) Distilled or Deionized water rinse;

Disposable PPE, such as nitrile gloves, will be changed between each sampling point and disposed of properly.

3.0 GROUNDWATER SAMPLING

Groundwater samples will be collected from 33 Site wells. The wells to be sampled are presented on Figure 2.1 and in Table 3.1. If free product is encountered in any of the wells to be sampled, those wells will not be sampled. The purpose of the groundwater sampling is to assess groundwater quality and the offsite migration of contaminants. The contaminants of concern at the Site are presented in Table 3.2.

3.1 GROUNDWATER SAMPLING PROCEDURES

The following presents equipment requirements and procedures for sampling of monitoring wells using low flow purging.

Equipment:

The following equipment will be used to conduct low flow purging and sampling:

i) Pumps: Peristaltic pumps with well dedicated flexible silicon tubing;

ii) Tubing: Well dedicated polyethylene down-hole tubing;

iii) Field Parameter Monitoring Instruments: field parameters will be monitored with the use of a flow-through-cell with sensors to measure pH, specific conductance, temperature, dissolved oxygen, oxidation-reduction potential, salinity, and total dissolved solids;

iv) Flow Measurement Equipment: flow rates will be measured with a graduated container and a stopwatch; and

v) Water Level Indicator: an electric water level indicator or oil-water interface probe will be used to manually measure water levels in the wells.

vi) Bailer: Disposable PVC bailer and disposable rope.

Low-Flow Purging and Sampling Procedure:

The following procedures will be used to purge and sample monitoring wells:

i) Identify the well using a current Site map and inspect the well for damage. The condition of the surface protection, manhole or cover, and the well cap will be noted;

ii) Obtain water level and well depth measurements in order to determine if the well has accumulated sediments;

iii) When installing tubing, lower slowly into the well to a depth such that the intake end of the tubing is located in the middle of the screened interval or just below the top of the water level if below the top of screen.

iv) With the pump controller set to its lowest setting, begin pumping.

v) Slowly increase the pumping rate until discharge occurs;

vi) once discharge occurs, record the visual observation of water quality, check the water level in the well, and adjust the pumping rate such that the pumping rate does not exceed 0.2 liters per minute (LPM);

vii) Measure and record the water level and pumping rate every three minutes during purging. Record any pumping rate changes;

viii) Measure and record field indicator parameters (pH, specific conductance, temperature, dissolved oxygen, oxidation-reduction potential, salinity, total dissolved solids) and visual water quality every three minutes. Purging will be considered complete when all of the indicator parameters pH, temperature, dissolved oxygen, specific conductance, and oxidation-reduction potential have stabilized. Stabilization will be considered to be achieved after three consecutive readings are within the following limits:

pH	(±0.1 unit)
Temperature	(3 percent)
Dissolved Oxygen	(10 percent)
Specific Conductance	(3 percent)
Oxidation-Reduction Potential	(10 percent)
Water Level	(0.2 feet)

ix) Disconnect the pump tubing from the flow-through cell and fill the sample containers from the pump tubing;

x) If parameters will not stabilize or if there is insufficient volume in the well to maintain minimal drawdown, 3 wells volumes may be purged from the well using a disposable bailer and then sampled. If the well goes dry during bailing, allow the well to recharge and then collect the sample.

x) Record the conditions at the time of sampling in the field log book, including a description of the sample, the date and time of sampling, the sample identification number, the sample location, and the weather conditions;

xi) Sample containers will be labeled, wrapped in packing material, and immediately placed in a cooler with ice; and

xii) Samples will be shipped or transported to the analytical laboratory within one day of the day of collection.

3.2 DECONTAMINATION PROCEDURES

Prior to being placed in a well, all equipment will be cleaned according to the following procedures:

vii) Disassemble the equipment if necessary;
viii) Non-phosphate detergent wash;
ix) Tap water rinse; and
x) Distilled or Deionized water rinse;

Disposable PPE, such as nitrile gloves, will be changed between each sampling point and disposed of properly.

3.3 INVESTIGATION DERIVED WASTE

All investigation derived waste including decontamination and purge water will be placed in the sump at the ConocoPhillips Remediation System to be processed and discharged. Disposable equipment and PPE will be rinsed and disposed of in the trash.

3.4 SAMPLE HANDLING PROCEDURES

3.4.1 LABELING AND PACKAGING

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example: GW-081009 – AA – LLL - XXX
Where: GW - Designates sample type
(GW=Groundwater) (S=Soil) (SE=Sediment)
081007: Date of collection (mm/dd/yy)

AA: Sampler initials
LLL: Location ID
XXX: Unique sample number

QC samples will also be numbered with a unique sample number, with the exception of matrix spikes and matrix spike duplicates.

Sample containers will be wrapped and placed on ice or cooler packs in laboratory-supplied coolers immediately after labeling. Samples will be delivered to the laboratory by courier or in person under approved chain of custody procedures as described below.

3.4.2 CHAIN OF CUSTODY PROCEDURES

Chain of Custody forms will be completed for all samples collected during the program.

The Chain of Custody form will document the transfer of sample containers. Custody seals will be placed on each cooler. The cooler will then be sealed with packing tape. Sample container labels will include sample number, place of collection and date and time of collection. All samples will be refrigerated using wet ice at 4°C (±2°C) and delivered to the analytical laboratory within 24 to 48 hours of collection. All samples will be delivered to the laboratory by commercial courier or Contractor personnel. All samples will be stored at 4°C (±2°C) at the laboratory.

The Chain of Custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The Chain of Custody document will be signed, timed, and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a Chain of Custody form. The Chain of Custody form will consist of four copies which will be distributed as follows: The shipper will maintain a copy while the other three copies will be enclosed in a waterproof envelop within the cooler with the samples. The cooler will then be sealed properly for shipment. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to the QA/QC Officer-Sampling and Analytical Activities upon receipt of the samples by the laboratory. One copy will be returned with the data deliverables package.

Upon receipt of the cooler at the laboratory, the shipping cooler and the custody seal will be inspected by the Sample Custodian. The condition of the cooler and the custody seal will be noted on the Chain of Custody record sheet by the Sample Custodian. The Sample Custodian will record the temperature of one sample (or temperature blank) from each cooler and the temperature will be noted on the Chain of Custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The Sample Custodian will document the date and time of receipt of the container, and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated, and signed. Any damage or discrepancies will be reported to the Laboratory Project Manager and Laboratory QA/QC Officer before sample's are processed.

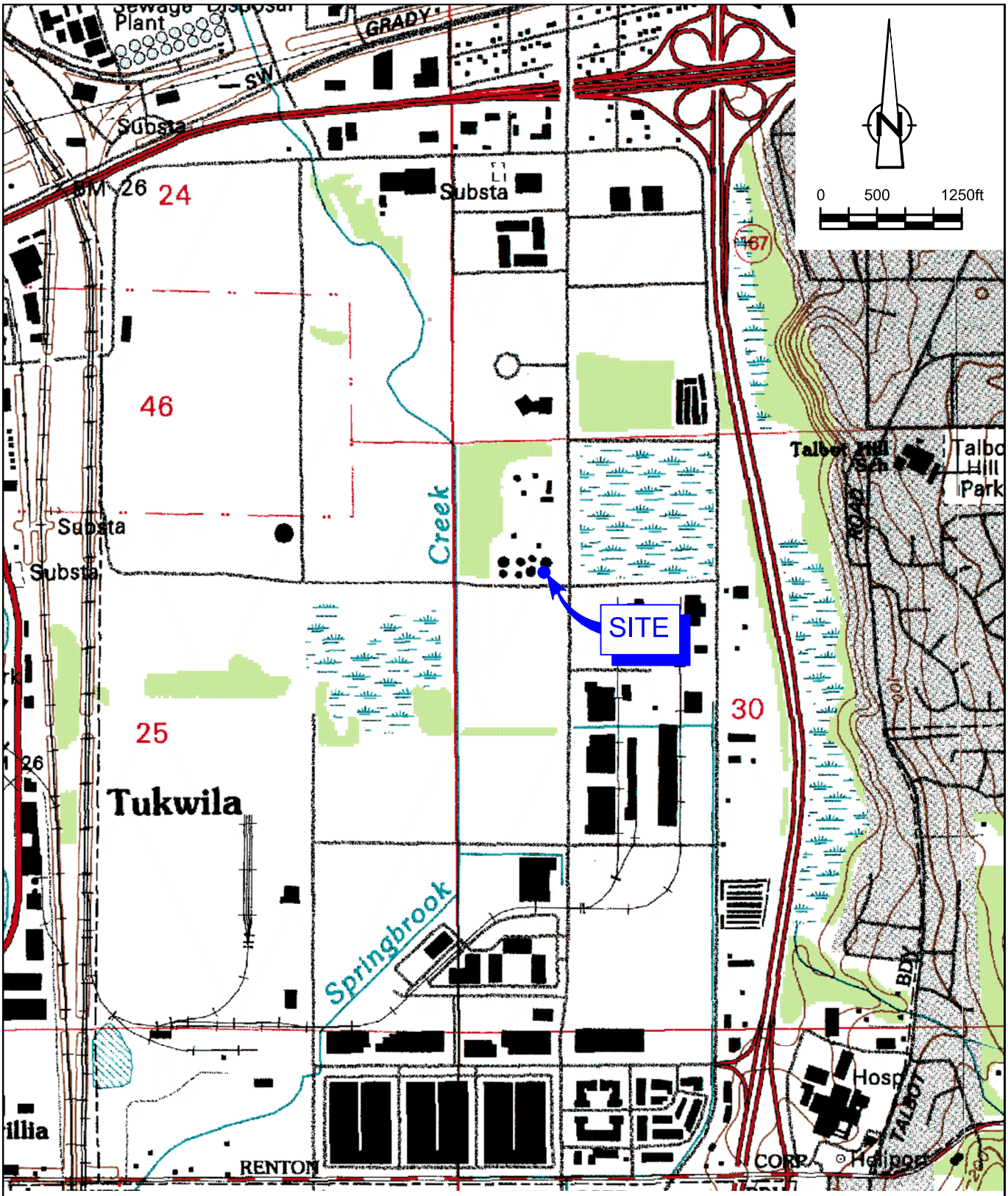
3.5 LABORATORY ANALYSIS

All groundwater samples will be analyzed for the following:

- Total petroleum hydrocarbons – gasoline range (TPH-G) per NWTPH-Gx;
- Total petroleum hydrocarbons – diesel range (TPH-D) and oil range (TPH-O) per NWTPH-Dx with silica gel cleanup;
- Benzene, Toluene, Ethylbenzene, total Xylenes (BTEX), and Methyl Tertiary-butyl Ether (MTBE) per EPA method 8260;

The analytical parameters, methods, number of samples, quality control sampling requirements are presented in Table 3.3. The sample container requirements and holding times for each analysis are presented in Table 3.4. All sampling activities will be conducted in accordance with the "Quality Assurance Project Plan" (QAPP) included as Appendix A.

FIGURES



SOURCE: USGS QUADRANGLE MAP:
RENTON, WASHINGTON

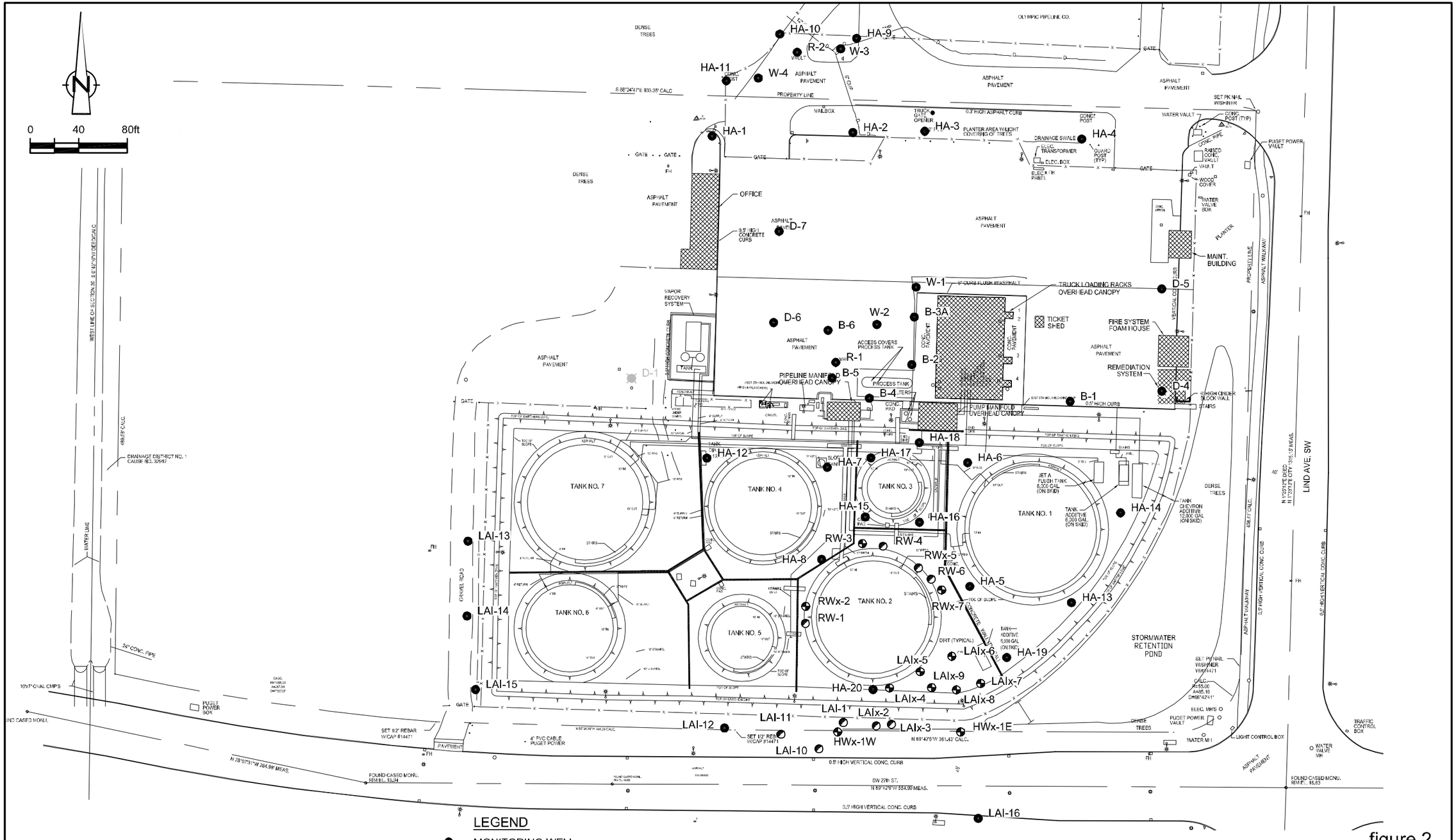
figure 1

VICINITY MAP
CONOCOPHILLIPS RENTON TERMINAL
2423 LIND AVENUE SW
Renton, Washington

WASHINGTON

70496-AS00(002)GN-WA001 FEB 01/2011

0 40 80ft



LEGEND

- MONITORING WELL
- ABANDONDED OR DESTROYED MONITORING WELL LOCATION
- 4" DIAMETER VERTICAL RECOVERY WELL (ACTIVELY PUMPING)
- 4" DIAMETER VERTICAL RECOVERY WELL (INACTIVE- NOT PUMPING)

SOURCE: STANTEC, FIGURE 2, SITE PLAN, DATED 09/16/2010.

figure 2

SITE PLAN
CONOCOPHILLIPS RENTON TERMINAL
2423 LIND AVENUE SW
Renton, Washington

70496-AS00(002)GN-WA002 FEB 01/2011

TABLES

TABLE 2.1

HYDRAULIC MONITORING WELLS
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Well	*Top of Casing Elevation (feet)*	*Well*	*Top of Casing Elevation (feet)*
LAI-1	20.94	D-4	21.09
LAIx-2	20.67	D-5	21.33
LAIx-3	20.74	D-6	20.61
LAIx-4	25.50	D-7	20.49
LAIx-5	25.63	HA-1	20.76
LAIx-6	25.25	HA-2	21.09
LAIx-7	25.24	HA-3	21.09
LAIx-8	25.59	HA-4	21.05
LAIx-9	25.55	HA-5	21.13
LAI-10	19.87	HA-6	21.43
LAI-11	20.61	HA-7	21.60
LAI-12	19.34	HA-8	21.97
LAI-13	21.53	HA-9	21.32
LAI-14	21.69	HA-10	21.15
LAI-15	20.03	HA-11	20.69
LAI-16	20.59	HA-12	22.47
RW-1	24.24	HA-13	22.73
RWx-2	26.20	HA-14	23.47
RW-3	22.85	HA-15	22.87
RW-4	23.78	HA-16	22.07
RWx-5	24.97	HA-17	21.82
RW-6	24.18	HA-18	21.51
RWx-7	24.71	HA-19	22.92
HWx-1East	20.44	HA-20	23.10
HWx-1West	19.96	R-1	16.94
B-1	21.61	R-2	17.52
B-2	21.82	W-1	21.89
B-3A	21.85	W-2	21.30
B-4	21.28	W-3	19.95
B-5	20.95	W-4	20.91
B-6	21.00		

TABLE 3.1

GROUNDWATER MONITORING WELLS
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Well
LAI-1
LAIx-2
LAIx-3
LAI-10
LAI-11
LAI-12
LAI-13
LAI-14
LAI-15
RW-4
RWx-5
RWx-7
B-2
B-6
D-6
D-7
HA-1
HA-2
HA-3
HA-4
HA-5
HA-6
HA-7
HA-8
HA-9
HA-10
HA-11
HA-13
HA-14
HA-16
HA-20
W-1
W-2

TABLE 3.2

GROUNDWATER CONSTITUENTS OF CONCERN
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Parameter	*Cleanup Level* [1] *(µg/L)*
Total Petroleum Hydrocarbons - Gasoline Range	800/1,000[2]
Total Petroleum Hydrocarbons - Deisel Range	500
Total Petroleum Hydrocarbons - Heavy Oils Range	500
Benzene	5
Toluene	1,000
Ethylbenzene	700
Total Xylenes	1,000
Methyl Tertiary-Butyl Ether	20

Notes:

(1) Groundwater Cleanup Levels based on MTCA Method A.
(2) Gasoline range hydrocarbons cleanup level is 800 µg/L if benzene is present in the sample and 1,000 µg/L if benezene is not present in the sample.
µg/L Micrograms per Liter

TABLE 3.3

SAMPLING AND ANALYSIS SUMMARY
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Sample Matrix	*Analytical Parameters*	*Analytical Method*	*Estimated Number of Samples*	*Field Duplicates*	*Trip Blanks*	*MS/MSD/Dup*	*Toal Number of Samples*	*Unit Price*	*Unit Subtotal*
Groundwater	Gasoline Range Organics	NWTPH-Gx[1]	33	2	5	2/2/0	44	$ 25.00	$ 1,100.00
	Diesel and Oil Range Organics[3]	NWTPH-Dx[1]	33	2	-	2/2/0	39	$ 45.00	$ 1,755.00
	BTEX AND MTBE	SW-846 8260[2]	33	2	5	2/2/0	44	$ 45.00	$ 1,980.00
								Total:	$ 4,835.00

Notes:

1 Referenced from "Analytical Methods for Petroleum Hydrocarbons, Publication No ECY 97-602, June 1997"

2 "Test Methods for Solid Waste Physical/Chemical Methods", SW-846, 3rd Edition, September 1986 (with all subsequent revisions).

3 Including silica gel cleanup.

BTEX Benzene, Toluene, Ethylbenzene, Total Xylenes
MTBE Methyl Teritiary-Butyl Ether
Dup Laboratory Duplicate.
EPH Extractable Petroleum Hydrocarbons
MS Matrix Spike.
MSD Matrix Spike Duplicate.
VPH Volatile Petroleum Hydrocarbons

TABLE 3.4

SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME PERIODS
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Analyses	*Sample Containers*	*Preservation*	*Maximum Holding Time*	*Notes*
Groundwater				
Gasoline Range Organics	Two 40 mL glass vials Teflon-lined septum	pH <2, HCl Cool 4°C	14 days from collection to analysis	Fill completely with no head space
Diesel and Oil Range Organics	Two 1L amber glass	pH <2, HCl Cool 4°C	14 days from collection to extraction, 40 days from extraction to analysis.	Fill completely
BTEX, MTBE	Two 40 mL glass vials Teflon-lined septum	pH <2, HCl Cool 4°C	14 days from collection to analysis	Fill completely with no head space

Notes:

BTEX	Benzene, Toluene, Ethylbenzene, Total Xylenes
MTBE	Methyl Teritiary-Butyl Ether
HCL	Hydrochloric Acid

ATTACHMENT 2
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
GROUNDWATER SAMPLING EVENT

CONOCOPHILLIPS RENTON TERMINAL
2423 LIND AVENUE SOUTHWEST
RENTON, WASHINGTON

AGREED ORDER NO. DE 7882
AGENCY NO. 2070

Prepared By:
Conestoga-Rovers & Associates
1117 Tacoma Avenue South
Tacoma, Washington 98402

Office: 253-573-1218
Fax: 253-573-1663

REVISION NUMBER 0
FEBRUARY 2011

QUALITY ASSURANCE PROJECT PLAN (QAPP)
GROUNDWATER SAMPLING
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON
REVISION NUMBER 0
FEBRUARY 2011

Prepared By: Conestoga-Rovers & Associates (CRA)

Prepared For: ConocoPhillips Company
Atlantic Richfield Company

Approved By: _____ Date:_____
Matthew Davis
Project Coordinator

Approved By: _____ Date:_____
Ed Turner
CRA Project Manager

Approved By: _____ Date:_____
Jeffrey Cloud
CRA QA Officer

Approved By: _____ Date:_____
Matthew Davis
CRA Field Sampling Supervisor

Approved By: _____ Date:_____
Laboratory Project Manager

TABLE OF CONTENTS

Page

1.0 PROJECT ORGANIZATION AND SCHEDULE 1

2.0 BACKGROUND AND OBJECTIVES 3

3.0 PROJECT DESCRIPTION 4

4.0 DATA QUALITY OBJECTIVES 5
4.1 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA 5
4.2 LABORATORY QUALITY ASSURANCE 5
4.2.1 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES 5
4.2.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY 6
4.3 FIELD MEASUREMENT QUALITY ASSURANCE 6

5.0 SAMPLING (EXPERIMENTAL) DESIGN 7

6.0 FIELD PROCEDURES 8
6.1 SAMPLE CUSTODY AND DOCUMENT CONTROL 8
6.1.1 FIELD LOGBOOK 8
6.1.2 SAMPLE NUMBERING 9
6.1.3 CHAIN OF CUSTODY RECORDS 9
6.1.4 SAMPLE DOCUMENTATION IN THE LABORATORY 10
6.1.5 STORAGE OF SAMPLES 11
6.1.6 SAMPLE DOCUMENTATION 11
6.1.7 FIELD INSTRUMENTATION 11

7.0 LABORATORY PROCEDURES 13
7.1 ANALYTICAL METHODS 13
7.2 CALIBRATION PROCEDURES AND FREQUENCY 13
7.2.1 INSTRUMENT CALIBRATION AND TUNING 13
7.2.2 GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS) 13
7.2.3 GAS CHROMATOGRAPHY (GC) 14
7.2.5 FIELD INSTRUMENTATION 14
7.3 COMPOUND IDENTIFICATION 15
7.4 QUANTITATION 15
7.5 QUANTITATION LIMIT REQUIREMENTS 15

8.0 QUALITY CONTROL 17
8.1 QC FOR LABORATORY ANALYSES 17
8.1.1 REAGENT BLANKS 17
8.1.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)/DUPLICATE ANALYSES 17
8.1.3 SURROGATE ANALYSES 17

8.2 QC FOR FIELD SAMPLING 18
8.2.1 TRIP BLANKS 18
8.2.2 FIELD DUPLICATE SAMPLES 18

9.0 DATA MANAGEMENT PROCEDURES 19
9.1 GENERAL 19
9.2 LABORATORY REPORTING, DATA, PRESENTATION AND FINAL REPORT 19
9.3 DOCUMENT CONTROL SYSTEM 20
9.4 QC CHECK POINTS AND DATA FLOW 20

10.0 AUDITS 22

11.0 DATA REVIEW, VERIFICATION, AND VALIDATION 23
11.1 GENERAL 23

12.0 DATA QUALITY ASSESSMENT 24
12.1 SPECIFIC ROUTINE PROCEDURES USES TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS 24
12.1.1 PRECISION 24
12.1.2 ACCURACY 25
12.1.3 COMPLETENESS 25
12.1.4 OUTLIERS 26

13.0 PREVENTATIVE MAINTENANCE 27

14.0 CORRECTIVE ACTION 28

LIST OF TABLES
(Following Text)

TABLE 4.1 ANALYTICAL PARAMETERS - GROUNDWATER

TABLE 4.2 SAMPLING AND ANALYSIS SUMMARY

TABLE 6.1 SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME PERIODS

TABLE 9.1 LABORATORY REPORTING DELIVERABLES

1.0 PROJECT ORGANIZATION AND SCHEDULE

A brief description of the duties of the key project personnel is presented below.

Project Manager – Ed Turner

i) Provides day-to-day project management

ii) Provides managerial guidance to the Quality Assurance/Quality Control (QA/QC) Officer - Sampling and Analytical Activities

iii) Prepares and reviews reports

iv) Conducts preliminary chemical data interpretation and assessment

v) Responsible for overall project completion in accordance with the approved design

QA/QC Officer - Sampling and Analytical Activities – Jeffrey Cloud

i) Oversees and reviews laboratory activities

ii) Determines laboratory data corrective action

iii) Performs analytical data validation and assessment

iv) Reviews laboratory QA/QC

v) Assists in preparation and review of final report

vi) Provides technical representation for analytical activities

vii) Provides managerial and technical guidance to the Field Sampling Supervisor

Field Sampling Supervisor – Matthew Davis

i) Provides immediate supervision of all on-Site activities

ii) Provides field management of sample collection and field QA/QC

iii) Provides technical representation for field activities

iv) Is responsible for maintenance of the field equipment

Laboratory - Project Manager, Analytical Contractor

i) Ensures resources of laboratory are available on an as-required basis

ii) Coordinates laboratory analyses

iii) Supervises laboratory's in-house Chain of Custody

iv) Schedules analyses of samples

v) Oversees review of data

vi) Oversees preparation of analytical reports

vii) Approves final analytical reports

Laboratory - Quality Assurance/Quality Control Officer, Analytical Contractor

i) Overviews laboratory QA/QC

ii) Overviews QA/QC documentation

iii) Conducts detailed data review

iv) Decides laboratory corrective actions, if required

v) Provides technical representation for laboratory QA/QC procedures

Laboratory - Sample Custodian - Analytical Contractor

i) Receives and inspects the sample containers

ii) Records the condition of the sample containers

iii) Signs appropriate documents

iv) Verifies Chain of Custody and their correctness

v) Notifies laboratory Project Manager and laboratory QA/QC Officer of sample receipt and inspection

vi) Assigns a unique laboratory identification number correlated to the field sample identification number, and enters each into the sample receiving log

vii) Initiates transfer of samples to the appropriate lab sections with assistance from the laboratory project manager

viii) Controls and monitors access to and storage of samples and extracts

The analytical laboratory selected to perform the environmental analyses will be a full-service chemical analytical laboratory accredited under the State of Washington Department of Ecology (WDOE) Environmental Laboratory Accreditation Program (ELAP).

2.0 BACKGROUND AND OBJECTIVES

Section 1 of the Work Plan describes the historical basis for the project and the objectives of the investigation.

3.0 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities, and QA/QC activities designed to achieve the specific data quality goals to conduct groundwater sampling for the Renton Terminal (site) located at 2423 Lind Avenue Southwest, Renton, Washington. The objectives of this QAPP are to provide sufficiently thorough and concise descriptions of the measures to be applied during the investigations such that the data generated will be of a known and acceptable level of precision and accuracy. This QAPP provides comprehensive information regarding the project personnel responsibilities, and sets forth specific procedures to be used during sampling or relevant environmental matrices and analyses of data.

4.0 DATA QUALITY OBJECTIVES

4.1 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall Quality Assurance (QA) objective is to develop and implement procedures for sample collection and analyses which will provide data with an acceptable level of accuracy and precision.

QA measures for this project will begin with sample containers. Sample containers will be purchased from a certified manufacturer and will be precleaned (I-Chem Series 200 or equivalent).

4.2 LABORATORY QUALITY ASSURANCE

The following subsections define the QA goals required to meet the Data Quality Objectives (DQOs) of the project.

4.2.1 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to the accuracy, precision, and sensitivity of analytical data is to meet the Quality Control (QC) acceptance criteria of each analytical protocol. Analytical methods for groundwater analyses were chosen to achieve targeted quantitation limits that are below the MTCA Method A Cleanup Levels for Groundwater (WAC Table 720-1; Ecology, 2007). A summary of the targeted quantitation limits and cleanup levels are presented in Table 4.1. It should be noted that these limits are targeted quantitation limits only; limits are highly matrix dependent and may not always be achieved.

The method accuracy (percent recovery) for investigative samples will be determined by spiking selected samples (matrix spikes) with the method recommended spiking compounds. Accuracy will be reported as the percent recovery of the spiking compound(s) and will compare with the criteria given in the appropriate methods, as identified in Section 7.0.

The method(s) precision (reproducibility between duplicate analyses) will be determined based on the duplicate analysis of matrix spike (MS) samples for organic parameters. Precision will be reported as Relative Percent Differences (RPDs) between

duplicate analyses; acceptance criteria will be as specified in the appropriate methods identified in Section 7.0.

4.2.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

A completeness requirement of 90 percent will be targeted for the program (see Section 12.1.3 for definition of completeness).

The quantity of samples to be collected has been estimated in an effort to effectively represent the population being studied. A summary of the sampling and analysis program is presented in Table 4.2.

Analytical methods selected for this study are consistent with those used for previous studies (if applicable) to assure comparability of the data. All standards used by the laboratory will be traceable to reliable sources and will be checked with an independent standard.

4.3 FIELD MEASUREMENT QUALITY ASSURANCE

Measurement data will be generated during field activities. These activities include, but are not limited to, the following:

i) pH measurement (±0.1 unit)
ii) Specific conductivity measurement (±3%)
iii) Temperature measurement (±3%)
iv) Water level (±0.2')
v) Dissolved oxygen measurement (±10%)
vi) Oxidation-reduction potential (redox) (±10%)
vii) Documenting time and weather conditions
viii) Observation of sample appearance and other conditions

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

5.0 SAMPLING (EXPERIMENTAL) DESIGN

The sampling design is described in the Work Plan.

6.0 FIELD PROCEDURES

The field procedures are presented in Section 3.0 of the Work Plan.

The sample container, preservation, shipping, and packaging requirements are identified in Table 6.1 and in Section 6.1.3.

The following subsections define sample custody and document control.

6.1 SAMPLE CUSTODY AND DOCUMENT CONTROL

The following documentation procedures will be used during sampling and analysis to provide Chain of Custody control during transfer of samples from collection through storage. Recordkeeping documentation will include use of the following:

i) Field logbooks (bound with numbered pages) to document sampling activities in the field

ii) Labels to identify individual samples

iii) Chain of Custody record sheet to document analyses to be performed

iv) Laboratory sample custody logbook

6.1.1 FIELD LOGBOOK

In the field, the sampler will record the following information in the field logbook (bound) for each sample collected:

i) Project number

ii) Sample matrix

iii) Name of sampler

iv) Sample source

v) Time and date

vi) Pertinent data (e.g., depth)

vii) Analysis to be conducted

viii) Sampling method

ix) Appearance of each sample (i.e., color, evidence of soil staining)

x) Preservation added, if any

xi) Number of sample bottles collected

xii) Pertinent weather data

Each field logbook page will be signed by the sampler.

6.1.2 SAMPLE NUMBERING

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example:	GW-081009 – AA – LLL - XXX
Where:	GW - Designates sample type
	(GW=Groundwater) (S=Soil) (SE=Sediment)
081007:	Date of collection (mm/dd/yy)
AA:	Sampler initials
LLL:	Location ID
XXX:	Unique sample number

QC samples will also be numbered with a unique sample number, with the exception of matrix spikes and matrix spike duplicates.

6.1.3 CHAIN OF CUSTODY RECORDS

Chain of Custody forms will be completed for all samples collected during the program.

The Chain of Custody form will document the transfer of sample containers. Custody seals will be placed on each cooler. The cooler will then be sealed with packing tape. Sample container labels will include sample number, place of collection and date and time of collection. All samples will be refrigerated using wet ice at 4°C (±2°C) and delivered to the analytical laboratory within 24 to 48 hours of collection. All samples will be delivered to the laboratory by commercial courier or Contractor personnel. All samples will be stored at 4°C (±2°C) at the laboratory.

The Chain of Custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler.

The Chain of Custody document will be signed, timed, and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a Chain of Custody form. The Chain of Custody form will consist of four copies which will be distributed as follows: The shipper will maintain a copy while the other three copies will be enclosed in a waterproof envelop within the cooler with the samples. The cooler will then be sealed properly for shipment. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to the QA/QC Officer-Sampling and Analytical Activities upon receipt of the samples by the laboratory. One copy will be returned with the data deliverables package.

Upon receipt of the cooler at the laboratory, the shipping cooler and the custody seal will be inspected by the Sample Custodian. The condition of the cooler and the custody seal will be noted on the Chain of Custody record sheet by the Sample Custodian. The Sample Custodian will record the temperature of one sample (or temperature blank) from each cooler and the temperature will be noted on the Chain of Custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The Sample Custodian will document the date and time of receipt of the container, and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated, and signed. Any damage or discrepancies will be reported to the Laboratory Project Manager and Laboratory QA/QC Officer before samples are processed.

6.1.4 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The Sample Custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Logbook. Samples removed from storage for analyses will be documented in the Sample Control Logbook.

The laboratory will be responsible for maintaining analytical logbooks and laboratory data as well as a sample (on hand) inventory for submittal to the QA/QC Officer - Sampling and Analytical Activities on an "as required" basis. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried

and maintained by the laboratory for a period of 5 years at which time the QA/QC Officer - Sampling and Analytical Activities will advise the laboratory regarding the need for additional storage.

6.1.5 STORAGE OF SAMPLES

After the Sample Custodian has completed the Chain of Custody forms and the incoming sample log, the Chain of Custody will be checked to ensure that all samples are stored in the appropriate locations. All samples will be stored within an access controlled custody room and will be maintained at 4°C (±2°C) until all analytical work is complete.

6.1.6 SAMPLE DOCUMENTATION

Evidentiary files for the entire project shall be inventoried and maintained by the QA/QC Officer - Sampling and Analytical Activities and shall consist of the following:

i) Project related plans
ii) Project logbooks
iii) Field data records
iv) Sample identification documents
v) Chain of Custody records
vi) Report notes, calculations, etc.
vii) Lab data, etc.
viii) References, copies of pertinent literature
ix) Miscellaneous - photos, maps, drawings, etc.
x) A copy of all final reports pertaining to the project

The evidentiary file materials shall be the responsibility of the Project Manager with respect to maintenance and document removal.

6.1.7 FIELD INSTRUMENTATION

Calibration and maintenance of field instruments will be performed by the supplier or manufacturer prior to use. Confirmation of properly functioning equipment will be

made by the Field Coordinator upon receipt of equipment at the Site. During the field activities, it will be the responsibility of the Field Coordinator to ensure proper field calibration and maintenance. Prior to use, field personnel will have documented training in the use of the field instruments they will be using. All equipment calibration and maintenance will be performed in accordance with manufacturer's guidelines. Manuals for all equipment will be available on-Site during the period(s) the equipment is in use. Field maintenance and calibration records will be maintained in a field logbook or on maintenance and calibration sheets.

Water quality instrumentation used during this investigation will be calibrated prior to the day's surveys in accordance with the manufacturer's instructions. Intermediate checks of calibration will be performed, and the data recorded in a field logbook, periodically throughout the usage period and at the end of the day. If necessary, instruments will be recalibrated.

7.0 LABORATORY PROCEDURES

7.1 ANALYTICAL METHODS

Investigative samples will be analyzed for the parameters listed in Table 4.1 using the methods cited in Table 4.2. These methods have been selected to meet the DQOs for each sampling activity.

Data deliverables for this program will include final results for the investigative samples and corresponding QC parameters as specified in Section 9.2.

7.2 CALIBRATION PROCEDURES AND FREQUENCY

7.2.1 INSTRUMENT CALIBRATION AND TUNING

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards are determined by the manufacturer guidelines, the analytical method, or the requirements of special contracts.

A bound notebook will be kept with each instrument requiring calibration in which will be recorded activities associated with QA monitoring and repairs program. These records will be checked during periodic equipment review and internal and external QA/QC audits.

7.2.2 GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

It is necessary to establish that a given GC/MS meets the standard mass spectral abundance criteria prior to initiating any ongoing data collection. This is accomplished through the analyses of tuning compounds as specified in the analytical methods.

Calibration of the GC/MS system will be performed daily at the beginning of the day or with each 12 hours of instrument operating time.

All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear

regression (with a correlation coefficient requirement of 0.995). Higher order fits will not be allowed.

Quantification of samples that are analyzed by GC/MS will be performed by internal standard calibration. For quantitation, the nearest internal standard free of interferences must be used.

7.2.3 GAS CHROMATOGRAPHY (GC)

Quantification of samples that are analyzed by GC/MS with element selective detectors shall be performed by external standard calibration. Standards containing the compounds of interest will be analyzed at a minimum of five concentrations to establish the linear range of the detector. Single point calibration will be performed at the beginning of each day and at every tenth injection. The response factors from the single point calibration will be checked against the average response factors from multi-level calibration. If deviations in response factors are greater than those allowed by the analytical method protocols, then system recalibration will be performed. Alternatively, fresh calibration standards will be prepared and analyzed to verify instrument calibration.

All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear regression (with a correlation coefficient requirement of ≥0.995). Higher order fits will not be allowed.

7.2.5 FIELD INSTRUMENTATION

Field equipment used during this investigation will be calibrated both prior to and following the day's surveys in accordance with the manufacturer's instructions. The equipment will also be operated in accordance with the manufacturer's instructions. Records of calibrations of field equipment will be recorded in a bound field notebook.

If a Horiba meter is used, calibration should be performed as follows:

i) The meter will be calibrated using the one-point calibration standard

ii) The pH meter will be checked against a second standard before and after each day's use

7.3 COMPOUND IDENTIFICATION

Compounds, which will be analyzed by GC/MS, will be identified by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard references should be obtained on the user's GC/MS within the same 12 hours as the sample analysis. These standard reference spectra may be obtained through analysis of the calibration standards. The following criteria must be satisfied to verify identification:

i) Elution of the sample component at the same GC relative retention time (RRT) as the standard component

ii) Correspondence of the sample component and the standard component mass spectrum

For GC determinations of specific analytes, the RRT of the unknown will be compared with that of an authentic standard. Since a true identification by GC is not possible, an analytical run for compound confirmation will be followed according to the specifications in the methods. Peaks must elute within daily retention time windows established for each indicator parameter to be declared a tentative or confirmed identification. Retention time windows are determined using standard protocols defined in each method.

7.4 QUANTITATION

The procedures for quantitation of analytes are discussed in the appropriate analytical methods. Sample results are generally calculated using external standards with the exception of the samples analyzed by GC/MS; these methods employ the use of internal standards for analyte quantitation.

7.5 QUANTITATION LIMIT REQUIREMENTS

Targeted quantitation limits will be consistent with those presented in Table 4.1. When matrix interferences are noted during sample analysis, actions will be taken by the laboratory to achieve the specified quantitation limits. Samples will not be diluted by more than a factor of five to reduce matrix effects. The laboratory will re-extract and/or use any of the cleanup techniques presented in the analytical methods to eliminate

matrix interferences. Sample results less than the quantitation limits but greater than the method or instrument detection limits will be reported and qualified as estimated.

Samples may be diluted to a greater extent if the concentrations of analytes of concern exceed the calibration range of the instrument. In such cases, the laboratory QA/QC Officer will assure that the laboratory demonstrates good analytical practices and that such practices are documented in order to achieve the specified detection limits.

8.0 QUALITY CONTROL

8.1 QC FOR LABORATORY ANALYSES

Specific procedures related to internal laboratory QC samples are described in the following subsections.

8.1.1 REAGENT BLANKS

A reagent blank will be analyzed by the laboratory at a frequency of one blank per analytical batch. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

8.1.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)/DUPLICATE ANALYSES

An MS/MSD sample will be analyzed for organic parameters and a duplicate and matrix spike will be analyzed for inorganic parameters at a minimum frequency of one per analytical batch. Acceptable criteria and analytes that will be used for matrix spikes are identified in the methods. Where method specified limits were not available, general control limits will be used. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the RPD between duplicate analyses will be used to assess analytical precision.

8.1.3 SURROGATE ANALYSES

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

The compounds that will be used as surrogates and the levels of recommended spiking are specified in the methods. Surrogate spike recoveries must fall within the control limits specified in the methods. If surrogate recoveries are excessively low (<10 percent), the laboratory will contact the QA/QC Officer - Sampling and Analytical Activities for further instructions. Dilution of samples to bring the analyte concentration

into the linear range of calibration may dilute the surrogates out of the quantification limit. Reanalysis of these samples is not required. Assessment of analytical quality in these cases will be based on the MS/MSD sample analysis results.

8.2 QC FOR FIELD SAMPLING

To assess the quality of data resulting from the field sampling program, field duplicate and trip blank samples will be collected and submitted to the analytical laboratory as samples.

8.2.1 TRIP BLANKS

Trip blanks will be used during the groundwater sampling program to detect contamination introduced through sample transport, sample container preparation, sample storage, and/or the analytical process.

8.2.2 FIELD DUPLICATE SAMPLES

Field duplicate samples will be collected and used to assess the aggregate precision of sampling techniques and laboratory analysis. For every 20 investigative samples, a field duplicate sample will be collected using standard sampling procedures. This duplicate will be packed and shipped to the laboratory for analysis.

9.0 DATA MANAGEMENT PROCEDURES

9.1 GENERAL

The contract laboratory will perform analytical data reduction and validation in-house under the direction of the Laboratory QA/QC Officer. The Laboratory QA/QC Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the relevant methods, which would caution the data user of possible unreliability. Data reduction, validation and reporting by the laboratory will be conducted as detailed in the following:

i) Raw data produced and checked by the responsible analysts is turned over for independent review by another analyst.

ii) The area supervisor reviews the data for attainment of quality control criteria presented in the referenced analytical methods.

iii) Upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the Laboratory QA/QC Officer.

iv) The Laboratory QA/QC Officer will complete a thorough inspection of all reports.

v) The Laboratory QA/QC Officer and area supervisor will decide whether any sample reanalysis is required.

vi) Upon acceptance of the preliminary reports by the Laboratory QA/QC Officer, final reports will be generated and signed by the Laboratory Project Manager.

9.2 LABORATORY REPORTING, DATA, PRESENTATION AND FINAL REPORT

Reporting and deliverables shall include, but not be limited to, all items listed in Table 9.1.

All sample data and corresponding QA/QC data as specified in the analytical methods, shall be maintained accessible either in hard copy or computer data files.

The laboratory will submit one copy of the final analytical report within 10 business days of receipt of the final sample included in the sample delivery group (SDG). An

electronic copy of the results and QC in eQuis format will also be required with the hard copy.

9.3 DOCUMENT CONTROL SYSTEM

A document control system ensures that all documents are accounted for when the project is complete.

A project number will be assigned to the project. This number will appear on sample identification tags, logbooks, data sheets, control charts, project memos, and analytical reports, document control logs, corrective action forms and logs, QA plans, and other project analytical records.

9.4 QC CHECK POINTS AND DATA FLOW

The following specific QC check points will be common to all metals, GC, and GC/MS analyses. They are presented with the decision points:

Chemist - bench level checks

i) Systems check: sensitivity, linearity, and reproducibility within specified limits

ii) Duplicate analyses within control limits

iii) Matrix spike results within control limits

iv) Surrogate spike results within control limits (organics only)

v) calculation/data reduction checks: calculations cross-checked, any discrepancies between forms and results evident, results tabulated sequentially on the correct forms.

Laboratory Project Manager

i) Systems operating within limits

ii) Data transcription correct

iii) Data complete

iv) Data acceptable

Sample Control

i) Samples returned to sample control following analysis.

Laboratory QA/QC Officer

i) QA objectives met

ii) QC checks are completed

iii) Final data and report package is complete

10.0 AUDITS

For the purpose of external evaluation, performance evaluation check samples are analyzed periodically by the laboratory. Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

The QA/QC Officer - Sampling and Analytical Activities may carry out performance and/or systems audits to insure that data of known and defensible quality are consistently produced during this program.

Systems audits are qualitative evaluations of all components of field and laboratory quality control measurement systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after completion of the program. Such audits typically involve a comparison of the activities given in the QA/QC plan described herein, with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to quantitatively evaluate precision and accuracy. A performance audit may be carried out by or under the auspices of the QA/QC Officer - Sampling and Analytical Activities without the knowledge of the analyst during each sampling event for this program.

It should be noted, however, that any additional external QA audits will only be performed if deemed necessary.

11.0 DATA REVIEW, VERIFICATION, AND VALIDATION

11.1 GENERAL

Validation of the analytical data will be performed by the QA/QC Officer - Sampling and Analytical Activities. The data validation will be performed in accordance with the documents: "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review," United States Environmental Protection Agency USEPA 540/R-99-008, October 1999.

Assessment of analytical and in-house data will include checks on data consistency by looking for comparability of duplicate analyses, comparability to previous data from the same sampling location (if available), adherence to accuracy and precision control criteria detailed in this QAPP and anomalously high or low parameter values. The results of these data validations will be reported to the Project Manager and the contract laboratory, noting any discrepancies and their effect upon acceptability of the data.

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be audited for anomalously high or low values that may appear to be inconsistent with other data.

12.0 DATA QUALITY ASSESSMENT

Final reports will contain a discussion on QA/QC summarizing the quality of the data collected and/or used as appropriate for each phase of the project. The Project Manager who has responsibility for these summaries, will rely on written reports/memoranda documenting the data assessment activities, performance and systems audits and footnotes identifying qualifications to the data, it any.

QA reports will be prepared by the QA/QC Officer - Sampling and Analytical Activities following receipt of all analytical data. These reports will include discussions of the following and their effects on the quality of the data reported:

i) Sample holding times

ii) Laboratory/reagent blank data

iii) Surrogate spike, matrix spike and matrix spike duplicate data

iv) Field QA/QC data

v) Pertinent instrument performance per method protocols

vi) Audit results (if performed)

In addition, the QA reports will summarize all QA problems, and give a general assessment of QA results versus control criteria for such parameters as accuracy, precision, etc. The QA reports will be forwarded to the Project Manager.

12.1 SPECIFIC ROUTINE PROCEDURES USES TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

12.1.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as percent relative difference will be calculated as follows for values significantly greater than the associated detection limit:

$$\text{Precision} = \left| \frac{(D_2 - D_1)}{(D_1 + D_2)/2} \right| \times 100$$

D_1 = matrix spike recovery

D_2 = matrix spike duplicate spike recovery

For results near the associated detection limits, precision will be assessed based on the following criteria:

Precision = $\left|\right.$ Original result – duplicate result $\left|\right.$ <CRDL[1]

12.1.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and check sample recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A - B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample

B = The background level determined by a separate analysis of the unspiked sample

C = The amount of spike added

In some cases, MS and/or MSD recoveries may not be available due to elevated levels of the spiked analyte in the investigative sample. In such cases, accuracy will be assessed based on surrogate spike recoveries and/or laboratory control samples.

12.1.3 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

[1] CRDL - Contract Required Detection Limit.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{usable data obtained}}{\text{total data planned}} \times 100 \text{ percent}$$

12.1.4 OUTLIERS

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data assessed and documented.

13.0 PREVENTATIVE MAINTENANCE

This section applies to both field and laboratory equipment. Specific preventive maintenance procedures for field equipment will be consistent with the manufacturer's guidelines. Specific preventive maintenance protocols for laboratory equipment will be consistent with the contract laboratory's standard operating procedures.

All analytical instruments to be used in this project will be serviced by laboratory personnel at regularly scheduled intervals in accordance with the manufacturers' recommendations. Instruments may also be serviced at other times due to failure. Requisite servicing beyond the abilities of laboratory personnel will be performed by the equipment manufacturer or their designated representative.

Routine maintenance of the instruments will be performed as per manufacturers' recommendations. The Laboratory Project Manager is responsible for the preventive maintenance of the instruments.

14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system will be:

i) Checking the predetermined limits for data acceptability beyond which corrective action is required

ii) Identifying and defining problems

iii) Assigning responsibility for investigating the problem

iv) Investigating and determining the cause of the problem

v) Determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and analyses)

vi) Assigning and accepting responsibility for implementing the corrective action

vii) Implementing the corrective action and evaluating the effectiveness

viii) Verifying that the corrective action has eliminated the problem

ix) Documenting the corrective action taken

For each measurement system, the laboratory QA/QC Officer will be responsible for initiating the corrective action and the Laboratory Project Manager will be responsible for implementing the corrective action.

TABLES

TABLE 4.1

ANALYTICAL PARAMETERS - GROUNDWATER
GROUNDWATER SAMPLING
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Method	*Parameter*	*Targeted Quantitation Limit (ug/L)*	*Cleanup Level* [1] *(ug/L)*
NWTPH-Gx	TPH-Gasoline Range	160	800
NWTPH-Dx	TPH-Diesel Range	100	500
	TPH-Heavy Oil Range	100	500
SW-846 8260	Benzene	1	5
	Toluene	200	1000
	Ethylbenzene	140	700
	Xylenes (total)	200	1000
	Methyl tert-butyl ether	4	20

Notes:

[1] MTCA Method A Cleanup Levels for Groundwater (WAC Table 720-1; Ecology, 2007).
TPH Total Petroleum Hydrocarbons

TABLE 4.3

SAMPLING AND ANALYSIS SUMMARY
GROUNDWATER SAMPLING
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Sample Matrix	*Analytical Parameters*	*Analytical Method*	*Estimated Number of Samples*	*Field Duplicates*	*Trip Blanks*	*MS/MSD/Dup*	*Toal Number of Samples*	*Unit Price*	*Unit Subtotal*
Groundwater	Gasoline Range Organics	NWTPH-Gx[1]	33	2	5	2/2/0	44	$ 25.00	$ 1,100.00
	Diesel and Oil Range Organics[3]	NWTPH-Dx[1]	33	2	-	2/2/0	39	$ 45.00	$ 1,755.00
	BTEX, MTBE	SW-846 8260[2]	33	2	5	2/2/0	44	$ 45.00	$ 1,980.00
								Total:	$ 4,835.00

Notes:

[1] Referenced from "Analytical Methods for Petroleum Hydrocarbons, Publication No ECY 97-602, June 1997"

[2] "Test Methods for Solid Waste Physical/Chemical Methods", SW-846, 3rd Edition, September 1986 (with all subsequent revisions).

[3] Including silica gel cleanup.

Dup Laboratory Duplicate.

MS Matrix Spike.

MSD Matrix Spike Duplicate.

TABLE 6.1

SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME PERIODS
GROUNDWATER SAMPLING
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

Analyses	*Sample Containers*	*Preservation*	*Maximum Holding Time*	*Notes*
Groundwater				
Gasoline Range Organics	Two 40 mL glass vials Teflon-lined septum	pH <2, HCl Cool 4°C	14 days from collection to analysis	Fill completely with no head space
Diesel and Oil Range Organics	Two 1L amber glass	pH <2, HCl Cool 4°C	14 days from collection to extraction, 40 days from extraction to analysis.	Fill completely
BTEX, MTBE	Two 40 mL glass vials Teflon-lined septum	pH <2, HCl Cool 4°C	14 days from collection to analysis	Fill completely with no head space

TABLE 9.1

LABORATORY REPORTING DELIVERABLES - LEVEL II DATA PACKAGE
GROUNDWATER SAMPLING
CONOCOPHILLIPS RENTON TERMINAL
RENTON, WASHINGTON

A detailed report narrative should accompany each submission, summarizing the contents and results.

A. Chain of Custody Documentation and Detailed Narrative [(1)]

B. Sample Information
   1. date collected
   2. date extracted or digested
   3. date analyzed
   4. analytical method and reference

C. Data
   1. samples
   2. laboratory duplicates [(2)]
   3. method blanks
   4. spikes, spike duplicates [(2) (3)]
   5. surrogate recoveries [(2)]

D. Miscellaneous
   1. method detection limits and/or instrument detection limits
   2. percent solids (where applicable)
   3. metals run logs
   4. standard preparation logs
   5. sample preparation logs

All sample data and its corresponding quality assurance/quality control (QA/QC) data shall be maintained accessible to CRA either in hard copy or on magnetic tape or disc (computer data files). All solid sample results must be reported on a dry-weight basis.

Notes:

(1) Any QC outliers must be addressed and corrective action taken must be specified.
(2) Laboratory must specify applicable control limits for all QC sample results.
(3) A blank spike must be prepared and analyzed with each sample batch.