2011 HYDROLOGIC AND HYDROGEOLOGIC INVESTIGATION REPORT

Gateway Pacific Terminal

Whatcom County, Washington

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Project No. 091515338C

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PREFACE

Pacific International Terminals, Inc. (Pacific International Terminals), proposes to develop the Gateway Pacific Terminal (the "Terminal"), a multimodal terminal for transfer of dry bulk commodities, at Cherry Point in Whatcom County, Washington. Construction and operation of the Terminal and associated facilities require the approval of local, state, and federal agencies. Agency decision makers are to be informed of the potential environmental impacts of the proposed project by preparation of an Environmental Impact Statement (EIS). The EIS will be prepared under guidelines of the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) by a lead federal agency and lead state agency or agencies working in cooperation.

This report is one of several technical reports prepared on behalf of Pacific International Terminals that provide scientific technical information about the existing conditions of the proposed project area and in some cases the projected effects of project operations. It is provided to the lead federal, state, and local agencies for their use in preparation of a Draft EIS. Several of the technical reports have also been prepared to support specific project permit applications submitted to local, state, and federal agencies, or as part of the consultation process with resource agencies and affected Indian nations.

A more detailed description of the proposed Terminal, including a complete list of proposed commodities and the phasing plan, is provided in the *Revised Gateway Pacific Terminal Project Information Document* (Pacific International Terminals 2012).

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TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1
1.1 PURPOSE OF THIS REPORT 1
1.2 DOCUMENT ORGANIZATION 1

2.0 SETTING 5
2.1 GENERAL SETTING 5
2.1.1 Topography 5
2.1.2 Watershed and Surface Water Features 6
2.2 CLIMATE 14
2.3 REGIONAL GEOLOGY 14
2.4 CHERRY POINT HYDROGEOLOGY 16

3.0 HYDROLOGIC AND HYDROGEOLOGIC DATA COLLECTION 21
3.1 INSTALLATION OF HYDROLOGIC/HYDROGEOLOGIC INSTRUMENTATION 21
3.1.1 Piezometer Installation 21
3.1.2 Geotechnical Sample Collection 25
3.1.3 Staff Gages 25
3.2 GROUNDWATER AND SURFACE WATER MONITORING 26
3.2.1 Water Level Measurements 28
3.2.2 Discharge Monitoring 29
3.2.3 Water Quality Monitoring 30
3.3 DATA COLLECTION QUALITY ASSURANCE/QUALITY CONTROL 32

4.0 CONCEPTUAL SITE MODEL 33
4.1 HYDROSTRATIGRAPHY AND AQUIFER PROPERTIES 34
4.2 SURFACE WATER STAGE AND DISCHARGE MEASUREMENTS 41
4.3 GROUNDWATER FLOW DIRECTIONS AND GRADIENTS 65
4.4 STEADY-STATE WATER BALANCE 81
4.4.1 Recharge 82
4.4.2 Underflow 82
4.4.3 Baseflow 96
4.4.4 Water Balance 97
4.5 GROUNDWATER AND SURFACE WATER QUALITY 97

5.0 DEVELOPMENT OF NUMERICAL GROUNDWATER MODEL 109
5.1 NUMERICAL MODEL CODE 109
5.2 MODEL DOMAIN AND DISCRETIZATION 109
5.3 BOUNDARY CONDITIONS 115
5.4 RECHARGE ZONATION AND VALUES 123
5.5 HYDRAULIC PARAMETER ZONATION AND VALUES 124

6.0 MODEL CALIBRATION, MODEL RESULTS, AND SENSITIVITY ANALYSIS 133
6.1 MODEL CALIBRATION 133
6.1.1 Model Calibration Targets 133
6.1.2 Calibration Goals and Procedures 133
6.1.3 Calibration Results 134
6.2 MODEL RESULTS 140

6.2.1 Simulated Areas of Soil Saturation 141
6.2.2 Advective Groundwater Flow Paths 141
6.3 UNCERTAINTY AND SENSITIVITY ANALYSIS 142
6.3.1 Summary of Sensitivity Analysis 142
6.3.2 Sensitivity to Recharge Rate 151
6.3.3 Sensitivity to Hydraulic Conductivity 151
6.3.4 Sensitivity to Flux and Constant Head Boundaries 151
6.3.5 Sensitivity to DRAIN Package Conductance 152
6.4 MODEL LIMITATIONS 152
6.5 POSSIBLE FUTURE MODELING OBJECTIVES 153

7.0 SUMMARY AND CONCLUSIONS 171

8.0 REFERENCES 173

TABLES

Table 3-1 Construction Details for Groundwater Piezometers 22
Table 3-2 Construction Details for Surface Water Staff Gages 27

Table 4-1 Results of Geotechnical Analyses 34
Table 4-2 Surface Water Discharge Measurements 63
Table 4-3 Groundwater Elevations 77
Table 4-4 Steady-State Water Balance 94
Table 4-5 Analytical Data Summary – February 2011 99
Table 4-6 Analytical Data Summary – April 2011 101

Table 6-1 Calibration Statistics 139
Table 6-2 Simulated and Estimated Steady-State Water Balance 140

FIGURES

Figure 1-1 Vicinity Map 3

Figure 2-1 Terminal Project Area Topography and Surface Water Features 7
Figure 2-2 Watersheds within the Gateway Pacific Terminal Project Site 9
Figure 2-3 Existing Stream Network, Wetlands, and Hydrologic Flow 11
Figure 2-4 Stratigraphic Cross Section at Bellingham Bay 17

Figure 3-1 Project Area Piezometers, Staff Gages, and Surface Water Sampling Locations 23

Figure 4-1 Cross Section Location Map 35
Figure 4-2 Cross Sections A-A' & B-B' 37
Figure 4-3 Cross Section C-C' 39
Figure 4-4 Surface Water (Stage) Hydrographs: Gages SG-1 and SG-2 43
Figure 4-5 Surface Water (Stage) Hydrographs: Gages SG-3 and SG-4 45
Figure 4-6 Surface Water (Stage) Hydrographs: Gages SG-5 and SG-6 47
Figure 4-7 Surface Water (Stage) Hydrographs: Gages SG-7 and SG-8 49

Figure 4-8 Surface Water (Stage) Hydrographs: Gages SG-9 and SG-10 51
Figure 4-9 Surface Water (Stage) Hydrographs: Gages SG-11 and SG-12 53
Figure 4-10 Surface Water (Stage) Hydrographs: Gages SG-13 and SG-14 55
Figure 4-11 Surface Water (Stage) Hydrographs: Gages SG-15 and SG-16 57
Figure 4-12 Surface Water (Stage) Hydrographs: Gages SG-17 and SG-18 59
Figure 4-13 Surface Water (Stage) Hydrographs: Gages SG-19 and SG-20 61
Figure 4-14 SG-2 Rating Curve 67
Figure 4-15 SG-4 Rating Curve 69
Figure 4-16 Fourth Quarter 2010 (December 15, 2010) Groundwater Contour Map 71
Figure 4-17 First Quarter 2011 (February 10, 2011) Groundwater Contour Map 73
Figure 4-18 Second Quarter 2011 (April 1, 2011) Groundwater Contour Map 75
Figure 4-19 Groundwater Hydrographs: Wells PZ-1 and PZ-2 83
Figure 4-20 Groundwater Hydrographs: Wells PZ-3 and PZ-4 85
Figure 4-21 Groundwater Hydrographs: Wells PZ-5 and PZ-6 87
Figure 4-22 Groundwater Hydrographs: Wells PZ-7 and PZ-8 89
Figure 4-23 Groundwater Hydrographs: Wells PZ-9 and PZ-10 91
Figure 4-24 Groundwater Hydrographs: Wells PZ-11 and PZ-12 93
Figure 4-25 Piper Diagram: February 2011 Water Quality Data 105
Figure 4-26 Piper Diagram: April 2011 Water Quality Data 107

Figure 5-1 Groundwater Numerical Modeling Domain 111
Figure 5-2 Groundwater Numerical Model Grid Spacing 113
Figure 5-3 Groundwater Numerical Model Layer 1 Boundary Conditions 117
Figure 5-4 Groundwater Numerical Model Layer 2 Boundary Conditions 119
Figure 5-5 Groundwater Numerical Model Layer 3 Boundary Conditions 121
Figure 5-6 Groundwater Numerical Model Layer 1 Hydraulic Conductivity Distribution 125
Figure 5-7 Groundwater Numerical Model Layer 2 Hydraulic Conductivity Distribution 129
Figure 5-8 Groundwater Numerical Model Layer 3 Hydraulic Conductivity Distribution 131

Figure 6-1 Simulated Versus Observed Heads 135
Figure 6-2 Simulated Potentiometric Contours Weathered Bellingham Glaciomarine Drift 137
Figure 6-3 Simulated Saturated Surface Soils (Layer 1) 143
Figure 6-4 Particle Track Simulation Results for Model Layer 1 145
Figure 6-5 Particle Track Simulation Results for Model Layer 2 147
Figure 6-6 Particle Track Simulation Results for Model Layer 3 149
Figure 6-7 Recharge Rate Sensitivity Analysis 155
Figure 6-8 Everson Beach Deposits and Silt (Layer 1) Background Hydraulic Conductivity Sensitivity Analysis 157
Figure 6-9 Weathered Bellingham Glaciomarine Drift (Layer 2) Background Hydraulic Conductivity Sensitivity Analysis 159
Figure 6-10 Non-Weathered Bellingham Glaciomarine Drift (Layer 3) Background Hydraulic Conductivity Sensitivity Analysis 161
Figure 6-11 Everson Beach Deposits and Silt (Layer 1) Constant Flux Sensitivity Analysis 163
Figure 6-12 Weathered Bellingham Glaciomarine Drift (Layer 2) General Head Boundary Sensitivity Analysis 165
Figure 6-13 Non-Weathered Bellingham Glaciomarine Drift (Layer 3) General Head Boundary Sensitivity Analysis 167
Figure 6-14 Drain Package Conductance Sensitivity Analysis 169

APPENDICES

Appendix A Boring Logs
Appendix B Well Reports
Appendix C Laboratory Reports for Water Quality Analyses
Appendix D Laboratory Report for Geotechnical Analyses

ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Environment & Infrastructure, Inc.
ARI	Analytical Resources, Inc., in Tukwila, Washington
bgs	below ground surface
BIA	Bellingham International Airport
BP	British Petroleum
BTEX	benzene, toluene, ethylbenzene, and xylene
cm/sec	centimeters per second
COC	chain of custody
DEA	David Evans and Associates, Inc.
Deming Sand	a fluvial deposit (i.e., non-marine) exhibiting cross-bedding and channels in the sandy sediment, and covers approximately 2,300 square kilometers.
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
Everson beach deposits	Everson Interstade emergence beach deposits consisting mainly of sand and gravels; occur in localized areas throughout the Fraser–Whatcom Lowlands, which overlie the Bellingham glaciomarine drift
Fraser-Whatcom Lowlands	part of the larger Georgia Basin and bounded by the Coast Mountains in British Columbia, the Cascade Mountains, and the Strait of Georgia
ft^3/sec	cubic feet per second
GHB	general head boundary
GUI	graphical-user-interface software Groundwater Vistas (Version 5.51, Build 16)
HARN	High Accuracy Reference Network
HCID	hydrocarbon identification
HCIM	hydraulic control interim measure
LiDAR	Light Detection and Ranging
µL	microliter
mL/minute	milliliters per minute
MODFLOW	USGS Modular Three-Dimensional Finite-Difference Ground-Water Flow Model
msl	mean sea level
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NED	USGS National Elevation Dataset
NEPA	National Environmental Policy Act

ORP	oxidation-reduction potential
Project Area/Terminal Project Area	property owned by Pacific International Terminals, Inc.
project vicinity	the general region surrounding the Terminal Project Area
ppt	parts per thousand
PVC	polyvinyl chloride
PZ	piezometer
RSD	residual standard deviation
RSD/range ratio	residual standard deviation divided by the observed range in head
SEPA	Washington State Environment Policy Act
SG	staff gage
SVOCs	semi-volatile organic compounds
TDS	total dissolved solids
Terminal	Gateway Pacific Terminal at Cherry Point in Whatcom County, Washington
TPH	total petroleum hydrocarbons
TPH-Gx	total petroleum hydrocarbons in the gasoline range
TSS	total suspended solids
UGA	urban growth area
USACE	U.S. Army Corps of Engineers
U.S. EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDNR	Washington Department of Natural Resources
WRCC	Western Regional Climate Center
WRIA	Water Resources Inventory Area

1.0 INTRODUCTION

Pacific International Terminals, Inc. (Pacific International Terminals), has proposed construction and operation of the Gateway Pacific Terminal (the Terminal) at Cherry Point in Whatcom County, Washington (Figure 1-1). The proposed Terminal is designed for the import and export of dry bulk commodities. Planned infrastructure associated with Terminal operations includes a deep-water wharf with access trestle, dry bulk materials handling and storage facilities, and rail transportation access. A more detailed description of the proposed Terminal is provided in the *Revised Gateway Pacific Terminal Project Information Document* (Pacific International Terminals, Inc. 2012).

Terminal construction would alter surface water and shallow groundwater hydrologic conditions at the Terminal. Direct and indirect effects to wetlands, streams, and ditches may also occur during Terminal construction or operation. This report presents baseline wet-season groundwater and surface water data for the Terminal project area; a project area hydrologic and hydrogeologic conceptual model; and a numerical model developed to analyze project area groundwater flow conditions and surface soil saturation in wetland areas.

1.1 PURPOSE OF THIS REPORT

The purpose of this report is to establish baseline hydrologic and hydrogeologic conditions in the Terminal project area. An extensive investigation was required to acquire the data needed to support preparation of an Environmental Impact Statement (EIS), including development and calibration of the numerical hydrogeologic model. Going forward, the baseline data and hydrogeologic model will be used to:

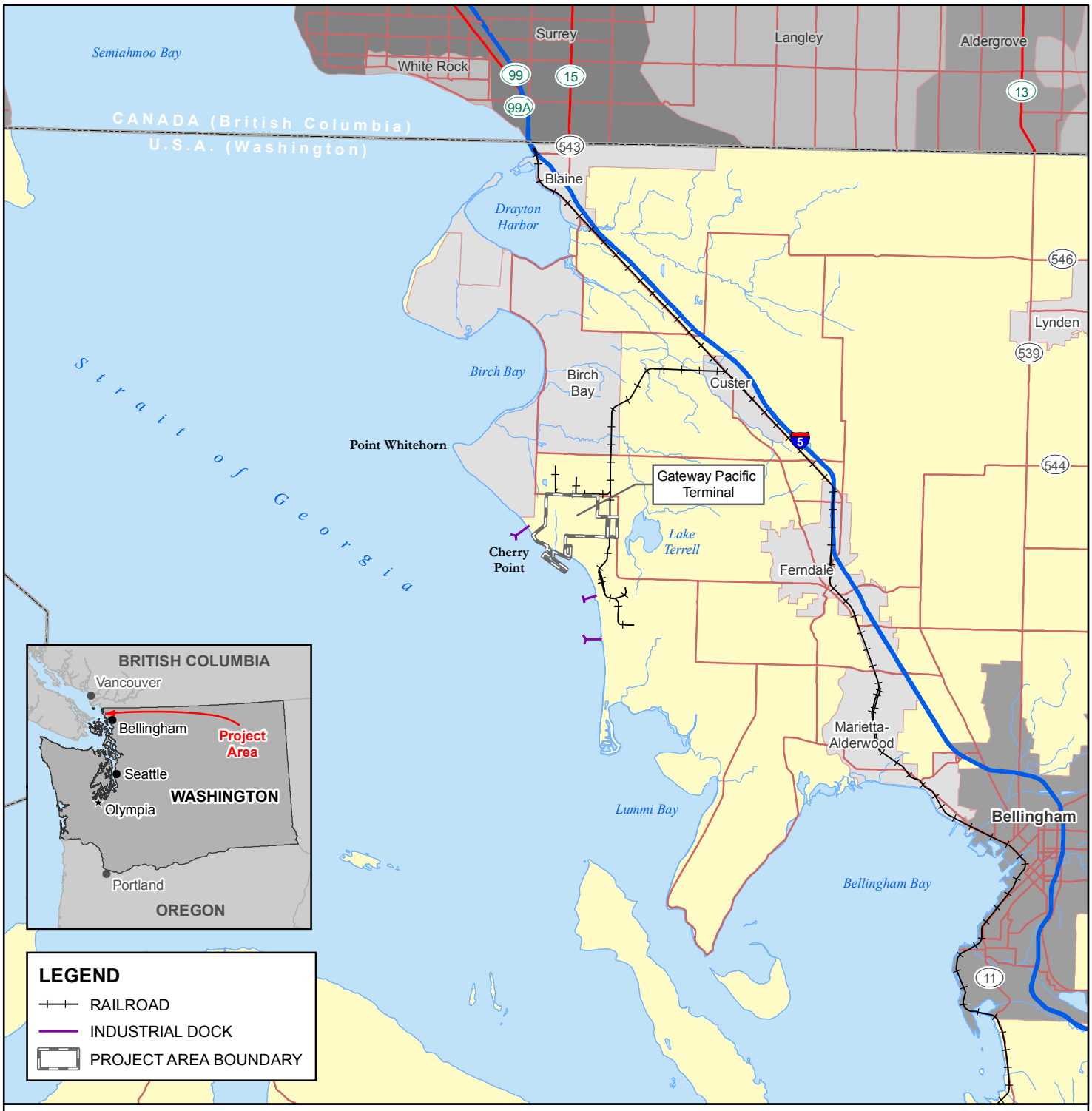
- Evaluate potential effects of the Terminal on wetlands and to support wetland mitigation designs;
- Develop the stormwater management system at the Terminal and support the decisions for required stormwater permits;
- Ensure that the Terminal design approach is compatible with project area hydrologic and hydrogeologic conditions; and
- Establish baseline water quality conditions in the Terminal project area.

1.2 DOCUMENT ORGANIZATION

The Hydrologic and Hydrogeologic Investigation Report is organized as follows:

- Section 1.0 – Introduction
- Section 2.0 – Setting

- Section 3.0 – Hydrologic and Hydrogeologic Data Collection
- Section 4.0 – Conceptual Site Model
- Section 5.0 – Development of Numerical Groundwater Model
- Section 6.0 – Model Calibration, Model Results, and Sensitivity Analysis
- Section 7.0 – Summary and Conclusions
- Section 8.0 – References



AMEC 11810 North Creek Parkway N Bothell, WA 98011	amec	Pacific International Terminals	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

PROJECT: GATEWAY PACIFIC TERMINAL	DWN BY: SD	DATUM: NAD83	DATE: August 2011
TITLE: VICINITY MAP	CHK'D BY: CS	REV. NO.: 1	PROJECT NO.: 091515338C-12-04
	PROJECTION: WA SP North, Ft.	SCALE: 1 inch=3 miles	FIGURE No.: FIGURE 1-1

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-07-03 - Geotechnical Investigation\Figure 1 - Vicinity Map.mxd

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2.0 SETTING

The proposed Terminal project area consists of approximately 1,200 acres at Cherry Point in Whatcom County, Washington. Cherry Point is a small promontory of land located along the southeast margin of the Strait of Georgia. The project area lies approximately 18 miles northwest of the City of Bellingham; 5 miles west of the City of Ferndale; and 17 miles south of the United States–Canada Border (Figure 1-1). This region in western Whatcom County is zoned for Heavy Impact Industrial use and is designated as one of Whatcom County's Urban Growth Areas (UGA). Major industrial facilities currently operating in the Cherry Point Industrial UGA include the British Petroleum (BP) Cherry Point Refinery, the ConocoPhillips Ferndale Refinery, and ALCOA-Intalco Works. In addition to industrial activities, western Whatcom County also contains mixed residential and agricultural areas.

Approximately 1,139 acres of the 1,200-acre project area are currently owned by Pacific International Terminals. Approximately 20 acres not owned by Pacific International Terminals comprise Whatcom County rights-of-way. The total project area of 1,200 acres is larger than the area considered in this hydrologic and hydrogeologic investigation, which addresses only upland areas within the Terminal project area.

Neighboring properties include the BP Cherry Point Refinery immediately north and west of the project area. The Strait of Georgia and a 335-acre area known as "Parcel 15" lie to the south and southwest of the proposed Terminal project area. The BNSF Railway Custer Spur, including the Eliot Rail Yard, is located within the eastern portion of the project area. The closest residential properties are located 1.5 miles to the east lying between the Terminal project area and the Lake Terrell State Wildlife Refuge (Figure 1-1).

2.1 GENERAL SETTING

The following sections describe the general setting of the proposed Terminal project area, including discussions of project area topography, watershed and surface water features, climate, and regional geologic and hydrogeologic conditions.

2.1.1 Topography

The topography in the project area exhibits slopes trending to the west and south with two localized topographic high points in the central and northwest portions of the project areas (Figure 2-1). Upland ground surface elevations range from approximately mean sea level (msl; North American Vertical Datum of 1988 [NAVD88]) along the Strait of Georgia to above 225 feet above msl at the eastern edge of the project area (Figure 2-1). A small southwest/northeast-trending topographic ridge lies within the northwest portion of the project area. A second localized topographic high point is centrally

located within the project area just north of Henry Road, where elevation rises above 175 feet msl. Steeper topographic slopes tend to occur within the eastern, central, and southern portions of the project area. As shown in Figure 2-1, wetlands are generally absent in project areas characterized by either local topographic highs or relatively steeper topographic slopes.

Other portions of the project area characterized by steep terrain include the bluffs along the northwestern portion of the Strait of Georgia shoreline and the middle and lower reaches of Stream 1. The channel slope of Stream 1 is characterized by lower gradients within its upper reaches and channel elevation decreases quickly forming a deep ravine immediately south of Lonseth Road (Figure 2-1). Stream 1 continues to flow within the ravine until the steep sides forming the ravine walls gradually moderate. Stream 1 exits the ravine just before discharging through a coastal wetland to the Strait of Georgia.

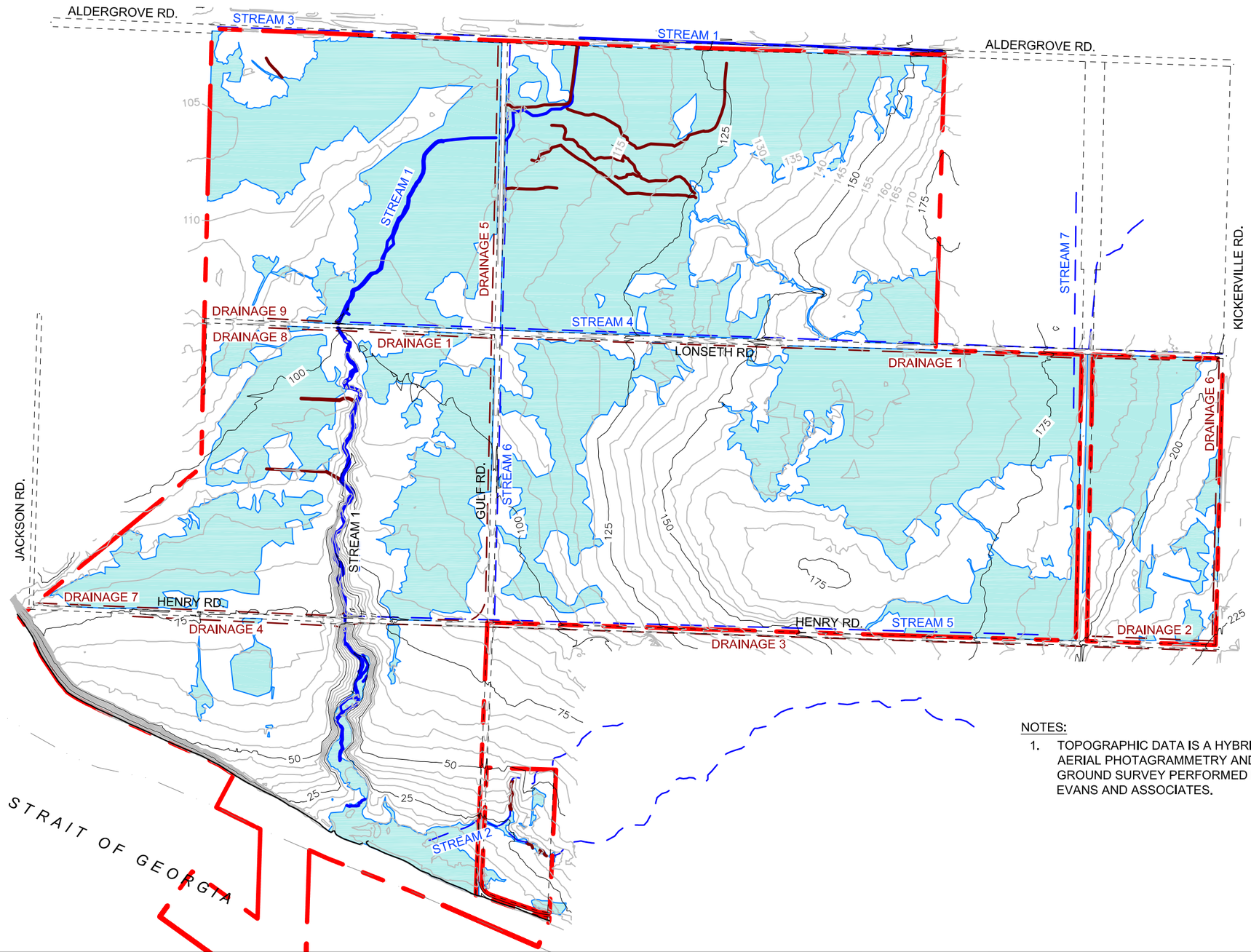
2.1.2 Watershed and Surface Water Features

The project area includes portions of two coastal watersheds that ultimately discharge to the Strait of Georgia: (1) the Birch Bay Watershed, and (2) an unnamed coastal watershed designated the Gateway Pacific Terminal Watershed for purposes of the Terminal project (Figure 2-2) (Pacific International Terminals, Inc. 2012).

2.1.2.1 Birch Bay Watershed

A relatively small area (approximately 68 acres) located in the extreme northwest corner of the project area is within the Birch Bay Watershed. This area is currently drained by Stream 3, which flows westerly paralleling Aldergrove Road before turning northwest and flowing through the BP Cherry Point Refinery property (Figure 2-3). Stream 3 is a tributary to Terrell Creek, which ultimately discharges to Birch Bay (Pacific International Terminals, Inc. 2012).

The portion of the Birch Bay Watershed within the project area includes Wetland 1 (approximately 44 acres), which is part of the contributing area to Stream 3 (Figure 2-3). A single 6-inch culvert beneath Aldergrove Road provides surface water connection from Wetland 1 to Stream 3 only during periods of high flow (AMEC Earth & Environmental 2008); however, using topographic gradients to infer shallow groundwater flow directions, it is likely that shallow groundwater beneath Wetland 1 discharges to Stream 3 when the water table rises above streambed elevations.



LEGEND

HYDROLOGIC FEATURES

- STREAM LOCATION (DASHED WHERE APPROXIMATE)
- DRAINAGE LOCATION (DASHED WHERE APPROXIMATE)
- WETLAND AREA

OTHER FEATURES

- GROUND SURFACE ELEVATION CONTOUR [1] CONTOUR INTERVAL 5 FEET (NAVD88 FT)
- PROJECT AREA BOUNDARY (WHARF NOT SHOWN IN ITS ENTIRETY)
- RIGHT-OF-WAY OR EASEMENT WITHIN PROJECT AREA VICINITY

NOTES:

1. TOPOGRAPHIC DATA IS A HYBRID OF AERIAL PHOTAGRAMMETRY AND A GROUND SURVEY PERFORMED BY DAVID EVANS AND ASSOCIATES.

0 500 1,000
APPROXIMATE SCALE IN FEET

	CLIENT LOGO	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: APS CHK'D BY: RH	PROJECT: GATEWAY PACIFIC TERMINAL	DATE: JUNE 2012 PROJECT NO: 5-91M-15338-0
		AMEC Environment & Infrastructure, Inc. 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201	DATUM: NAD83 PROJECTION: WA SP NORTH Ft. SCALE: AS SHOWN	TITLE: TERMINAL PROJECT AREA TOPOGRAPHY AND SURFACE WATER FEATURES	REV. NO.: A FIGURE No. FIGURE 2-1

S:\AMEC-Offices\Bothell\15338c\003_HydrologyReport\GPT_SiteMap_061312.dwg – Fig 2-1TOPO map – Jun. 14, 2012 11:21am – adam.stenberg

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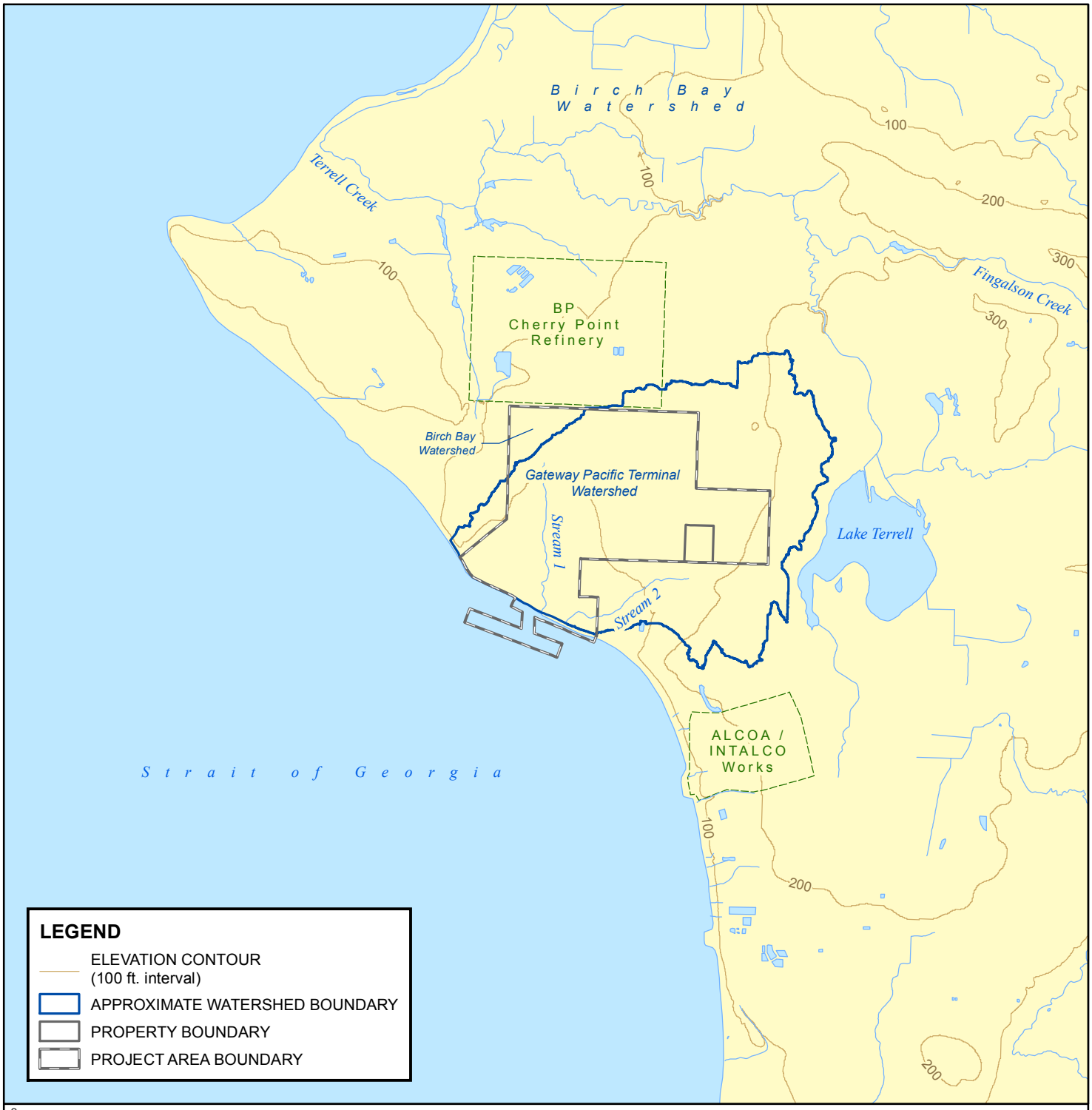

Source:
Elevation Contours from Whatcom County:
http://www.co.whatcom.wa.us/pds/planning/gis/gisdata.jsp

0 0.5 1 2 Miles

N

AMEC 11810 North Creek Parkway N Bothell, WA 98011	amec	Pacific International Terminals.	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.
PROJECT: GATEWAY PACIFIC TERMINAL		DWN BY: SD	DATUM: NAD83 / DATE: APRIL 2012
TITLE: WATERSHEDS WITHIN THE GATEWAY PACIFIC TERMINAL PROJECT SITE		CHK'D BY: RW	REV. NO.: 1 / PROJECT NO.: 091515338C-14-04
		PROJECTION: WA SP North, Ft.	SCALE: 1 inch=1 mile / FIGURE No.: FIGURE 2-2

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-14-04 - Hydrologic and Hydrogeologic Investigation Report\dwg\Figure 2-2 - Watersheds.mxd

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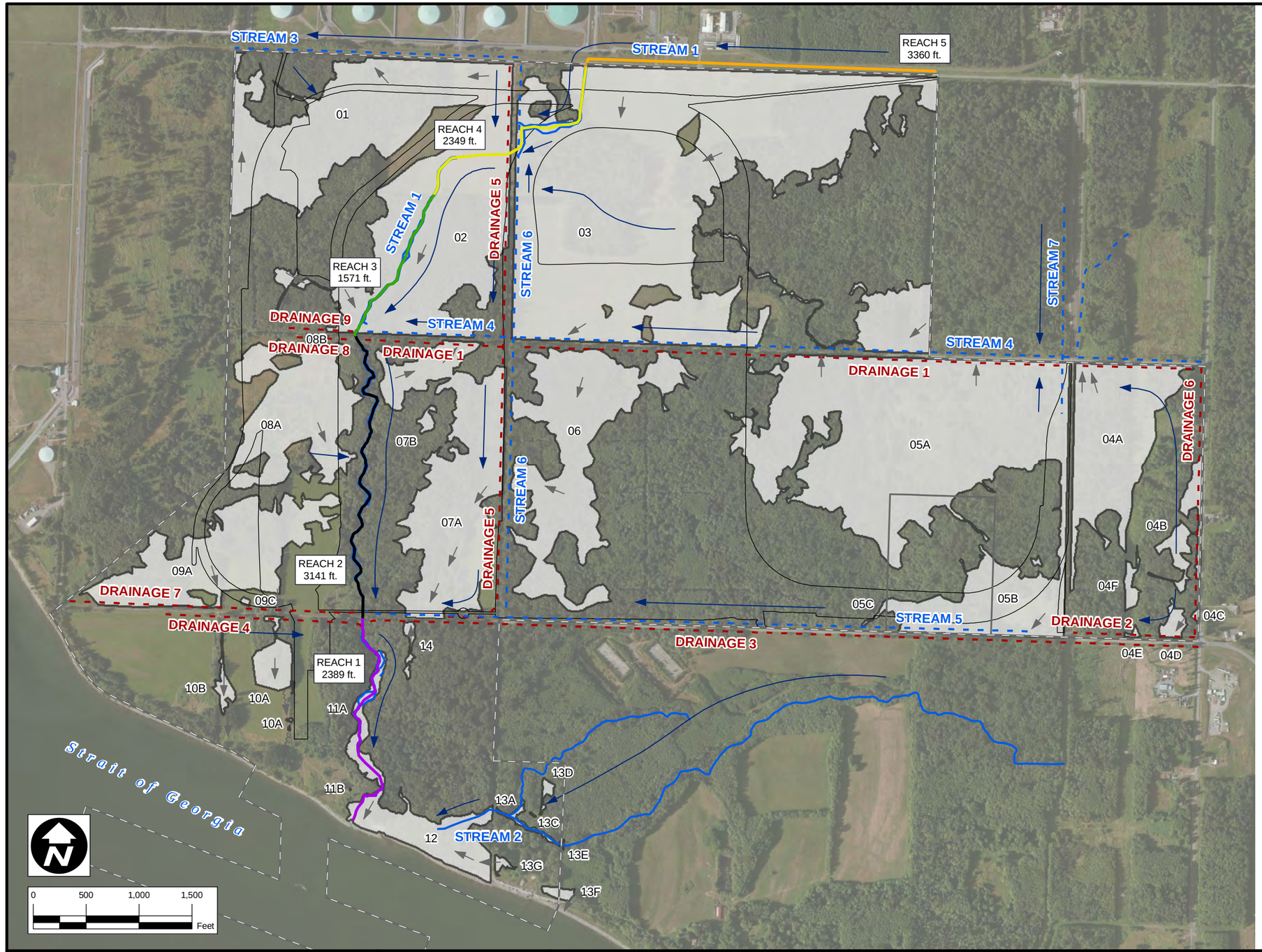

LEGEND

- APPROXIMATE DRAINAGE
- APPROXIMATE STREAM
- SURVEYED STREAM
- STREAM AND DRAINAGE FLOW DIRECTION
- WETLAND FLOW DIRECTION

STREAM 1:

- REACH 1
- REACH 2
- REACH 3
- REACH 4
- REACH 5
- EXISTING WETLAND AREA
- DEVELOPMENT FOOTPRINT
- PROPERTY BOUNDARY
- PROJECT AREA BOUNDARY

NOTE: Streams regulated by WDFW under the Hydraulic Code (RCW 77.55 and WAC 220-110): Stream 1 (Reaches 1, 2, and 3), 2, 4, 6 & 7.

Streams regulated by Whatcom County per Critical Areas Ordinance Maps: Streams 1, 2, 3, 4, 5, 6, and 7 .

Source:
Ausenco Sandwell, 143166-A100-WC001-1.dwg (Rev. P1), 12/22/2011.

Pacific International Terminals
A Cermix Enterprise

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway N
Bothell, WA 98011

amec

DWN BY:	SD
CHK'D BY:	MZ
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 1,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: EXISTING STREAM NETWORK, WETLANDS, AND HYDROLOGIC FLOW

DATE:	JUNE 2012
PROJECT NO.:	091515338C-12-04
REV. NO.:	-
FIGURE NO.:	FIGURE 2-3

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-12-04 - 2011 Hydrology Report\dwg\Figure 2-3 - Existing Stream Network.mxd

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2.1.2.2 Gateway Pacific Terminal Watershed

The project area encompasses a major portion of a small coastal watershed (2,179 acres), referred to as the Gateway Pacific Terminal Watershed (Pacific International Terminals, Inc. 2012). The Gateway Pacific Terminal Watershed lies completely within the Fraser-Whatcom Lowlands and drains via two second-order streams toward the Strait of Georgia. The outlets to Streams 1 and 2 occur within a shallow coastal wetland, bordering the Strait of Georgia (Wetland 12; Figure 2-3). Natural drainage in the Gateway Pacific Terminal Watershed has been altered by historic development activities (Pacific International Terminals, Inc. 2012).

The principal hydrologic feature within the Gateway Pacific Terminal Watershed is Stream 1 (Water Resources Inventory Area [WRIA] Number 01.0100; Figure 2-3). Stream 1 is approximately 2.4 miles long in the project vicinity and drains a total of 1,723 acres flowing through a combination of natural drainages and roadside ditches. Field observations suggest that Stream 1 has continuous flow for approximately 9 to 10 months of the year, with dry periods occurring during late summer to early fall. Because it has continuous flow for at least three months of the year, Stream 1 is an intermittent stream.

Lower reaches of a second smaller stream, designated Stream 2 (WRIA Number 01.0101), are located on the southeast portion of the Pacific International Terminals property (Figure 2-3). This intermittent, second-order stream drains the eastern portion of the Gateway Pacific Terminal Watershed as it flows through forested and pasture areas toward the southwest. Stream 2 is approximately 1 mile long with about 1,160 linear feet located on the Pacific International Terminals property. The remaining upper reaches of Stream 2 flow through adjacent, privately owned parcels, collectively known as “Parcel 15.”

Approximately 250 feet east of the project area boundary, an old stock pond with an earthen dam across the main channel prevents continuous flow in the portions of Stream 2 on the Pacific International Terminals property. Upstream of the stock pond, the stream lies in a steep-sided ravine, and the riparian area is narrow but forested. Where Stream 2 exhibits steep sidewalls, groundwater seeps may provide important contributions to stream flow. A short tributary flowing from the northeast (Stream 2A) joins the primary channel of Stream 2 at a location approximately 300 feet east of Gulf Road. The stream then flows southwest through a culvert under Gulf Road and empties into Wetland 12 (Figure 2-3).

In addition to two stream features, other surface water features in the project area include roadside ditches. Roadside ditches within the project area were constructed to convey runoff, keep the road subbase dry, and provide a transition from public roads to private property. While all of the roadside conveyances produce a defined channel or bed, none of the streams or ditches occur in locations

where natural streams existed before human alteration. Surface water contributions to ditches include overland sheet flow, runoff from asphaltic road surfaces, baseflow discharge through the streambed, and throughflow from surface soils that discharges through the ditch sidewalls. Discharge in nearly all roadside ditches eventually flows into Stream 1.

Wetlands comprise approximately 530 acres of the project area. Wetlands located within the Terminal project area are shown in Figure 2-3. A Jurisdictional Determination by the U.S. Army Corps of Engineers (USACE) issued on March 5, 2009, confirmed the extent and location of delineated wetlands on the Pacific International Terminals property. Wetland ratings and water quality, hydrologic, and habitat functions are established in the *Wetland Determination and Delineation Report* (AMEC Earth & Environmental 2008).

2.2 CLIMATE

Historical climate data from the Bellingham International Airport (BIA) were obtained from the Western Regional Climate Center (WRCC, 2012). Available data covers the period from December 1, 1949, through April 30, 2012. During this period, average annual precipitation at the Airport was 35.3 inches/year while average annual snowfall was 13.7 inches/year. The coldest month of the year is typically January with an average low temperature of 31.7°F and an average high temperature of 43.5°F. The warmest month of the year is normally August with an average low temperature of 53.2°F and an average high temperature of 71.4°F.

2.3 REGIONAL GEOLOGY

The project area lies within the Fraser-Whatcom Lowlands, a physiographic region covering much of the Lower Mainland in British Columbia and portions of Whatcom County in the United States. The Fraser-Whatcom Lowlands is part of the larger Georgia Basin and is bounded by the Coast Mountains in British Columbia, the Cascade Mountains, and the Strait of Georgia (Cox and Kahle 1999).

The Georgia Basin is a Cretaceous to Cenozoic age forearc basin that formed in response to the convergence of oceanic and continental crust plates (England and Bustin 1998; Mustoe et al. 2007). During the Late Paleocene through the Late Eocene, massive amounts of siliclastic, nonmarine sediments were deposited in fault-bounded basins throughout the Georgia Basin. Compaction and cementation of these sediments resulted in approximately 9,000 meters of arkose (sandstone), siltsone, conglomerate, and coal that compose the Chuckanut Formation (Mustoe et al. 2007). The Chuckanut Formation is the probable bedrock unit that underlies Cherry Point, including the Terminal project area.

Surface terrain within the Fraser–Whatcom Lowlands was shaped by several advances and retreats of the Cordilleran ice sheet during the Wisconsonian Fraser Glaciation, which lasted from circa (ca.)

25,000 years before present until ca. 10,000 years before present (Easterbrook et al. 2007). The chronological sequence of glacial periods during the Fraser Glaciation includes the Evans Creek stade; the Vashon stade; the Everson Interstade; and the Sumas stade (Easterbrook 1992; Lapen 2000; Easterbrook et al. 2007). Following the maximum advancement of the Cordilleran ice sheet at the end of the Vashon stade, the glacier retreated and rapidly thinned, allowing marine waters to flood the Fraser–Whatcom Lowland (Easterbrook et al. 2007). The influx of marine water through the Strait of Juan de Fuca caused the remaining debris-filled ice to float, resulting in the deposition of Everson glaciomarine drift over an area approximately 18,000 square kilometers within the Fraser–Whatcom Lowlands and the San Juan Islands (Easterbrook 1992). Easterbrook (1992) compiled more than 80 radiocarbon dates from marine shells collected in Washington and British Columbia, which fixed the age of the Everson glaciomarine drift at 11,500 to 13,500 years before present.

The Everson glaciomarine drift is separated into the underlying Kulshan glaciomarine drift and the overlying Bellingham glaciomarine drift by the Deming Sand. The glaciomarine drift deposits are generally bluish-gray and composed of fossiliferous, pebbly and stony mud with till-like mixtures, marine clay, and some deltaic sediments (Easterbrook et al. 2007). The Deming Sand is a fluvial deposit (i.e., non-marine) exhibiting cross-bedding and channels in the sandy sediment. The Deming Sand covers approximately 2,300 square kilometers (Easterbrook 1992). Easterbrook (1992) suggests that isostatic rebound rates that exceeded eustatic sea level rise caused emergence of the Fraser–Whatcom Lowlands, resulting in deposition of the Deming Sand. Fort Langley deposits observed in southwestern British Columbia correlate with the Kulshan, Deming, and Bellingham deposits suggesting that lowland rise and floodplain deposition occurred regionally throughout the Fraser–Whatcom Lowlands (Kovanen and Slaymaker 2003; Easterbrook et al. 2007). Along Bellingham Bay, the Deming Sand grades to sea level and is represented by coarse beach sand and gravel intermixed with intervals of silt and clay (Easterbrook et al. 2007) (Figure 2-4).

Everson Interstade emergence beach deposits (Everson beach deposits) occur in localized areas throughout the Fraser–Whatcom Lowlands and consist mainly of sand and gravels, which overlie the Bellingham glaciomarine drift (Lapen 2000). These deposits may have been formed by wave action sediment erosion and deposition as the Everson glaciomarine drift rose above sea level (Lapen 2000). Generally, the Everson beach deposits are less than 3 to 25 feet thick (Lapen 2000). At the BP Cherry Point Refinery, Everson beach deposits are present but discontinuous (CH2M HILL 1985). Where beach deposits are absent, a thin silt unit that is typically only a few feet thick frequently overlies the Bellingham glaciomarine drift (CH2M HILL 1985).

Other major sedimentary units within the region include areas of Holocene-age alluvial deposits and Pleistocene-age terrace deposits. Easterbrook (1976) noted alluvial and terrace deposits in upland areas adjacent to Terrell Creek, the Nooksack River, and other low-order streams that discharge to

the Strait of Georgia. The alluvial deposits generally consist of sands, gravels, and silt that were deposited in coastal environments, floodplains, and river terraces. Terrace deposits are generally composed of sand and gravels, which were also deposited along floodplains and in beach environments.

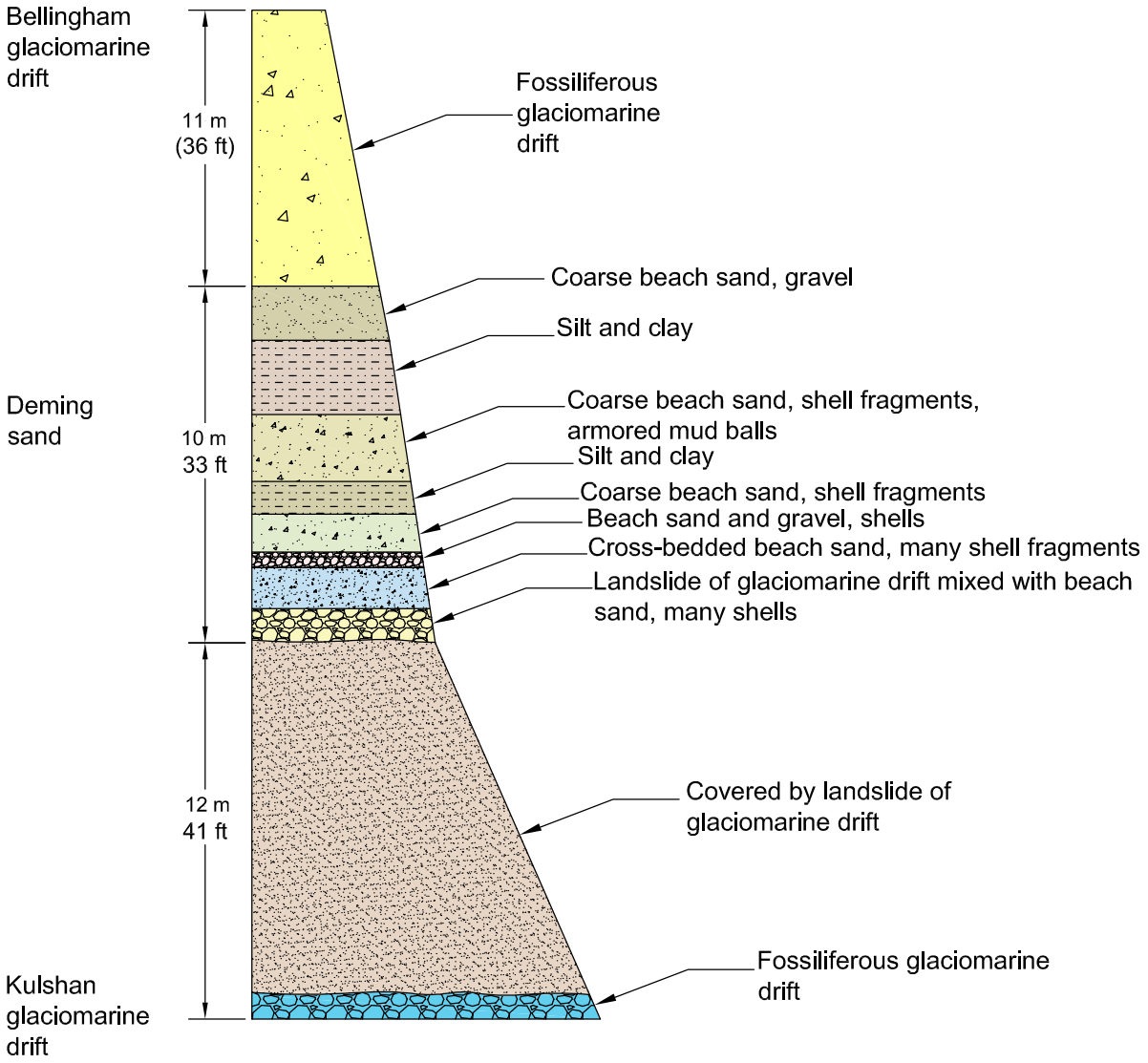
2.4 CHERRY POINT HYDROGEOLOGY

Regional hydrogeologic studies typically recognize hydrostratigraphic units that are correlated to the geologic deposits described above (Washburn 1957; CH2M HILL 1985; Converse Consultants NW 1989).

In order of increasing depth below ground surface, the major near-surface hydrostratigraphic units in the Terminal project area are the Everson beach deposits, the Bellingham Drift, and coarse beach sand and gravel intermixed with intervals of silt and clay, which has likely replaced the Deming Sand Unit. The stratigraphic sequence observed at the Terminal project area is believed to be analogous to the geologic cross section for Bellingham Bay developed by Easterbrook et al. (2007) and shown in Figure 2-4.

Where present, the Everson beach deposits are generally very thin leading to low aquifer transmissivity values (Washburn 1957). Recharge to this unit occurs primarily through infiltrating precipitation, although lateral groundwater redistribution may occur in deposits that are hydraulically continuous over larger areas (Washburn 1957). Due to the very low permeability of the underlying Bellingham glaciomarine drift, the downward infiltration of groundwater is impeded, leading to a semi-perched condition within the Everson beach deposits (Washburn 1957). The contrast between the permeability of the beach deposits and the glaciomarine drift also results in numerous springs in the area as groundwater flows laterally along the contact between the two formations and discharges along bluffs and other steep slopes (Washburn 1957). During the annual dry season, water levels within the Everson beach deposits decline as a result of reduced recharge. Washburn (1957) indicated annual fluctuations in beach deposit groundwater elevations on the Lummi Nation just south of the Project area were approximately 5 to 10 feet.

Hydraulic conductivity estimates for the Everson beach deposits and surface silt layer are available from slug tests performed for wells installed at the neighboring BP Cherry Point Refinery. Tests at three different wells resulted in hydraulic conductivity values ranging from 1.0 foot per day (foot/day) (3.5×10^{-4} centimeters per second [cm/sec]) to 1.2 feet/day (4.2×10^{-4} cm/sec) (CH2M HILL 1985). These hydraulic conductivity values were quoted from the CH2M HILL (1985) report without re-interpretations of slug test data.



NOTE: FROM EASTERBROOK ET AL., 2007

AMEC 11810 North Creek Parkway N Bothell, WA 98011	amec	CLIENT LOGO	CLIENT PACIFIC INTERNATIONAL TERMINALS, INC.	
PROJECT GATEWAY PACIFIC TERMINAL		DWN BY: MDS	DATUM: NAD83	DATE: JULY 2011
TITLE STRATIGRAPHIC CROSS SECTION AT BELLINGHAM BAY		CHK'D BY:	REV. NO.: 1	PROJECT NO: 091515338C-12-04
		PROJECTION: WA_STATE_PLANE	SCALE: AS_SHOWN	FIGURE No. 2-4

S:\AMEC-Offices\Bothell\15338c\003_HydrologyReport\Cross Section Detail Fig 2-4 071311.dwg - 8X11 PortraitE&E - Jul. 13, 2011 4:12pm - mike.stenberg

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The Bellingham glaciomarine drift has very low permeability. Previous studies performed for the BP Cherry Point Refinery have divided the glaciomarine drift into two separate zones (CH2M HILL 1985). The weathered upper zone is olive-green to brown in color with reddish brown mottling and extends to a maximum depth of 25 feet below ground surface (bgs) (CH2M HILL 1985). The upper zone has increased permeability relative to the lower unit due to secondary porosity from decayed root systems and shrinkage cracks from saturation/desaturation cycles associated with water table fluctuations (CH2M HILL 1985). The weathered upper zone of the Bellingham glaciomarine drift is also characterized by increased firmness relative to the lower zone.

Slug tests performed at the BP Cherry Point Refinery indicate that hydraulic conductivity for the weathered upper zone varies from 0.2 foot/day (6.70×10^{-5} cm/sec) to 1.5 foot/day (5.15×10^{-4} cm/sec). Recharge occurs due to vertical infiltration from precipitation, lateral flow from sand and gravel units, and lateral flow through the weathered upper zone from hydraulically upgradient areas (CH2M HILL 1985). Groundwater contouring using elevations collected from the upper zone shows a groundwater divide on the BP Cherry Point Refinery. In western portions of the refinery, groundwater flow diverges along a topographic divide, with flow directions to the southwest towards the Pacific International Terminals property and to the northwest towards Terrell Creek and Birch Bay. Horizontal flow gradients varied over a narrow range (0.0145 to 0.0150) despite seasonal variability in precipitation (CH2M HILL 1985).

Beneath the weathered zone lies fine-grained, blue-gray, fossiliferous clay indicative of Bellingham glaciomarine drift. Borings indicate the thickness of the blue-gray clay ranges from 25 feet to 80 feet. Groundwater flow directions are generally downward through the weathered zone toward the lower zone. CH2M HILL (1985) used groundwater elevations from wells screened in the weathered zone and the lower zone at the BP Cherry Point Refinery to calculate vertical gradients ranging from 0.013 to 0.175. Vertical gradients decreased slightly during summer months. Hydraulic conductivity for the lower zone was estimated from the slug test data and stratigraphic samples. Hydraulic conductivity values derived from the slug test data varied from 1.0×10^{-3} foot/day (3.67×10^{-7} cm/sec) to 3.2×10^{-3} foot/day (1.12×10^{-6} cm/sec), while values determined using stratigraphic samples ranged from 3.9×10^{-4} foot/day (1.38×10^{-7} cm/sec) to 1.8×10^{-3} foot/day (6.52×10^{-7} cm/sec) (CH2M HILL 1985).

Limited hydrogeologic information is available for the Deming Sand. CH2M HILL (1985) estimated hydraulic conductivity is approximately 1.4 foot/day (4.9×10^{-4} cm/sec) to 14.2 feet/day (5.0×10^{-3} cm/sec) based on grain sizes observed while drilling borings.

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3.0 HYDROLOGIC AND HYDROGEOLOGIC DATA COLLECTION

Hydrologic and hydrogeologic field studies were conducted to gather baseline data that characterize the groundwater and surface water flow systems in the Terminal project area. These data will be needed for the EIS to evaluate probable direct and indirect environmental impacts and to assess project alternatives and mitigation measures for the Terminal project. Hydrologic fieldwork was performed from September 2010 through early April 2011. Groundwater and surface water data collection activities during this period included installation of piezometers, geotechnical sample analyses, installation of staff gages, deployment of pressure transducers, piezometers and select staff gages, stage measurements at staff gages, discharge measurements at select staff gages, and collection of surface water and groundwater samples for geochemical analyses.

3.1 INSTALLATION OF HYDROLOGIC/HYDROGEOLOGIC INSTRUMENTATION

A monitoring network of 12 piezometers and 20 surface water staff gages were installed within the Terminal project area between September 2010 and February 2011. Locations of the groundwater and surface water monitoring points are shown on Figure 3-1. The following sections describe procedures used to install piezometers and staff gages.

3.1.1 Piezometer Installation

A groundwater-monitoring network consisting of 12 piezometers (PZ-1 through PZ-12) was installed within the Terminal project area by Cascade Drilling, Inc., of Woodinville, Washington (Figure 3-1). Borings for piezometers installation were advanced using hollow-stem auger drilling methods. All piezometers were screened within the weathered glaciomarine drift. Construction details for each piezometer are summarized in Table 3-1. Piezometer installation began in late September 2010 and was completed by mid-December 2010.

Stratigraphy observed during piezometer construction was documented to characterize geologic and hydrogeologic conditions. This information will be relevant in groundwater modeling and in developing a conceptual geological model of the Terminal project area. Stratigraphy was logged continuously during installation of all piezometers, except at depths greater than 27.5 feet bgs for PZ-5. The PZ-5 boring extended to a total depth of 51.5 feet bgs to determine the vertical extent of the blue-gray glaciomarine drift. At depths greater than 27.0 feet bgs, where the blue-gray glaciomarine drift was continuous, lithology was logged every 5 feet. The Deming Sand, which presumably underlies the glaciomarine drift, was not encountered. The boring was backfilled with native drill cuttings to 32.0 feet bgs followed by bentonite chips to 15.3 feet bgs. The screen for PZ-5 was then installed within the overlying weathered glaciomarine drift.

Boring logs and construction details for the piezometers are included in Appendix A.

Table 3-1 Construction Details for Groundwater Piezometers

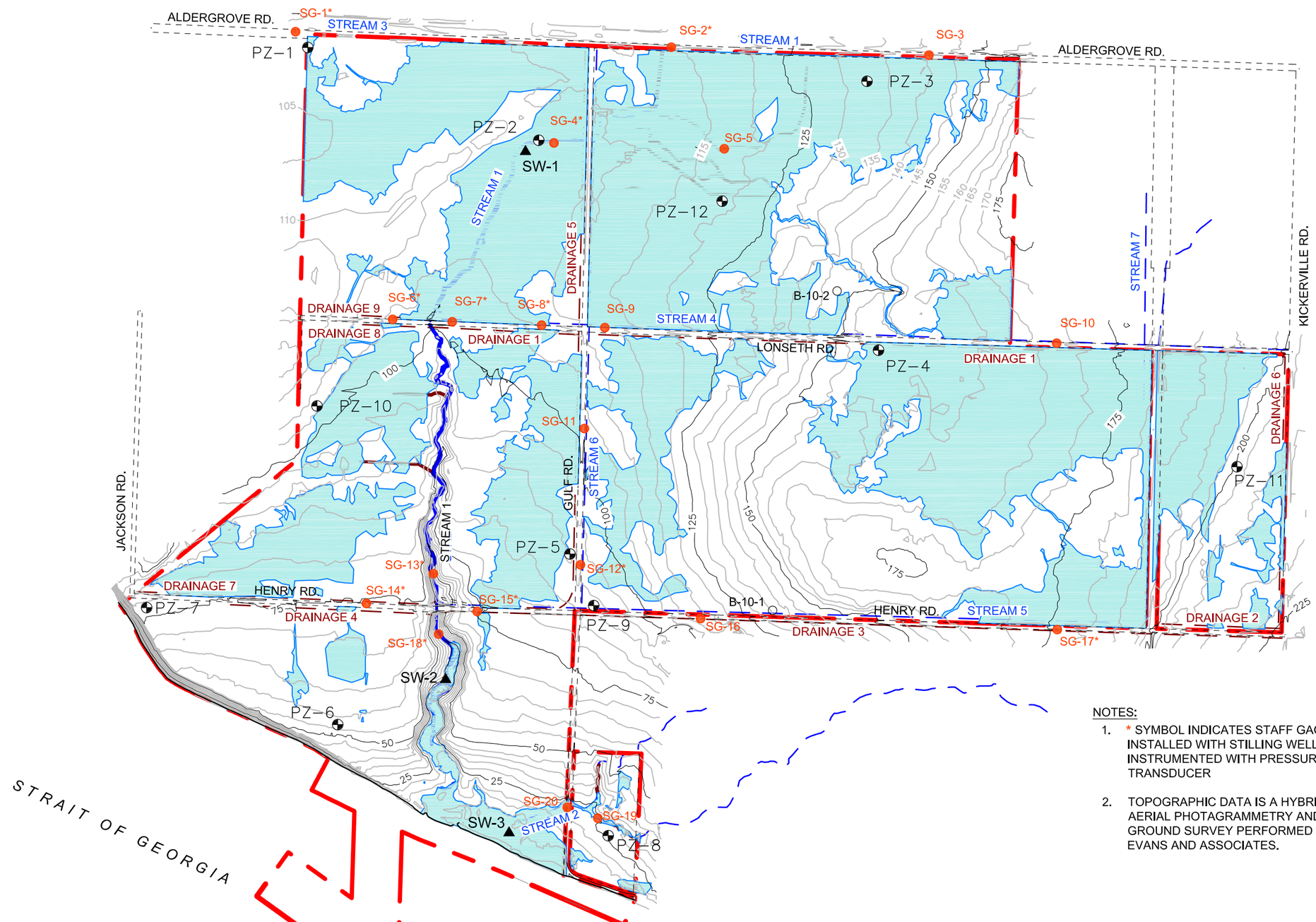
Well Identification	Drilling Method	Installation Date	Coordinates[1]	Total Borehole Depth (feet bgs)	Total Well Depth (feet bgs)	Diameter (inches)	Material	Screen Slot Size (inches)	Screen Interval (feet bgs)	Filter Pack Sand Type	Filter Pack Interval (feet bgs)	Seal Interval (feet bgs)
PZ-1	HSA	9/21/2010	N 690554.4 E 1180945.4	19.5	19.5	2.0	Sch. 40 PVC	0.010	9.2 - 19.2	2/12 Silica	6.0 - 19.5	0.0 - 6.0
PZ-2	HSA	9/21/2010	N 689686.4 E 1183101.5	19.5	15.3	2.0	Sch. 40 PVC	0.010	5.0 - 15.0	2/12 Silica	4.0 - 15.3	0.0 - 4.0
PZ-	HSA	9/20/2010	N 690236.8 E 1186168.7	19.5	17.0	2.0	Sch. 40 PVC	0.010	7.0 - 16.7	2/12 Silica	5.0 - 17.0	0.0 - 5.0
PZ-4	HSA	9/23/2010	N 687725.1 E 1186276.3	19.5	19.5	2.0	Sch. 40 PVC	0.010	5.0 - 15.0	2/12 Silica	4.0 - 15.3	0.0 - 4.0
PZ-5	HSA	9/23/2010	N 685822.8 E 1183393.3	51.5	15.3	2.0	Sch. 40 PVC	0.010	5.0 - 15.0	2/12 Silica	4.0 - 15.3	0.0 - 4.0
PZ-6	HSA	9/20/2010	N 6842229.6 E 1181223.9	24.0	24.0	2.0	Sch. 40 PVC	0.010	14.0 - 23.7	2/12 Silica	12.0 - 24.0	0.0 - 12.0
PZ-7	HSA	12/14/2010	N 685321.7 E 1179439.2	18.9	18.9	2.0	Sch. 40 PVC	0.010	8.8 - 18.6	2/12 Silica	6.0 - 18.9	0.0 - 6.0
PZ-8	HSA	12/15/2010	N 683190.8 E 1183752.0	13.5	13.4	2.0	Sch. 40 PVC	0.010	8.3 - 13.1	2/12 Silica	6.0 - 13.5	0.0 - 6.0
PZ-9	HSA	12/15/2010	N 685341.6 E 1183614.3	18.3	18.3	2.0	Sch. 40 PVC	0.010	8.1 - 17.9	2/12 Silica	6.0 - 18.3	0.0 - 6.0
PZ-10	HSA	12/13/2010	N 687204.9 E 1181030.0	22.7	22.7	2.0	Sch. 40 PVC	0.010	12.6 - 22.4	2/12 Silica	10.5 - 22.7	0.0 - 5.0
PZ-11	HSA	12/17/2010	N 686636.8 E 189624.3	18.8	18.8	2.0	Sch. 40 PVC	0.010	8.6 - 18.4	2/12 Silica	6.0 - 18.8	0.0 - 6.0
PZ-12	HSA	12/16/2010	N 689119.1 E 1184815.2	18.4	18.4	2.0	Sch. 40 PVC	0.010	8.3 - 18.1	2/12 Silica	6.0 - 18.4	0.0 - 6.0

Notes

1. Projection and Datum = Washington State Plane North, North American Datum of 1983 (NAD83), High Accuracy Reference Network (HARN).

Abbreviations

bgs: below ground surface
HSA: hollow-stem auger
PVC: polyvinyl chloride



LEGEND

DATA COLLECTION POINTS

- PZ-3 — PIEZOMETER
- SW-1 — SURFACE WATER QUALITY SAMPLING LOCATION
- SG-10 — STAFF GAGE
- B-10-2 — GEOTECHNICAL BORING COMPLETED AS 1-INCH PIEZOMETER

HYDROLOGIC FEATURES

- STREAM LOCATION (DASHED WHERE APPROXIMATE)
- DRAINAGE LOCATION (DASHED WHERE APPROXIMATE)
- WETLAND AREA

OTHER FEATURES

- GROUND SURFACE ELEVATION CONTOUR [2] CONTOUR INTERVAL 5 FEET (NAVD88 FT)
- PROJECT AREA BOUNDARY (WHARF NOT SHOWN IN ITS ENTIRETY)
- RIGHT-OF-WAY OR EASEMENT WITHIN PROJECT AREA VICINITY

NOTES:

1. * SYMBOL INDICATES STAFF GAGE IS INSTALLED WITH STILLING WELL INSTRUMENTED WITH PRESSURE TRANSDUCER
2. TOPOGRAPHIC DATA IS A HYBRID OF AERIAL PHOTAGRAMMETRY AND A GROUND SURVEY PERFORMED BY DAVID EVANS AND ASSOCIATES.

0 500 1,000
APPROXIMATE SCALE IN FEET

CLIENT LOGO: Pacific International Terminals

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	APS
CHK'D BY:	RH
DATUM:	NAD83
PROJECTION:	WA SP NORTH Ft.
SCALE:	AS SHOWN

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: TERMINAL PROJECT AREA PIEZOMETERS, STAFF GAUGES, AND SURFACE WATER SAMPLING LOCATIONS

DATE:	JUNE 2012
PROJECT NO:	091515338C-12
REV. NO.:	A
FIGURE No.	FIGURE 3-1

S:\AMEC-Offices\Bothell\15338c\003_HydrologyReport\GPT_SiteMap_061312.dwg – Fig 3-1 SiteMap – Jun. 14, 2012 11:40am – adam.stenberg

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Following installation, each piezometer was developed by surging the screen interval with a stainless steel bailer. Surging was performed until groundwater turbidity decreased or the piezometer no longer produced significant volumes of water. Total purge volumes ranged from 3.2 casing volumes (PZ-1 and PZ-6) to 10.9 casing volumes (PZ-10).

David Evans and Associates, Inc. (DEA) surveyed the locations of all piezometers in December 2010 and April 2011. Locations and elevations were recorded using the Washington State Plane North, North American Datum of 1983 (NAD83), High Accuracy Reference Network (HARN), and NAVD88. Refer to Table 3-1 for construction details and location information for the groundwater-monitoring network.

All piezometers described in this report were installed as “Resource Protection Wells,” pursuant to Washington Administrative Code (WAC) Chapter 173-160. A licensed Resource Protection Well Contractor (or well driller) licensed under WAC 173-162 constructed all piezometers. The well construction notifications (start cards and fees) and well reports required under WAC 173-160 were submitted by the licensed well driller(s) to the Washington State Department of Ecology (Ecology). Copies of all well reports for the piezometers installed in this study are included in Appendix B.

3.1.2 Geotechnical Sample Collection

A Shelby tube soil sample was collected from the weathered Bellingham glaciomarine drift during the installation of PZ-4 and PZ-5, respectively. Grain size distribution, soil moisture content, total porosity, and hydraulic conductivity analyses were performed for the PZ-4 Shelby tube soil sample. The PZ-5 Shelby tube sample from the weathered Bellingham glaciomarine drift was analyzed for hydraulic conductivity, soil moisture content, and total porosity.

An additional Shelby tube soil sample was collected from the non-weathered Bellingham glaciomarine drift encountered at PZ-5. This sample was analyzed for hydraulic conductivity, moisture content, and total porosity.

Finally, a grab soil sample was collected from the weathered drift at PZ-5 and analyzed for grain size distribution.

3.1.3 Staff Gages

A total of 20 surface water staff gages were installed in streams and ditches within the Terminal project area to monitor the depth of surface water flow. Of these, 12 staff gages were instrumented with automated pressure transducers, while 8 were installed as standalone staff gages. The locations of the staff gages are indicated on Figure 3-1. At each location, an 8-foot-long angle-iron fence post was driven into either stream or ditch bed sediments using a fence post driver. Staff gages were

constructed by bolting numerical plates, specifically designed for measuring stage values, to a 7-foot-long, 2-inch by 6-inch composite board. The plates on each staff gage are incremented in units of 0.01 foot and allow for a maximum stage height measurement of 6.67 feet. The staff gages were then secured to an angle-iron fence post using three U-bolts. The staff gages were installed so that the bottom of each board rested on the top of the stream or ditch bed sediments. A rebar cap was installed on the stream bank adjacent to each staff gage to establish the monitoring position permanently in case instrumentation is lost.

For monitoring locations with staff gages and stilling wells (SG-1, SG-2, SG-4, SG-6, SG-7, SG-8, SG-12 through SG-15, SG-17, and SG-18), a 6-foot-long, 2-inch-diameter, polyvinyl chloride (PVC) tube was also attached to the angle-iron fence post using hose clamps. The PVC tube was positioned with the bottom of the stilling well resting on the top of the stream or ditch bed sediments. The bottom cap of each stilling well was perforated with multiple holes to allow hydraulic communication between surface water and the inside of the stilling well. A water level tape was used to verify that the water level outside the stilling well was equal to the water level inside the stilling well following installation.

For staff gages with stilling wells, a Solinst Model 3001 Levelogger Junior pressure transducer was suspended inside each stilling well from a stainless steel chain so that the bottom of the pressure transducer was positioned just above the bottom of the perforated PVC cap. The pressure transducer allows automated continuous surface water level readings that are recorded to approximately 0.36 inch at the interval of every 15 minutes. Data recorded by the pressure transducer dating back to the time of installation were transferred to a portable hand-held data transfer unit (Solinst Model 3001 Leveloader Gold) on April 7, 2011.

Following installation, staff gages and rebar caps were surveyed in April 2011. As with project area piezometers, locations and elevations for the staff gages and rebar caps were surveyed using NAD83, HARN, and NAVD88. Table 3-2 specifies construction details and location information for the entire staff gage monitoring network.

3.2 GROUNDWATER AND SURFACE WATER MONITORING

Hydrogeologic data collection in the Terminal project area began in late September 2010 with depth to groundwater measurements. Beginning in February 2011, surface water monitoring included stream and ditch staff gage measurements at all 20 staff gage locations. In addition, transects were established at six staff gage locations (SG-2, SG-4, SG-7, SG-13, SG-15, and SG-18) for surface water discharge measurements. Groundwater and surface water samples were collected during the first and second quarters 2011 for geochemical analyses. These activities are described in detail in the sections below.

Table 3-2 Construction Details for Surface Water Staff Gages

Well Identification	Instrumentation Type	Installation Date	Coordinates[1]	Diameter (inches)	Staff Gage Measuring Point Elevation[2]	Water Body[3]
SG-1	Stilling Well w/Pressure Transducer	2/9/2011	N 690700.9 E 110830.0	2.0	109.01	Stream 3
SG-2	Stilling Well w/Pressure Transducer	2/9/2011	N 690555.9 E 1184340.3	2.0	120.21	Stream 1
SG-3	Manual Reading	2/9/2011	N 690482.4 E 1186747.0	2.0	145.16	Stream 1
SG-4	Stilling Well w/Pressure Transducer	2/9/2011	N 689662.0 E 1183243.9	2.0	113.25	Stream 1
SG-5	Manual Reading	2/9/2011	N 689607.4 E 1184835.3	2.0	123.52	Unnamed Drainage Near PZ-12
SG-6	Stilling Well w/Pressure Transducer	2/9/2011	N 688014.1 E 1181737.3	2.0	109.30	Drainage 9
SG-7	Stilling Well w/Pressure Transducer	2/9/2011	N 687991.5 E 1182293.7	2.0	107.11	Stream 4
SG-8	Stilling Well w/Pressure Transducer	2/9/2011	N 687959.5 E 1183128.7	2.0	111.37	Stream 4
SG-9	Manual Reading	2/9/2011	N 687937.0 E 1183719.5	2.0	117.69	Stream 4
SG-10	Manual Reading	2/9/2011	N 687791.4 E 1187940.5	2.0	171.53	Stream 4
SG-11	Manual Reading	2/9/2011	N 686994.7 E 1183528.6	2.0	107.09	Stream 6
SG-12	Stilling Well w/Pressure Transducer	2/9/2011	N 685722.3 E 1183491.9	2.0	95.63	Stream 6
SG-13	Stilling Well w/Pressure Transducer	2/10/2011	N 685638.8 E 1182117.2	2.0	46.30	Stream 1
SG-14	Stilling Well w/Pressure Transducer	2/10/2011	N 685361.0 E 1181492.2	2.0	78.71	Drainage 7
SG-15	Stilling Well w/Pressure Transducer	2/10/2011	N 685286.5 E 1182526.3	2.0	77.76	Stream 5
SG-16	Manual Reading	2/10/2011	N 685219.7 E 1184614.0	2.0	116.16	Stream 5

Table 3-2 Construction Details for Surface Water Staff Gages

Well Identification	Instrumentation Type	Installation Date	Coordinates[1]	Diameter (inches)	Staff Gage Measuring Point Elevation[2]	Water Body[3]
SG-17	Stilling Well w/Pressure Transducer	2/10/2011	N 685117.1 E 1187945.8	2.0	180.39	Stream 5
SG-18	Stilling Well w/Pressure Transducer	2/10/2011	N 685074.9 E 1182167.3	2.0	31.03	Stream 1
SG-19	Manual Reading	2/10/2011	N 683355.1 E 1183653.9	2.0	28.44	Stream 2
SG-20	Manual Reading	2/10/2011	N 683456.2 E 1183368.7	2.0	23.58	Stream 2

Notes
1. Horizontal Projection and Datum = Washington State Plane North, North American Datum of 1983 (NAD83), High Accuracy Reference Network (HARN).
2. Vertical Datum = North American Vertical Datum 1988 (NAVD88); Staff gage measuring point elevation corresponds to the 6.67 feet mark on each staff gage.
3. Water body locations are shown on Figure 2-3.

Abbreviations
bgs: below ground surface
E: Easting
HSA: hollow-stem auger
N: Northing
PVC: polyvinyl chloride

3.2.1 Water Level Measurements

After development, all piezometers were instrumented with a non-vented Solinst Model 3001 Levelogger Junior pressure transducer. Each transducer was suspended inside the respective piezometer from a stainless steel chain so that a fixed distance was maintained between the transducer and the top of the piezometer casing. Additionally, one pressure transducer (Solinst 3001 Levelogger Gold) was suspended from a stainless steel chain in PZ-1 to provide barometric compensation data. The barometric pressure transducer was positioned above the ground surface within the PVC stickup to prevent it from becoming submerged under conditions of high groundwater elevations. Pressure transducers in PZ-1 through PZ-6 were installed in late October 2010, while pressure transducers in PZ-7 through PZ-12 were installed in mid-January 2011.

The 12 pressure transducers and the barometric logger were connected to a laptop computer to verify their functionality prior to installation. The clocks of all pressure transducers were synchronized to the clock of a laptop computer. The pressure transducers deployed within the piezometer network were set to record at one-hour intervals. Hourly data dating back to the time of installation were transferred

from the 12 transducers and the barometric pressure transducer to a portable hand-held data transfer unit (Solinst Model 3001 Leveloader Gold) on April 5, 2011.

Manual depth-to-water measurements were performed at least once following pressure transducer deployment. Manual measurements were used to calculate groundwater elevations at each piezometer. After compensating pressure transducer data for barometric pressure fluctuations, the manually derived groundwater elevation was compared to the transducer data point corresponding to the time of the manual groundwater measurement. The difference between the two values was used to calculate a correction factor for each piezometer. Each respective correction factor was then added to the pressure transducer measurements to produce a groundwater elevation time series for each piezometer.

Manual surface water stage measurements were recorded at all 20 staff gages on February 9–10, March 9, and April 5–6, 2011. Surface water stage measurements at a subset of staff gages were recorded on March 22, April 1, and April 18, 2011. Manual measurements provide surface water elevations for each staff gage not instrumented with a pressure transducer (SG-3, SG-5, SG-9, SG-10, SG-11, SG-16, SG-19, and SG-20). After compensating pressure transducer data for barometric pressure fluctuations, the manually measured surface water elevation was compared to the transducer data point corresponding to the time of the manual staff gage measurement. The difference between the two values was used to calculate a correction factor for each instrumented staff gage (SG-1, SG-2, SG-4, SG-6, SG-7, SG-8, SG-12 through SG-15, SG-17, and SG-18). Each respective correction factor was then added to the pressure transducer measurements for that staff gage to produce a surface water elevation time series for each staff gage.

3.2.2 Discharge Monitoring

Selection of stream cross sections for surface water discharge measurements was based on criteria established by Dingman (2002) and Butkus (2007). To be considered suitable for stream flow measurements, stream cross sections required the following specific characteristics:

- relatively straight stream course upstream and downstream;
- absence of vegetation in the stream course;
- stable and relatively uniform stream bed without major scouring or deposition of bed material;
- stream channel confined to a single course, even during low-flow conditions; and
- stable, non-eroding stream banks.

Rebar caps were installed at stream cross sections so that the exact same locations were measured during each monitoring event. Large rocks or vegetation were cleared in the immediate vicinity of the cross section to promote uniform stream flow conditions. Cross sections for discharge measurements within the proposed Terminal site were identified at six staff gage locations (SG-2, SG-4, SG-7, SG-13, SG-15, and SG-18; Figure 3-1).

Field procedures for measuring stream velocities followed Butkus (2007). Stream cross sections were divided into segments and measured in-stream with the Swoffer Model 2100 flow meter. The meter propeller was replaced and the Swoffer meter was calibrated prior to the first round of stream velocity measurements performed on March 9, 2011. For each measurement, a measuring tape was extended between two rebar stakes at each cross section to measure stream width and to determine the locations for horizontal measurements. The widths of individual stream segment intervals were 0.2 foot for stream reaches and ditches with narrow widths or 0.3 foot for stream reaches with larger bank width distances. The small segments were utilized with the goal of not capturing more than 10 percent of the total discharge in any single segment of a stream cross section. At each interval of 0.2 foot or 0.3 foot, stream velocity was measured at a depth of six-tenths of the total water depth from the surface. Duplicate measurements were taken at one of the six established cross sections during each round of velocity measurements for quality assurance. The duplicate was collected by slightly moving the initial measurement position 0.1 foot on the measuring tape and then continuing with segment measurements at the same interval as the original measurement. This approach results in a duplicate measurement with segments of the same size but from different locations across the stream transect. If the percent difference for duplicate measurements was greater than 5 percent or a single segment contained greater than 10 percent of the total discharge, discharge values were flagged as an estimate.

Stream flow measurements were recorded on six dates in late winter through early spring 2011: March 9, 10, and 22, and April 1, 6, and 18. Stream flow data were recorded in a field notebook and transferred to electronic spreadsheets to calculate total stream discharge at each location on each date.

3.2.3 Water Quality Monitoring

Quarterly groundwater and surface water sampling were performed as part of the hydrologic and hydrogeologic investigation. First quarter surface water and groundwater samples were collected between February 2 and February 3, 2011, while second quarter surface water and groundwater samples were collected between April 13 and April 15, 2011. Sample collection methodology is discussed in more detail below.

3.2.3.1 Groundwater Monitoring

Groundwater samples were collected using U.S. Environmental Protection Agency (U.S. EPA) low-flow sampling techniques. These techniques provide for samples that are representative of actual site conditions and reduce the possibility of stripping constituents from groundwater or mobilizing colloids that are immobile during normal groundwater flow conditions. All reusable equipment in contact with the well or water samples was decontaminated prior to use.

Water levels were measured prior to and during purging. Wells were purged at a low rate (approximately 200 to 500 milliliters per minute [mL/minute]), and groundwater quality parameters (temperature, pH, specific conductivity, dissolved oxygen [DO], oxidation-reduction potential [ORP], and turbidity) were monitored every 3 to 5 minutes during sampling activities for stabilization prior to sample collection. Stabilization was achieved when values for all parameters were within ±10 percent of each other for three consecutive readings. Once stabilization had been achieved, the groundwater samples were collected directly from the sample discharge tube connected to the pump.

First and second quarter 2011 groundwater samples were analyzed for a suite of water quality constituents including:

- total dissolved metals;
- total suspended solids (TSS);
- total dissolved solids (TDS);
- ammonia, alkalinity, salinity, fluoride, chloride, nitrate, sulfate, and ortho-phosphorous; and
- other general chemistry parameters.

Samples for dissolved metals were collected and filtered in the field using a filter with a mesh size of 0.45 microliter (µL). Sample preservation requirements and quality control sample collection methods are described in Section 3.3.

Groundwater samples collected during the second quarter were also analyzed for a suite of potential contaminants that may be found at industrial facilities, including:

- Semi-volatile organic compounds (SVOCs);
- Total petroleum hydrocarbons (TPH) hydrocarbon identification (HCID) by Method NWTPH-HCID; and
- TPH in the gasoline range (TPH-Gx by method NWTPH-Gx), plus benzene, toluene, ethylbenzene, and xylene (BTEX).

Samples were labeled, placed into ice-filled coolers, and shipped following standard chain-of-custody (COC) procedures to Analytical Resources, Inc. (ARI), in Tukwila, Washington, for chemical analyses.

3.2.3.2 Surface Water Monitoring

Surface water samples were collected from three locations within the Terminal project boundary, as shown on Figure 3-1. Surface water samples were collected in general accordance with the U.S. Geological Survey's National Field Manual to ensure proper sample collection (U.S. Department of Interior and U.S. Geological Survey 2010).

Surface water quality parameters (temperature, pH, specific conductivity, DO, ORP, and turbidity) were monitored prior to sample collection by suspending the water quality instrument in the stream and allowing the instrument readings to stabilize. The instrument readings were recorded on the field sampling form once the water quality instrument indicated that the water quality parameters had stabilized. The lid of a clean sampling container was removed, and the jar was gently submerged approximately halfway between the surface and the bottom of the stream to allow the surface water sample to fill the jar. During sampling, the mouth of the jar was facing downstream to reduce the possibility for suspended debris to enter the sampling jars. Samples were taken in the center of the stream channel in an area free of floating debris or disturbance caused by movement of field personnel.

First and second quarter 2011 surface water samples were analyzed for a suite of water quality constituents including total dissolved metals, TSS, TDS, ammonia, alkalinity, salinity, fluoride, chloride, nitrate, sulfate, ortho-phosphorous, and other general chemistry parameters. Second quarter surface water samples were also analyzed for suite of environmental constituents that may be found at industrial facilities including SVOCs, NWTPH-HCID, and NWTPH-Gx plus BTEX.

Samples were labeled, placed into ice-filled coolers, and shipped following standard COC procedures to ARI for chemical analyses.

3.3 DATA COLLECTION QUALITY ASSURANCE/QUALITY CONTROL

The groundwater and surface water data were subjected to a data quality review. The data quality review memos are presented in Appendix C along with the laboratory data packages. All of the sample results were deemed acceptable based on the data quality review.

4.0 CONCEPTUAL SITE MODEL

This section describes the Terminal project area conceptual site model, including hydrostratigraphy and aquifer properties, groundwater flow direction and gradients, surface water stage and discharge, and groundwater and surface water quality. A conceptual site model is a qualitative description of the hydrogeologic setting and typically includes:

- identification of hydrostratigraphic units and flow system boundaries;
- groundwater and surface water data to construct a water balance;
- data needed to assign aquifer parameters and possible hydraulic stresses; and
- general interpretations of site hydrology and hydrogeology derived from field visits to the site (Anderson and Woessner 2002).

The conceptual model can then be represented quantitatively as a mathematical model (Section 5.0). Because the study period for this report is limited in duration, the conceptual site model is developed based upon hydrometeorological conditions from September 2010 through April 2011. Importantly, the conceptual model and the discussion below should be viewed in context of the hydrometeorological conditions observed during this time frame and the limited data used to develop the model.

To evaluate whether the observed hydrometeorological conditions were representative of average conditions, precipitation data were obtained for the study period from a weather station installed on the neighboring BP Cherry Point Refinery property. The weather station is operated under the U.S. EPA Prevention of Significant Deterioration guidelines (U.S. EPA, 1980). Performance audits are performed by an independent auditor on a semiannual basis. The data screening process follows the suggested data screening criteria in Table 8-4 of U.S. EPA guidance (U.S. EPA, 2000). Comparison of precipitation records at the BP Cherry Point Refinery weather station and at BIA (Section 2.2) suggests that they are comparable; for example, total precipitation between January and April 2011 is 15.5 inches at the BP Cherry Point Refinery and 16.8 inches at BIA. Because the BP Cherry Point Refinery data do not have a long history, they were compared to historical precipitation records from BIA between December 1949 and April 2012 to determine the relative wetness or dryness of the study period. For the study period September 2010 through April 2011, monthly precipitation totals for the project area were above average in September, December, January, March, and April. In September 2010 and January 2011, the project area was very wet as indicated by monthly precipitation totals that were 3.7 inches and 2.6 inches above normal, respectively. The months of October, November, and February experienced precipitation totals approximately 1.0 to 1.4 inches below normal. Overall, total precipitation for the study period was 5.2 inches above normal. Consequently, the study period is considered wetter than the historical average, and results should be interpreted accordingly.

4.1 HYDROSTRATIGRAPHY AND AQUIFER PROPERTIES

Data obtained from piezometer installations and soil sample analyses performed from late fall 2010 through winter 2011 provided hydrogeologic information that was used in the development of a hydrogeological conceptual site model of the Terminal project area. Stratigraphy observed during piezometer installation allowed accurate delineation of major hydrostratigraphic units, including the Everson beach deposit and silt surface mantle, the weathered Bellingham glaciomarine drift, and the non-weathered Bellingham glaciomarine drift. The spatial and vertical distribution of these geologic units were used to construct geologic cross sections (A–A', B–B', and C–C') across the project area. The locations of these geologic cross sections are shown on Figure 4-1, and the geologic cross sections are presented in Figure 4-2 and Figure 4-3.

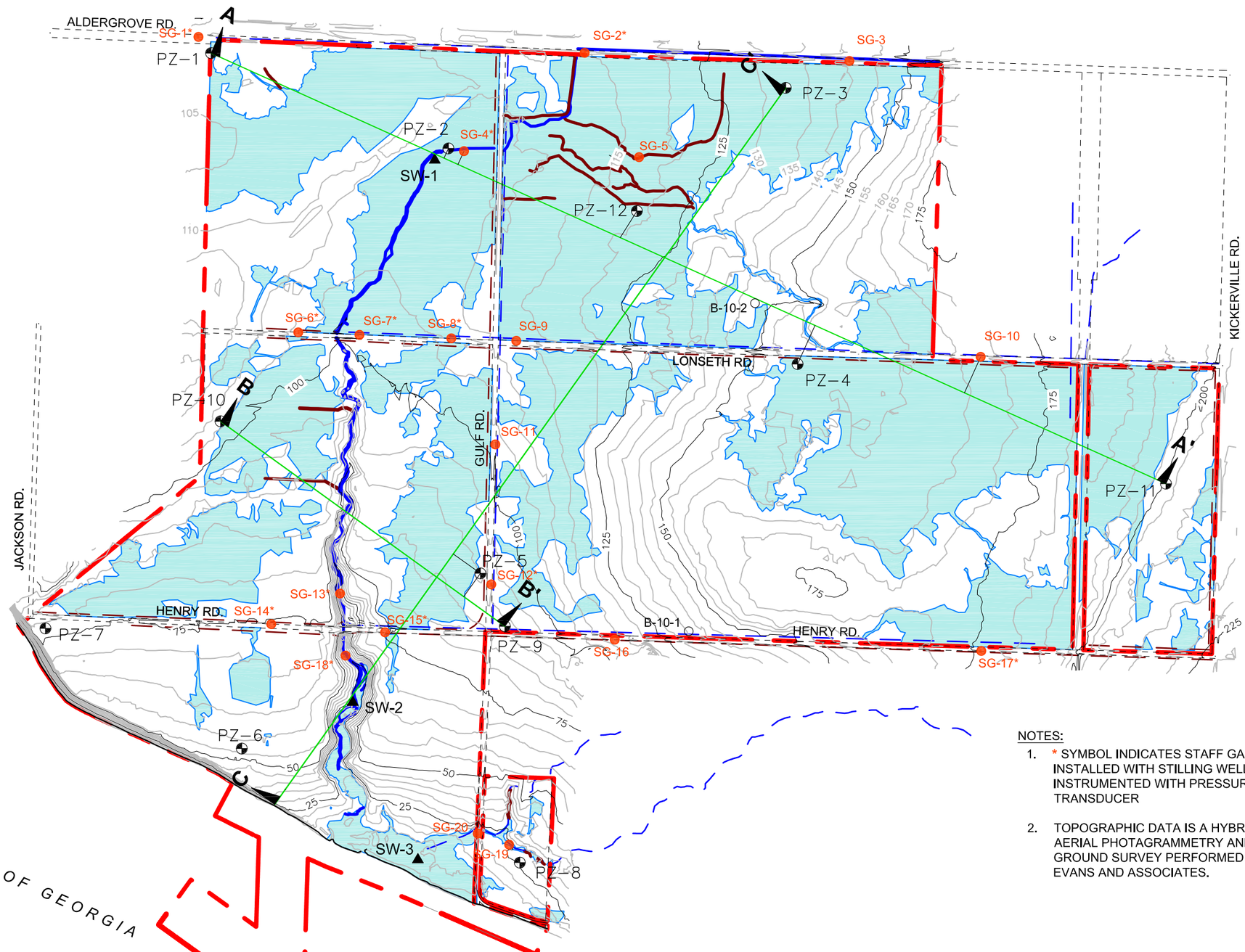
The Shelby tube samples were used to estimate porosity and hydraulic conductivity for both the weathered and non-weathered Bellingham glaciomarine drift. Porosity values were 0.360 to 0.374 for the weathered unit and 0.358 for the underlying non-weathered unit. Hydraulic conductivity values for the samples from the weathered glaciomarine drift varied from 2.42 x 10^{-3} foot/day (8.54 x 10^{-7} cm/sec) to 5.75 x 10^{-3} foot/day (2.03 x 10^{-6} cm/sec). Hydraulic conductivity for the PZ-5 sample collected from the underlying non-weathered glaciomarine drift was 2.82 x 10^{-4} foot/day (9.93 x 10^{-8} cm/sec).

The grab sample collected from the weathered drift at PZ-5 and the Shelby tube sample collected from the weathered drift at PZ-4 were evaluated for grain-size analysis. Sample results indicate the weathered Bellingham glaciomarine drift varied from lean clay with sand to sandy lean clay. The geotechnical analysis results are summarized in Table 4-1. Laboratory results for geotechnical analyses, including hydraulic conductivity estimates, porosity values, and grain-size analyses, are provided in Appendix D.

Table 4-1 Results of Geotechnical Analyses

			As Received Sample Parameters				Hydraulic Conductivity	
Location	Depth (ft)	Visual Description	Wet Density (lbs/ft^3)	Total Porosity	Saturation	Moisture Content (%)	(cm/s)	(ft/day)
PZ-4	10	Silty Clay with Gravel	126.8	0.360	0.933	19.8	2.03E-06	5.75E-03
PZ-5	8	Clay and Organic Debris with Gravel	125.7	0.374	0.947	21.3	8.54E-07	2.42E-03
PZ-5	23	Silty Clay with Gravel	129.5	0.358	1.040	21.9	9.93E-08	2.82E-04

Abbreviations
cm/s: centimeter per second
ft feet
ft/day: feet per day
lb/ft^3: pounds per cubic foot



LEGEND

DATA COLLECTION POINTS

- PZ-3 — PIEZOMETER
- SW-1 — SURFACE WATER QUALITY SAMPLING LOCATION
- SG-10 — STAFF GAGE
- B-10-2 — GEOTECHNICAL BORING COMPLETED AS 1-INCH PIEZOMETER

HYDROLOGIC FEATURES

- STREAM LOCATION (DASHED WHERE APPROXIMATE)
- DRAINAGE LOCATION (DASHED WHERE APPROXIMATE)
- WETLAND AREA

OTHER FEATURES

- GROUND SURFACE ELEVATION CONTOUR [2] CONTOUR INTERVAL 5 FEET (NAVD88 FT)
- PROJECT AREA BOUNDARY (WHARF NOT SHOWN IN ITS ENTIRETY)
- RIGHT-OF-WAY OR EASEMENT WITHIN PROJECT AREA VICINITY

NOTES:

1. * SYMBOL INDICATES STAFF GAGE IS INSTALLED WITH STILLING WELL INSTRUMENTED WITH PRESSURE TRANSDUCER
2. TOPOGRAPHIC DATA IS A HYBRID OF AERIAL PHOTAGRAMMETRY AND A GROUND SURVEY PERFORMED BY DAVID EVANS AND ASSOCIATES.

N

0 500 1,000

APPROXIMATE SCALE IN FEET

	CLIENT LOGO: Pacific International Terminals	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: APS CHK'D BY: RH DATUM: NAD83 PROJECTION: WA SP NORTH Ft. SCALE: AS SHOWN	PROJECT: GATEWAY PACIFIC TERMINAL	DATE: JUNE 2012 PROJECT NO: 5-91M-15338-0
		AMEC Environment & Infrastructure, Inc. 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201		TITLE: CROSS SECTION LOCATION MAP	REV. NO.: A FIGURE No. FIGURE 4-1

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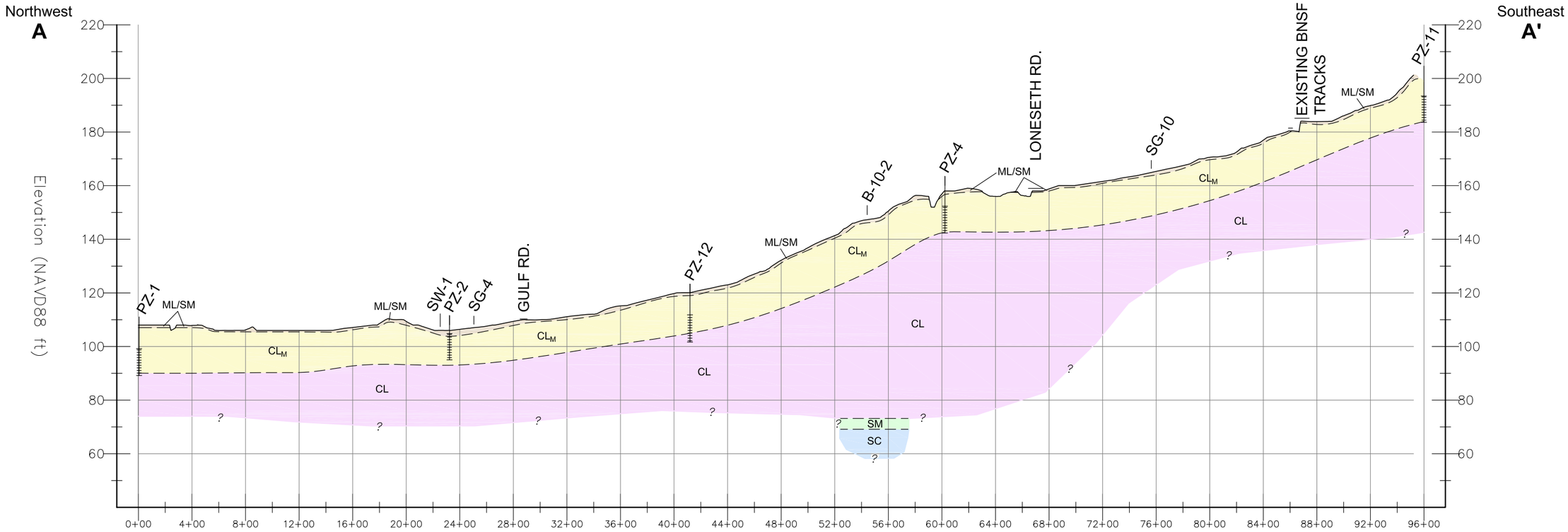
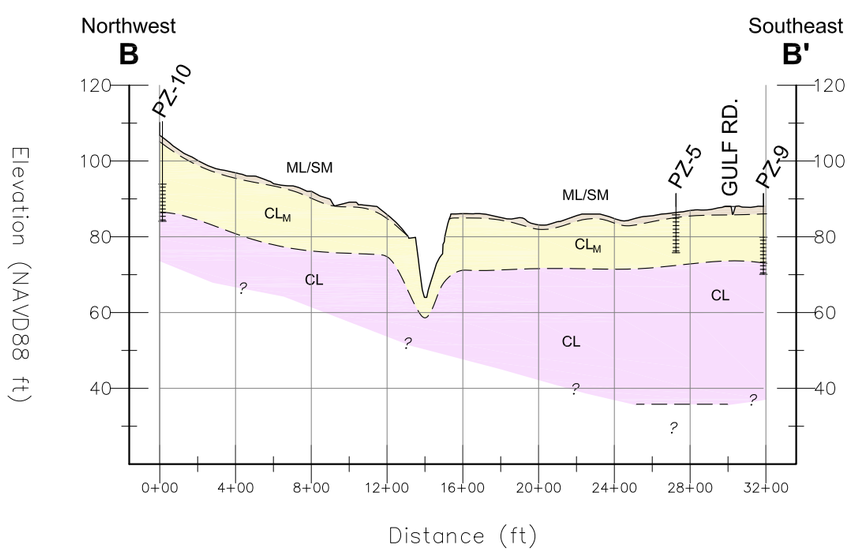
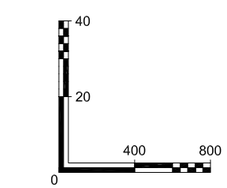




LEGEND

ML/SM	SILT TO SILTY SAND, DARK TO LIGHT BROWN (EVERSON INTERSTADE EMERGENCE BEACH DEPOSITS)
CL_M	CLAY WITH SAND, GRAYISH BROWN TO OLIVE BROWN, HIGH PLASTICITY, OXIDATION MOTTLING PREVALENT (WEATHERED BELLINGHAM GLACIOMARINE DRIFT)
CL	CLAY WITH SAND, GRAYISH BROWN TO OLIVE BROWN, HIGH PLASTICITY, TRACE SHELL FRAGMENTS (NON-WEATHERED BELLINGHAM GLACIOMARINE DRIFT)
SM / SC	GRAY SILTY FINE TO MEDIUM SAND TO GRAY SILTY CLAYEY SAND WITH OCCASIONAL GRAVEL (DEMING SAND)



APPROXIMATE SCALE IN FEET
VERTICAL 20x EXAGGERATION

CLIENT LOGO

Pacific International Terminals.

CLIENT:
PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	APS
CHK'D BY:	RH
DATUM:	NAD83
PROJECTION:	WA SP NORTH Ft.
SCALE:	AS SHOWN

PROJECT
GATEWAY PACIFIC TERMINAL

TITLE
GEOLOGIC CROSS SECTIONS A-A' & B-B'

DATE:	AUGUST 2011
PROJECT NO:	5-91M-15338-0
REV. NO.:	A
FIGURE No.	FIGURE 4-2

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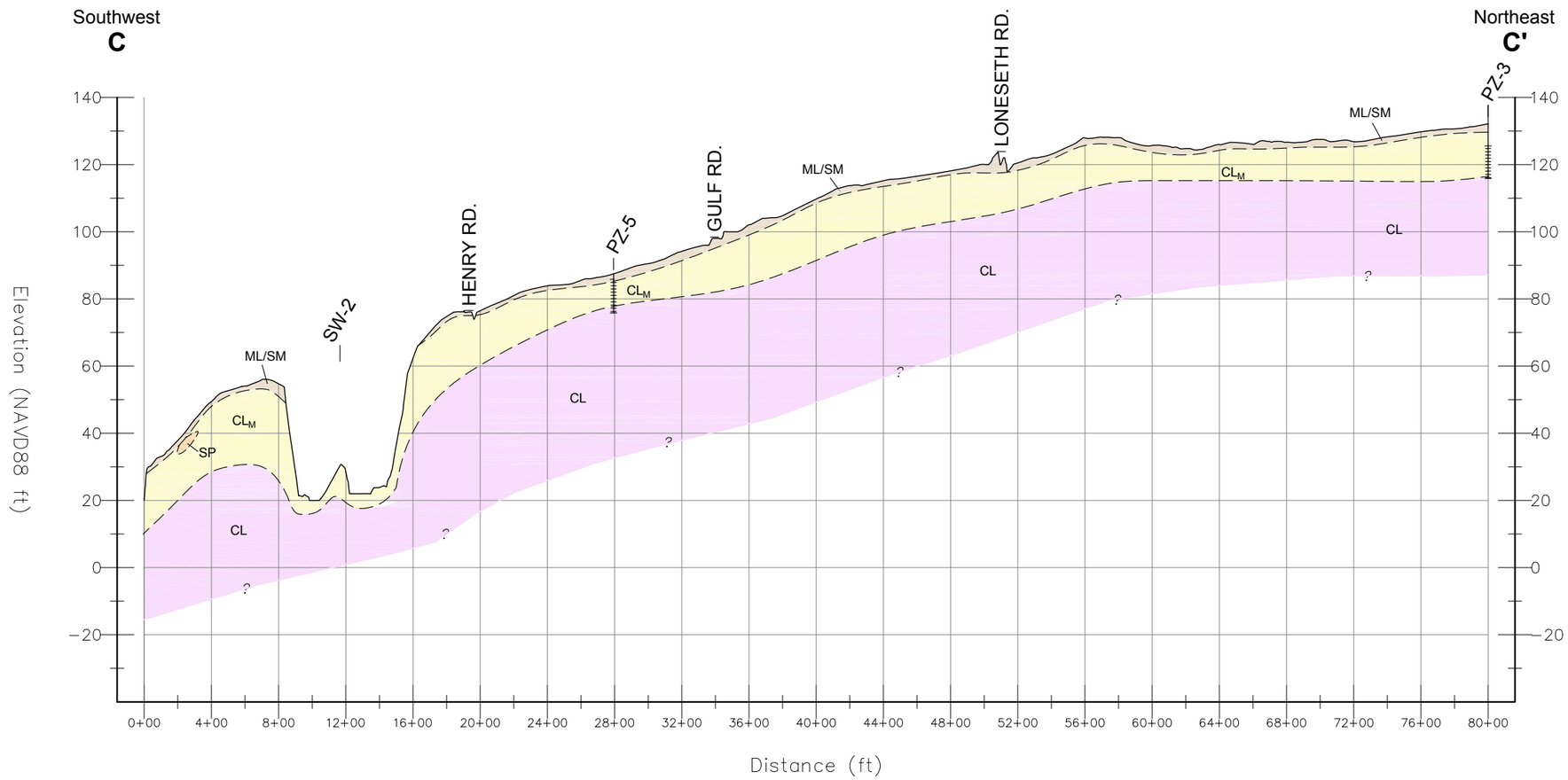
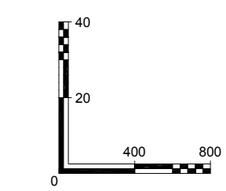


LEGEND

ML/SM	SILT TO SILTY SAND, DARK TO LIGHT BROWN (EVERSON INTERSTADE EMERGENCE BEACH DEPOSITS)
CL_M	CLAY WITH SAND, GRAYISH BROWN TO OLIVE BROWN, HIGH PLASTICITY, OXIDATION MOTTLING PREVALENT (WEATHERED BELLINGHAM GLACIOMARINE DRIFT)
CL	CLAY WITH SAND, GRAYISH BROWN TO OLIVE BROWN, HIGH PLASTICITY, TRACE SHELL FRAGMENTS (NON-WEATHERED BELLINGHAM GLACIOMARINE DRIFT)
SP	POORLY GRADED SAND WITH GRAVEL, DARK YELLOWISH BROWN (EVERSON INTERSTADE BEACH DEPOSITS)



APPROXIMATE SCALE IN FEET
VERTICAL 20x EXAGGERATION

CLIENT LOGO

Pacific International Terminals.

CLIENT:
PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	APS
CHK'D BY:	RH
DATUM:	NAD83
PROJECTION:	WA SP NORTH Ft.
SCALE:	AS SHOWN

PROJECT
GATEWAY PACIFIC TERMINAL

TITLE
GEOLOGIC CROSS SECTION C-C'

DATE:	AUGUST 2011
PROJECT NO:	5-91M-15338-0
REV. NO.:	A
FIGURE No.	FIGURE 4-3

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4.2 SURFACE WATER STAGE AND DISCHARGE MEASUREMENTS

As described in Section 3.2.1, surface water stage measurements were recorded at 20 staff gages installed within the Terminal project area (see Figure 3-1). Stage hydrographs for each staff gage are provided in Figures 4-4 through 4-13. The reach or drainage where each staff gage was installed is summarized in Table 3-2.

Staff gage locations that exhibited the largest increases in flow depth in response to precipitation events include SG-1 (Stream 3), SG-2 (Stream 1), SG-4 (Stream 1), SG-7 (Stream 4), SG-8 (Stream 4), SG-13 (Stream 1), SG-14 (Drainage 7), SG-17 (Drainage 3), and SG-18 (Stream 1). Stage elevations observed at locations SG-6 (Drainage 9), SG-12 (Stream 6), and SG-15 (Drainage 3) exhibited smaller increases in surface water elevation following precipitation events. The absence of a flood wave at SG-6 and SG-12 in response to precipitation is likely due to the small drainage areas upstream from both of these locations. At SG-15, the staff gage was installed in a clean and straight portion of the roadside ditch just upstream of where it discharges to Stream 1. The channel at SG-15 likely has a low Manning's roughness coefficient, which may dampen flood waves produced in the upgradient channel along Henry Road. Staff gages where stage was measured manually (SG-3 [Stream 1], SG-5 [Unnamed Drainage near PZ-12], SG-9 [Stream 4], SG-10 [Stream 4], SG-11 [Stream 6], SG-16 [Drainage 3], SG-19 [Stream 2], and SG-20 [Stream 2]) did not have data at a temporal resolution that captures individual flood events. Nonetheless, water elevation fluctuations at these locations are expected to be similar to those observed at other monitoring locations within the Terminal project area.

Discharge was calculated using water depth and velocity measurements for SG-2 (Stream 1), SG-4 (Stream 1), SG-7 (Stream 4), SG-13 (Stream 1), SG-15 (Drainage 3), and SG-18 (Stream 1) following the procedures described in Section 3.2.2. Results for all six transect discharge measurements preformed during the first and second quarters of 2011 are presented in Table 4-2. When a single measurement segment contained greater than 10 percent of the total discharge, the discharge value at that specific transect was flagged as estimated. For instances when duplicate measurements exceed the 5 percent difference criterion, all discharge measurements for the surface water monitoring event are flagged as estimated (see Table 4-2).

For roadside ditches and streams (SG-2, SG-7, and SG-15), discharge values ranged from 0.1 cubic foot per second (ft^3/sec) to 2.16 ft^3/sec. The generally low flow velocities and the presence of aquatic vegetation in roadside ditches and streams resulted in significant variation in discharge in the SG-2 and SG-7 stream segments. The vegetation serves as an obstruction to block stream flow. As a result, the presence of vegetation resulted in very low stream flow velocities immediately upstream of the obstruction. However, other segments within the SG-2 and SG-7 transects characterized by less aquatic vegetation were relatively free flowing.

The variability in stream velocities within each transect resulted in segments that contained greater than 10 percent of the total stream discharge at both SG-2 and SG-7. This issue occurred despite attempts to reduce vegetation at the transect locations and the use of small segment intervals for velocity measurements (0.2 foot – 0.3 foot). At SG-15, the percentage of flow in each segment exceeded 10 percent for each measurement because the width of the channel is very narrow, but velocities were fairly high due to the downward sloping channel and low channel roughness. Currently, a segment size of 0.2 foot is used for the SG-15 discharge measurement. A smaller segment width cannot be used due to the width of the Swoffer™ Model 2100 flow meter. As a result of the high percentage of flow contained in individual stream segments at SG-2, SG-7, and SG-15, many of the roadside ditches and stream discharge measurements are considered estimates.

Duplicate discharge measurements were collected at transects that exhibited high discharge to minimize the impacts of backwater eddies encountered in roadside ditches and streams. The percentage difference between duplicate measurements exceeded 5 percent during the March 22 (SG-13), April 1 (SG-4), and April 18 (SG-18) surface water monitoring events. The rocky streambed at SG-13 and SG-18 produced backwater eddy effects during low-flow conditions that were not evident under high discharge conditions, which may have caused the discrepancy between duplicate measurements observed during the March 22 and April 18 events. The duplicate measurements collected at SG-4 on April 1 occurred following a precipitation event, and a new stage value was not recorded for the second discharge measurement. Consequently, discharge may have been increasing during the period of measurement, causing the percentage difference in discharge measurements to exceed 5 percent. Following the April 1 surface water monitoring event, a unique stage value has been recorded for each duplicate discharge measurement.

Discharge measured for transect locations on Stream 1 increased in the downstream direction from SG-2 to SG-18 (Figure 3-1; Table 4-2). Stream 1 flows within a roadside ditch at SG-2 and then transitions to a wide, shallow channel that flows through an area of pastureland immediately upstream of SG-4. Discharge measurements collected at SG-4 ranged from 0.6 ft^3/sec to 4.6 ft^3/sec.

Comparison of discharge values from individual monitoring events indicates that Stream 1 is typically a gaining stream along its reach from SG-2 to SG-4. A *gaining stream* exhibits increased stream flow volume as it moves downstream. A *losing stream* exhibits decreased stream flow volume as it moves downstream. The increase in discharge observed at SG-4 is primarily due to other small tributaries that drain pastureland and forested areas near SG-5 and PZ-12, and which discharge to Stream 1 immediately upstream of SG-4. Other important contributions to Stream 1 flow likely include baseflow from the Everson beach deposits and silt surface soils.

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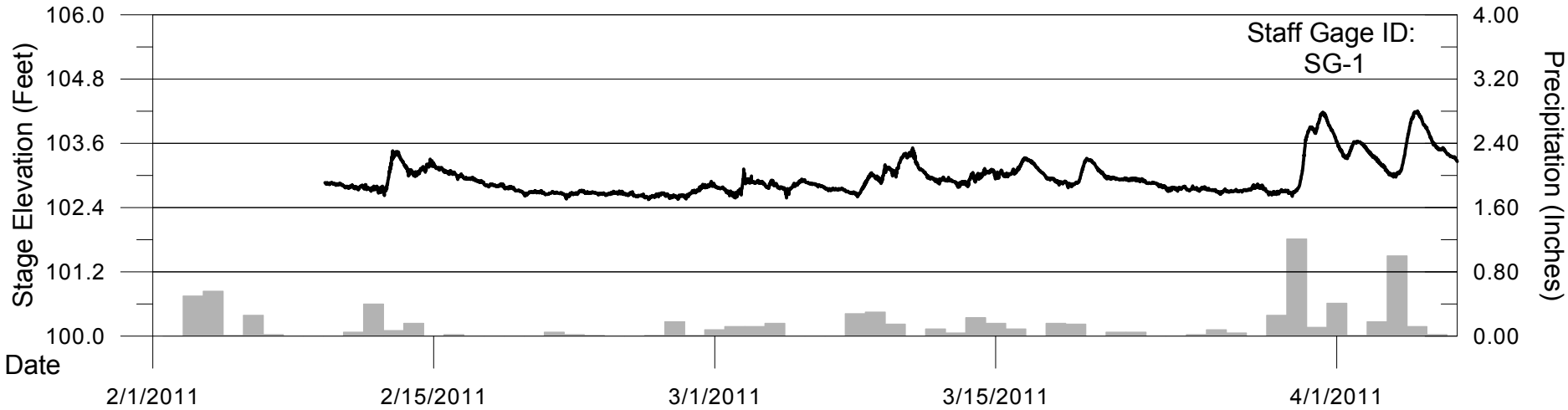

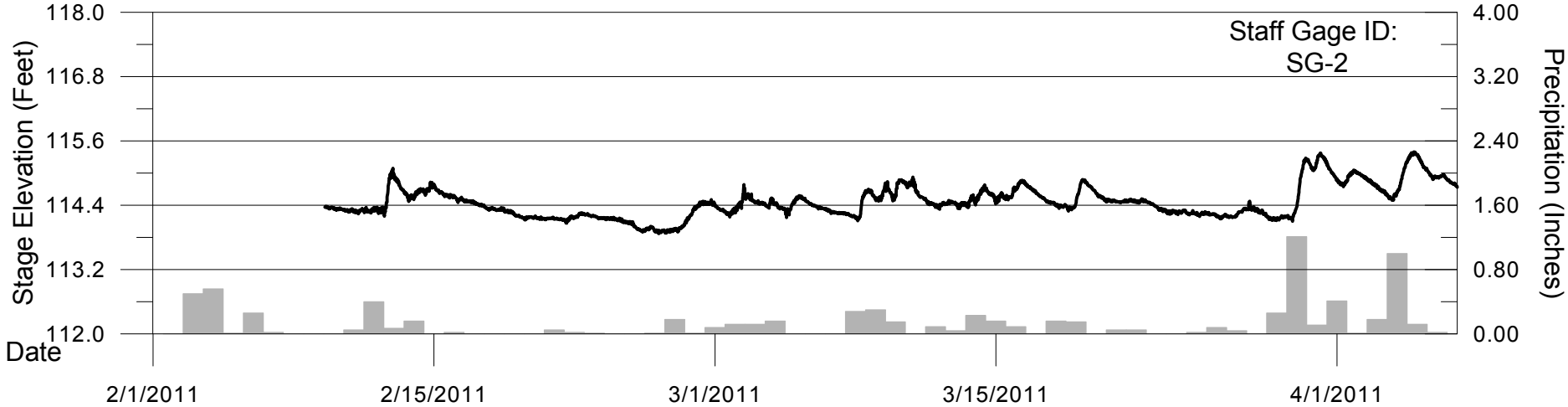

Notes: 1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.

LEGEND
Precipitation time series
Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-1 and SG-2 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-4

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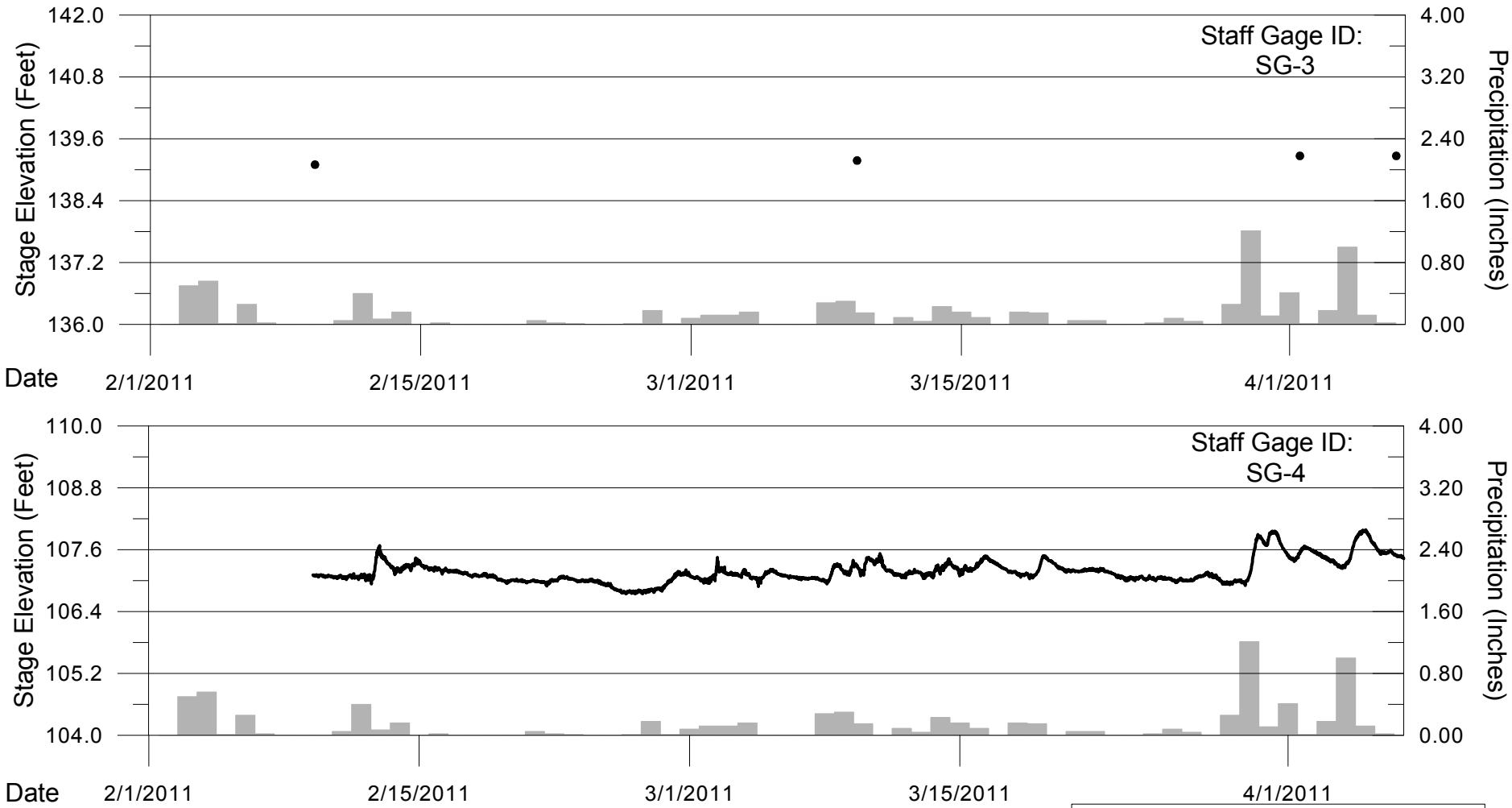

LEGEND

- Daily precipitation (inches)
- Surface water elevation time series (manual measurements)
- Surface water elevation time series (pressure transducer)

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. Staff gage SG-3 is not instrumented with a pressure transducer. Stage elevation data at SG-3 were recorded manually.

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-3 AND SG-4 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-5

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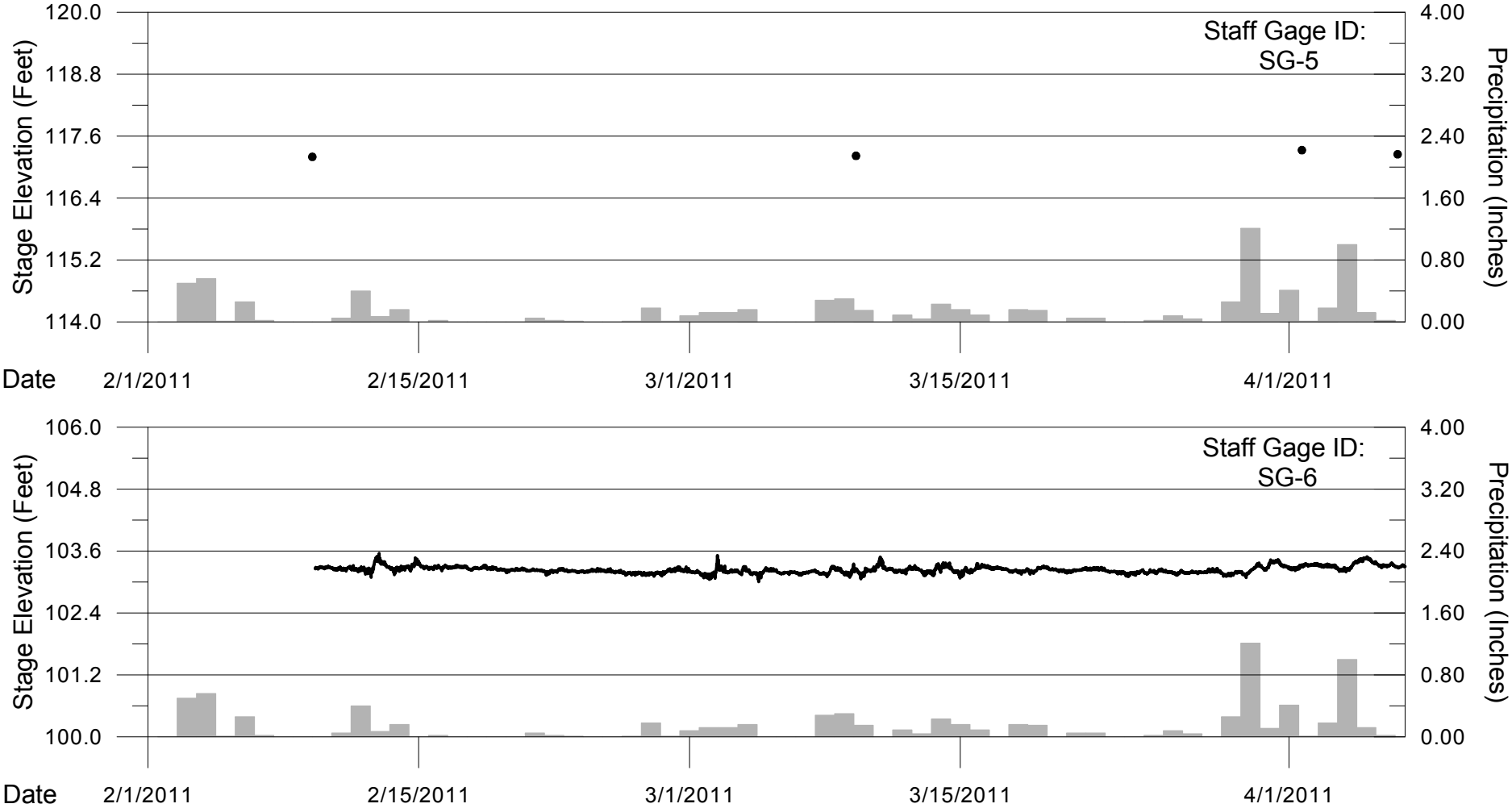

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. Staff gage SG-5 is not instrumented with a pressure transducer. Stage elevation data at SG-5 were recorded manually.

LEGEND
- Daily precipitation (inches)
- Surface Water elevation time series (manual measurements)
- Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-5 AND SG-6 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-6

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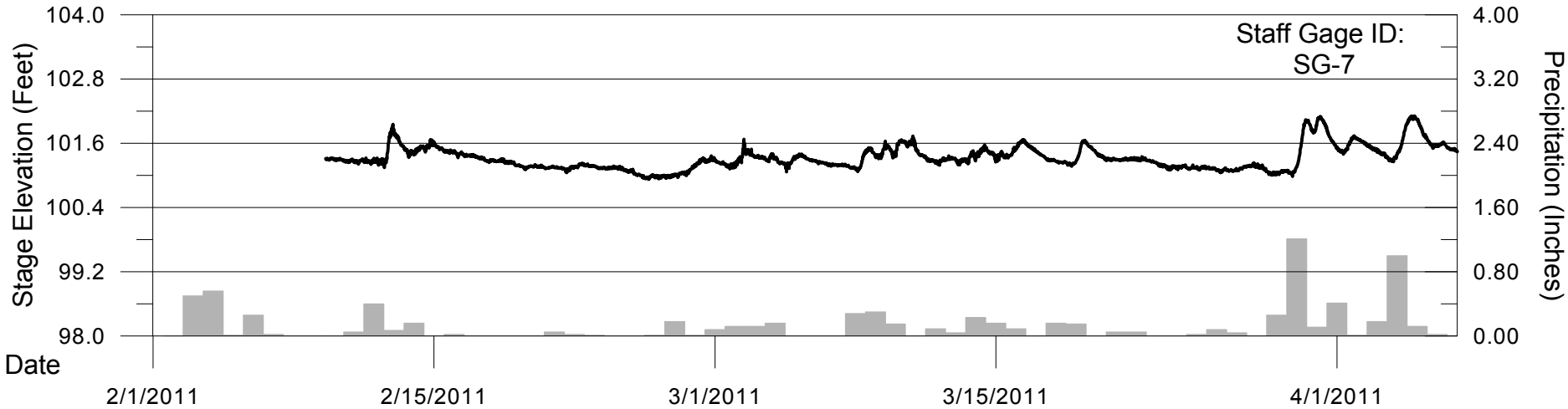

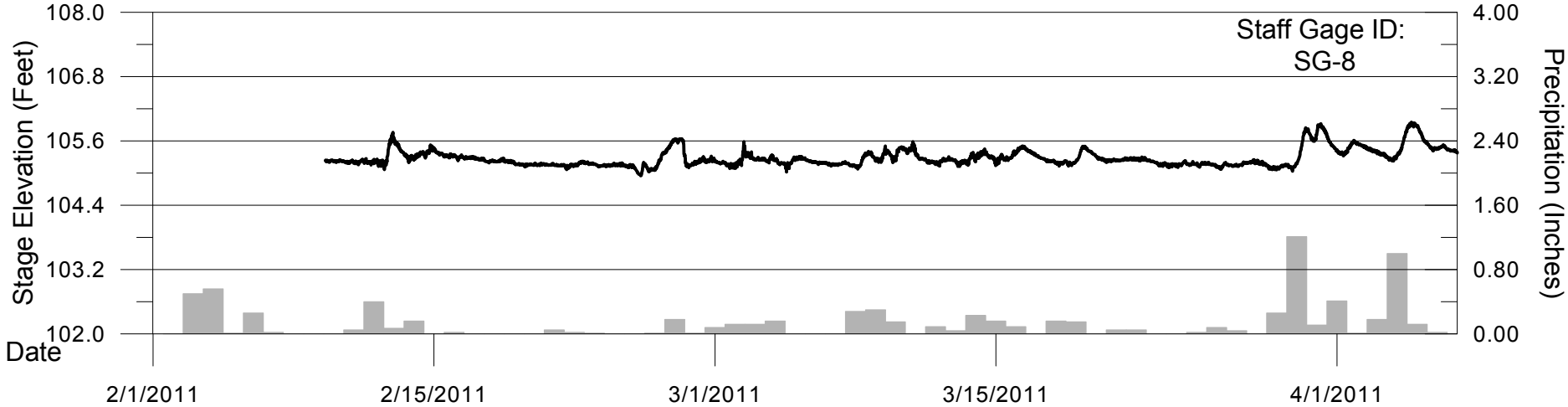

Notes: 1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.

LEGEND
Daily precipitation (inches)
Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-7 AND SG-8 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-7

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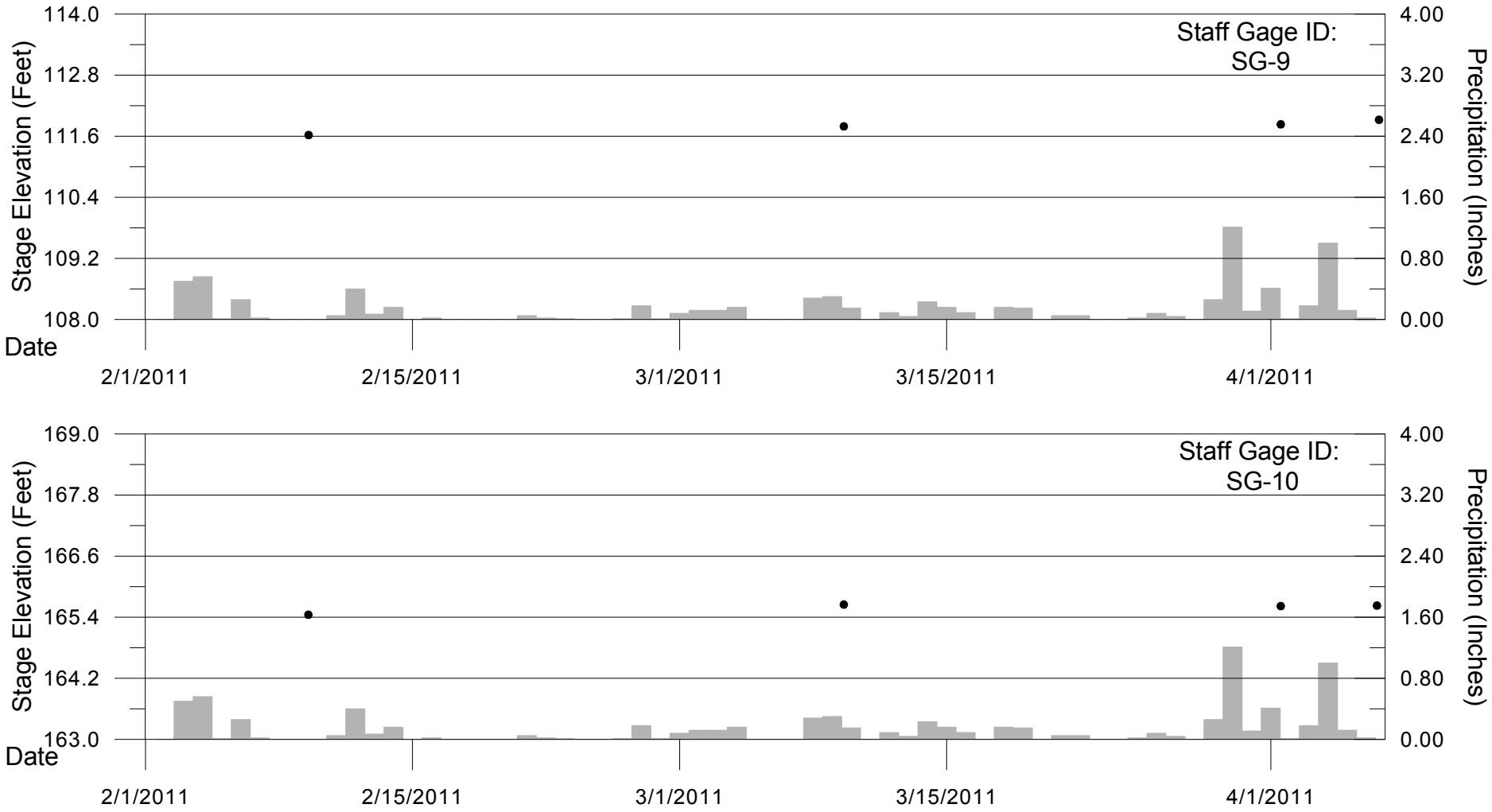

Notes: 1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. Staff gages SG-9 and SG-10 are not instrumented with a pressure transducer.
Stage elevation data at these locations were recorded manually.

LEGEND
Daily precipitation (inches)
Surface water elevation time series (manual measurements)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-9 AND SG-10 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-8

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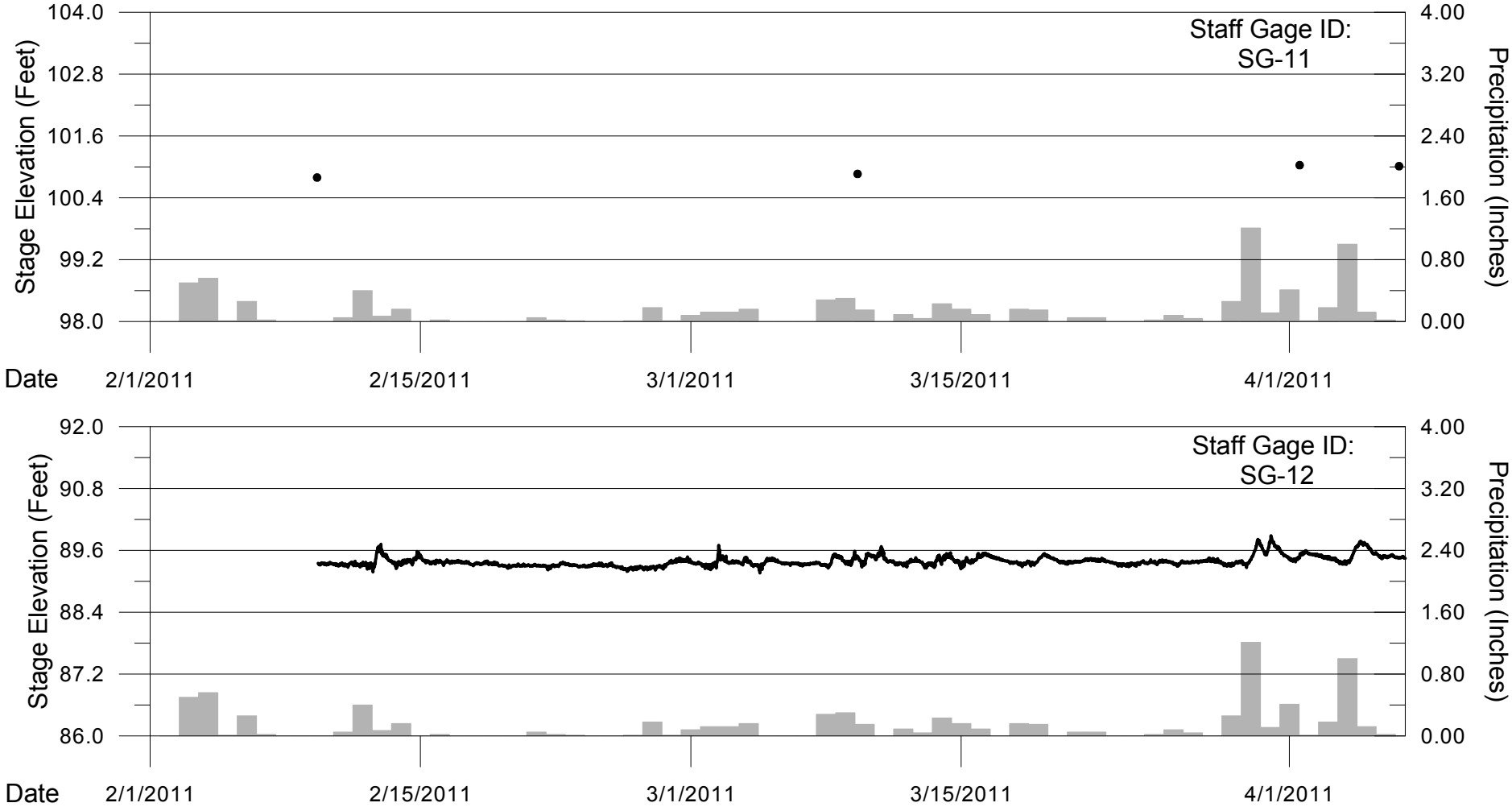

Notes: 1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
5. Staff gage SG-11 is not instrumented with a pressure transducer.
Stage elevation data at SG-11 were recorded manually.

LEGEND
- Daily precipitation (inches)
- Surface water elevation time series (manual measurement)
- Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-11 AND SG-12 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-9

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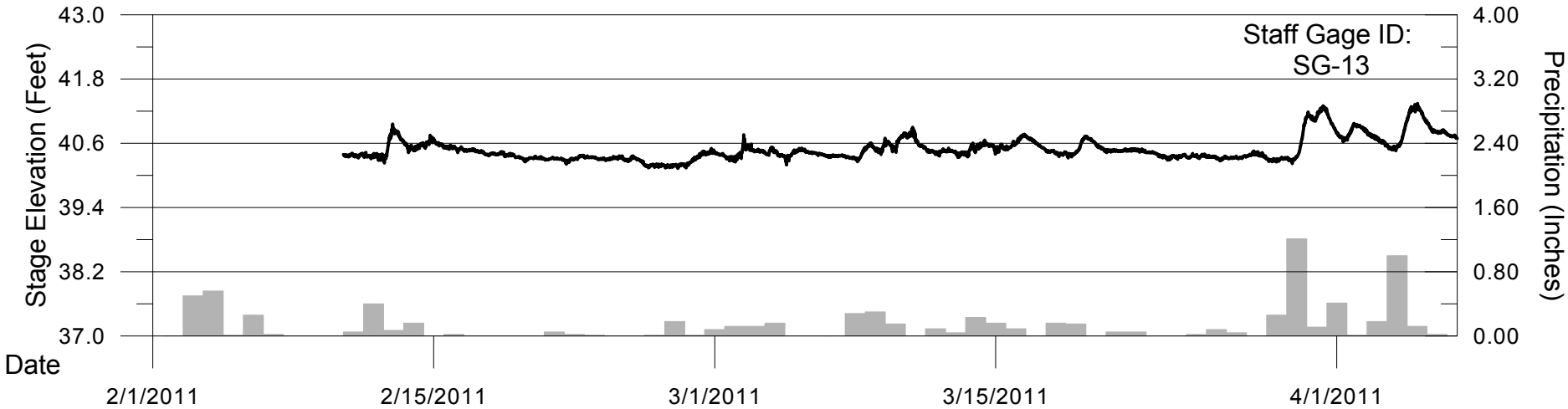

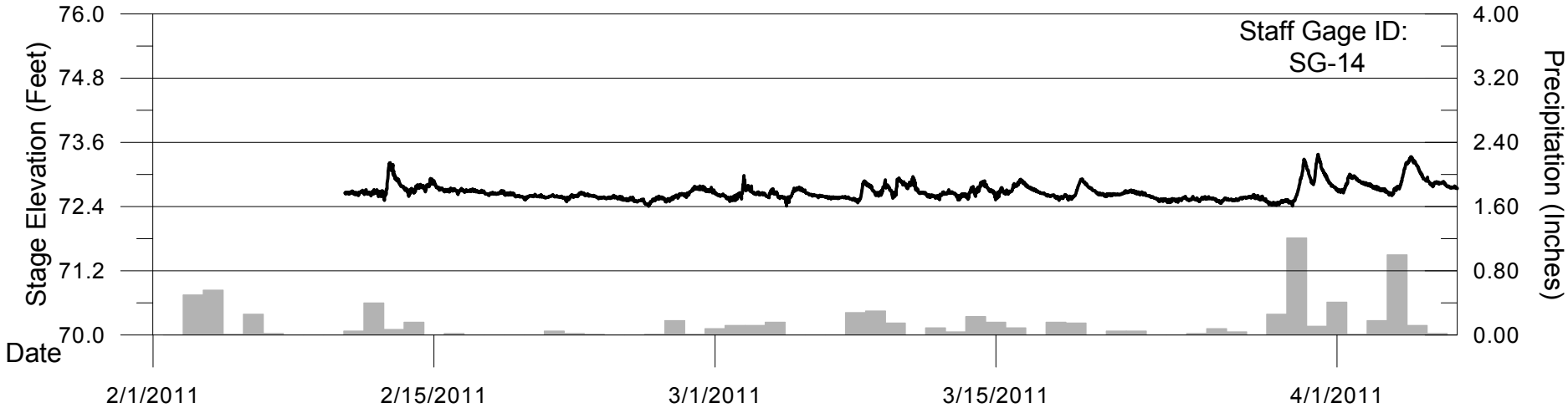

Notes: 1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.

LEGEND
Daily precipitation (inches)
Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-13 AND SG-14 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-10

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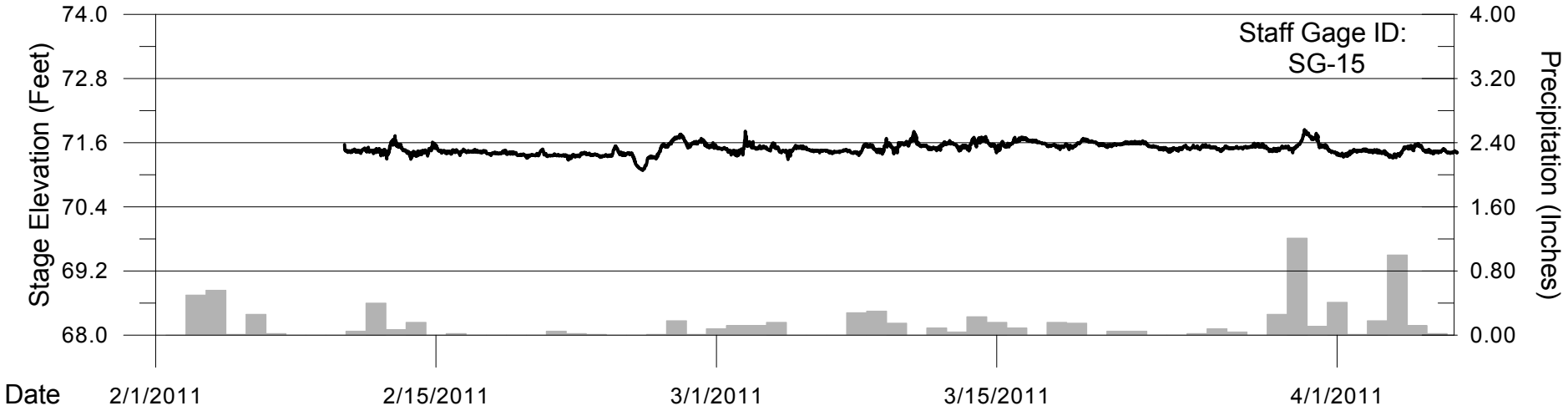

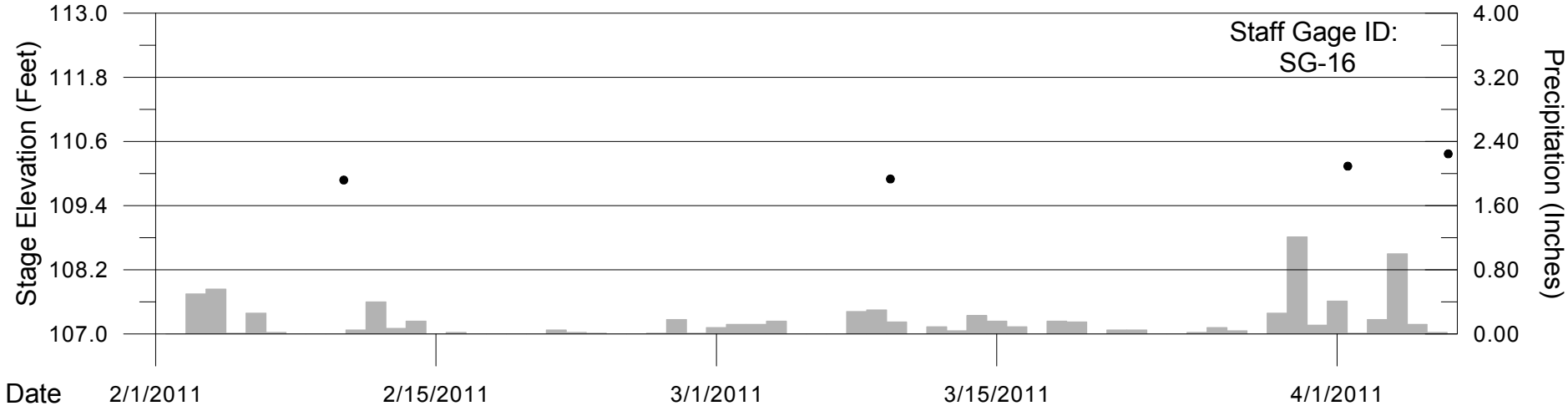

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
5. Staff gage SG-16 is not instrumented with a pressure transducer.
   Stage elevation data at SG-16 were recorded manually.

LEGEND
- Daily precipitation (inches)
- Surface water elevation time series (manual measurement)
- Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-15 AND SG-16 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-11

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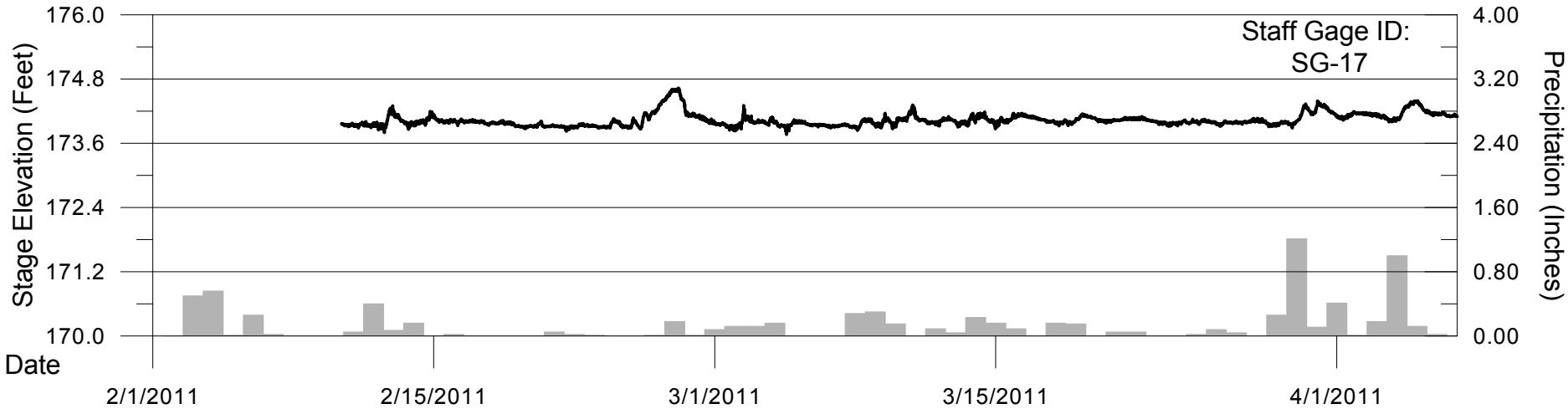

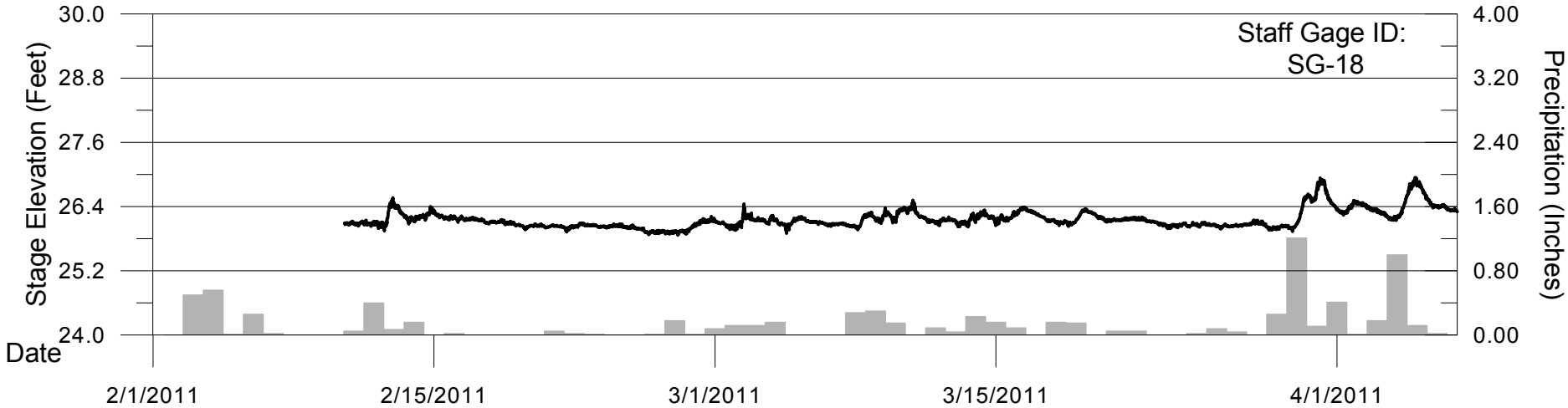

Notes: 1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.

LEGEND
- Daily precipitation (inches)
- Surface water elevation time series (pressure transducer)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-17 AND SG-18 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-12

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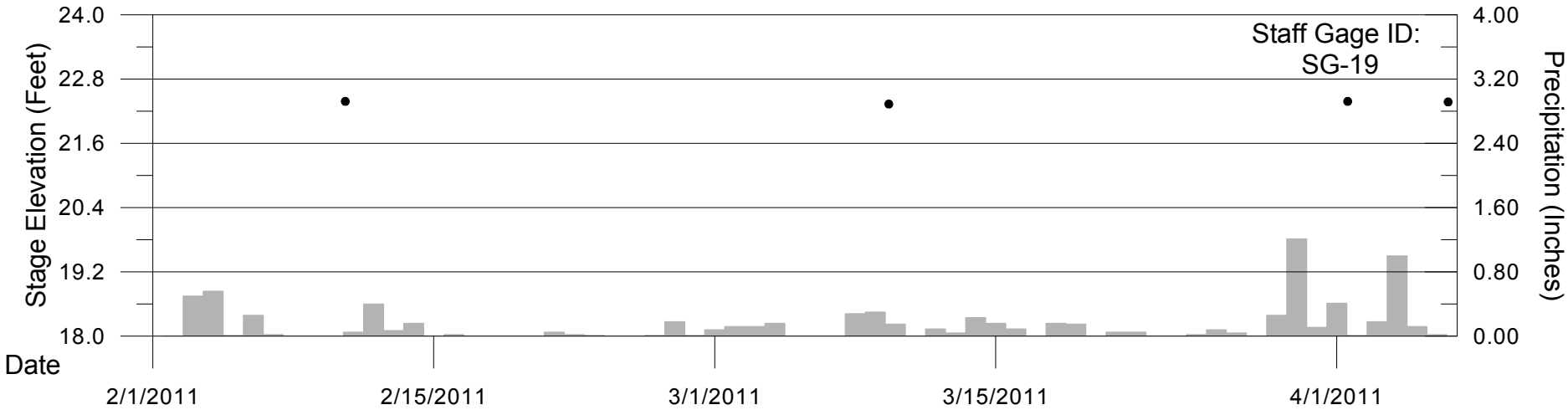

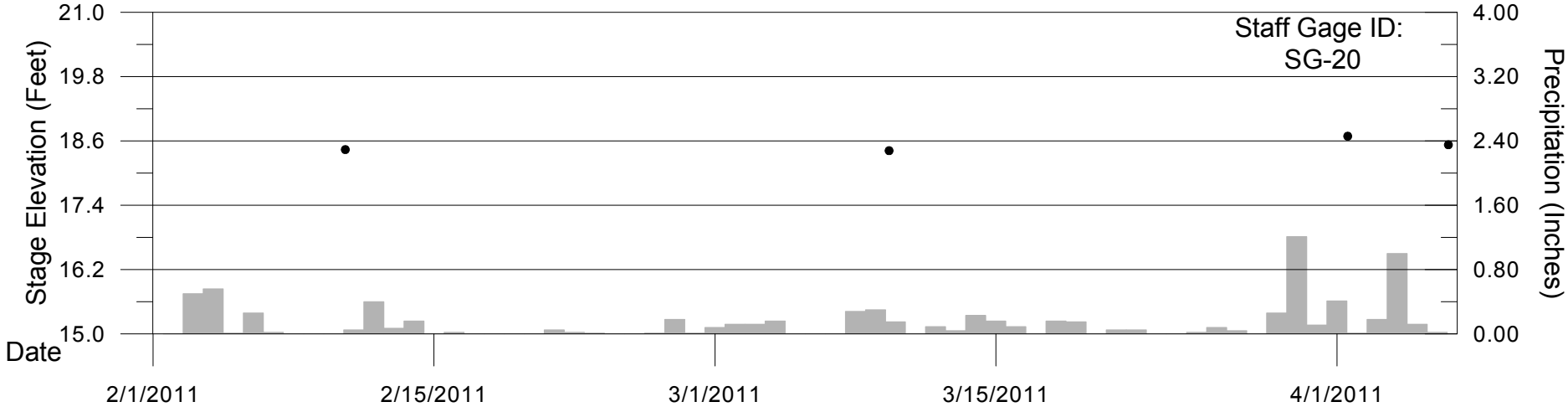

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
5. Staff gages SG-19 and SG-20 are not instrumented with a pressure transducer. Stage elevation data at SG-19 and SG-20 were recorded manually.

LEGEND
- Daily precipitation (inches)
- Surface water elevation time series (manual measurements)

amec	SURFACE WATER (STAGE) HYDROGRAPHS: GAGES SG-19 AND SG-20 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-13

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Table 4-2 Surface Water Discharge Measurements

	SG-2				SG-4			
Date	Time	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)	Time	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)
3/10/2011[1]	13:40	1.16	12.4	.78 J	13:01	0.71	6.5	3.4
3/22/2011	11:23	0.92	25.5	.16 J N	9:18	0.61	7.7	1.0 N
4/1/2011	9:55	1.30	11.8	2.16 J N	10:42	0.89	8.3	4.3 N
4/6/2011	14:20	1.34	8.6	1.26	15:15	0.93	7.8	4.6
4/18/2011	8:57	0.71	21.2	0.1 J N	9:43	0.50	11.1	0.6 J N

	SG-7				SG-13			
Date	Time	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)	Time	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)
3/10/2011[1]	12:50	1.15	8.8	1.8	8:55	1.11	7.5	10.1
3/22/2011	10:16	0.83	15.2	0.4 J N	12:32	0.79	14.0	2.3 J N
4/1/2011	12:20	1.08	9.2	1.8 N	13:38	2.05	5.3	10.6 N
4/6/2011	15:53	1.06	8.4	1.9	10:06	1.12	6.0	11.3
4/18/2011	10:27	0.68	15.8	0.3 J N	12:30	0.71	7.3	1.4 N

	SG-15				SG-18			
Date	Time	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)	Time	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)
3/10/2011	11:00	0.47	19.3	.72 J	10:09	2.03	5.7	13.7
3/22/2011	14:00	0.41	23.5	0.21 J N	13:00	1.79	8.0	2.9 N
4/1/2011	15:22	0.45	13.2	1.74 J N	14:40	2.05	5.0	16.8 N
4/6/2011	12:22	0.33	14.3	1.17 J	11:40	1.98	5.0	13.4
4/18/2011	14:06	0.20	32.8	.18 J N	13:18	1.68	8.1	1.8 N

Table 4-2 Surface Water Discharge Measurements

	Duplicate Measurement					
Date	Time	Staff Gage ID	Stage (ft)	Maximum Flow Percentage per Segment	Total Discharge (ft^3/sec)	Duplicate Measurement Percent Difference
3/10/2011	10:45	SG-18	2.03	5.4	13.6	0.7
3/22/2011	13:00	SG-13	0.79	13.9	2.5 J N	7.6
4/1/2011	10:42	SG-4	0.89	7.4	4.8 N	11.0
4/6/2011	10:45	SG-13	1.12	6.7	11.1	2.3
4/18/2011	13:40	SG-18	1.68	8.5	1.5 N	15.8

Notes
1. Discharge measurements for SG-2 and SG-4 were performed on 3/9/11.

Abbreviations
ft: feet
J: Discharge measurement is considered an estimate because the maximum flow rate for one stream segment exceeded 10% of the total stream discharge.
N: Discharge measurement is considered an estimate because the percent difference for duplicate discharge measurements exceeded the 5% criterion.
sec: second

Stream 1 flows through pasturelands south of SG-4 until it reaches a forested area north of Lonseth Road (Figure 3-1). After Stream 1 flows through a culvert beneath Lonseth Road, it rapidly drops into a ravine. Stream 1 then flows along the bottom of the ravine until discharging through a coastal wetland to the Strait of Georgia. Discharge measurements were collected at two locations within the ravine. Discharge measurements collected at SG-13, which is located just north of the culvert beneath Henry Road, ranged from 1.4 ft^3/sec to 11.3 ft^3/sec. Comparing discharge measured at SG-4 and SG-13 indicates that this section of Stream 1 is a gaining reach. Increased discharge is likely due to surface water contributions to Stream 1 from ditches along Lonseth Road and contributions from seeps located along the ravine walls. Minor baseflow contributions also occur from the Bellingham glaciomarine drift.

Between SG-13 and SG-18, Stream 1 flows through a culvert beneath Henry Road. Stream 1 receives surface water contributions from the roadside ditches along Henry Road immediately upstream of SG-18. Discharge measurements at SG-18 varied from 1.8 ft^3/sec to 16.8 ft^3/sec. Comparisons of discharge values from within a single monitoring event indicate that Stream 1 is a gaining reach between SG-13 and SG-18. Increased discharge observed at SG-18 is due to contributions from the roadside ditches bordering Henry Road and seep discharge along the walls of the ravine. Minor baseflow contributions also occur from the Bellingham glaciomarine drift.

Stage and discharge values were used to produce rating curves for each discharge measurement location. A *rating curve* is a plot of individual stage elevation with the corresponding discharge measurement. Once populated with actual field measurements of stage elevations and discharge measurements, the curve can be used to correlate a stage measurement to a discharge value so that only stage measurements are required in the field. If significant geomorphic alteration to the channel occurs, the rating curve may no longer be appropriate and must be regenerated. Preliminary rating curves for SG-2 and SG-4 are shown in Figures 4-14 and 4-15. Preliminary stage and discharge values were also plotted for SG-7, SG-13, SG-15, and SG-18. The results did not fall along a distinct curve due to the limited number of data points used to generate the rating curves and are therefore not included. Additional stage and discharge data will be collected from all six transects during the winter wet season of 2011-2012. These data will be used to construct the respective rating curves. The rating curves will then be used to calculate a discharge time series from the stage data collected by staff gage pressure transducers.

4.3 GROUNDWATER FLOW DIRECTIONS AND GRADIENTS

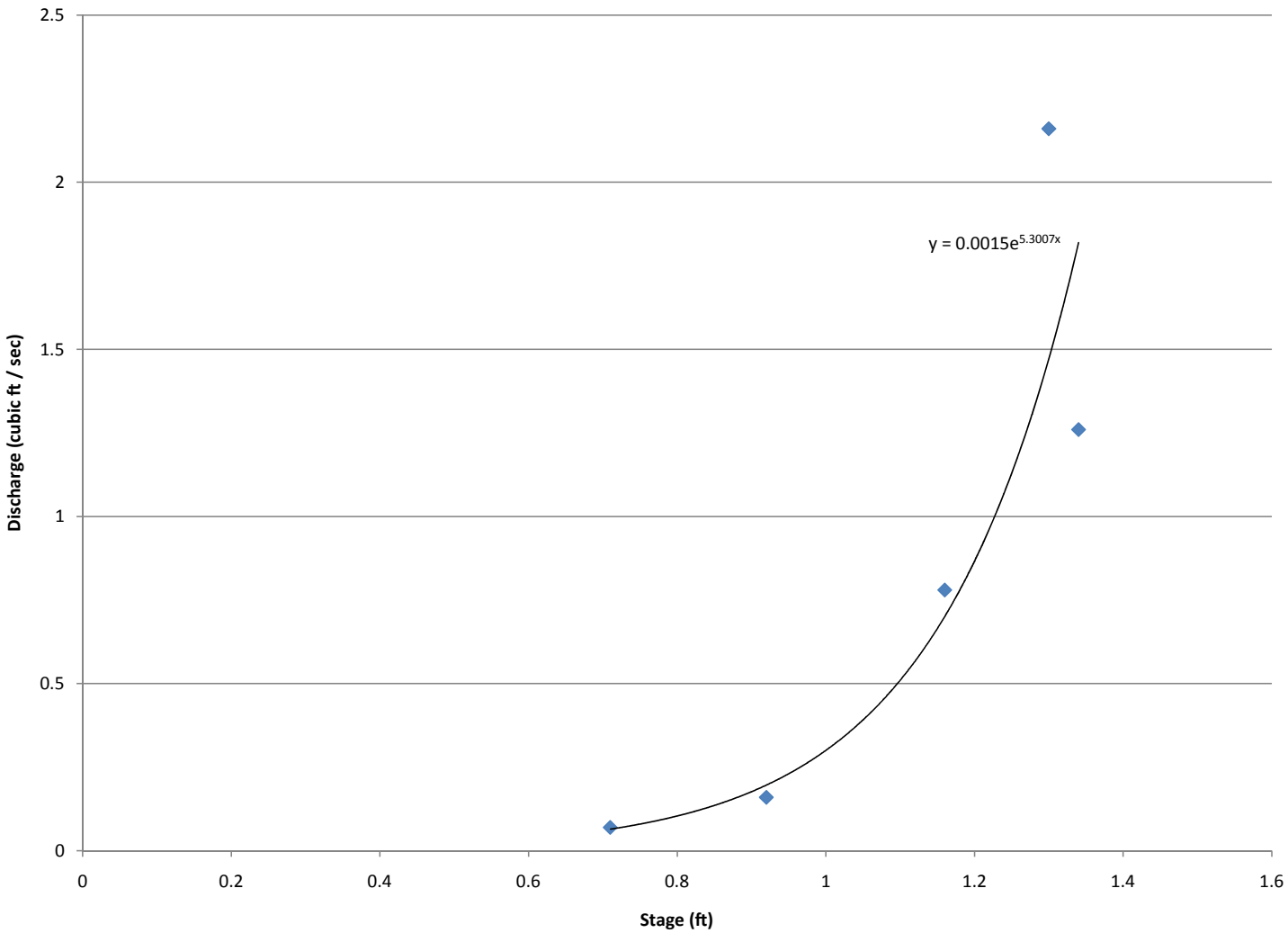
Quarterly groundwater contour maps for the fourth quarter 2010 through second quarter 2011 are presented in Figures 4-16 through 4-18. For the fourth quarter 2010, only piezometers PZ-1 through PZ-6 had been developed and instrumented with pressure transducers. As a result, no project area surface water data or groundwater elevations for PZ-7 through PZ-12 were available. A groundwater contour map developed using groundwater elevations from PZ-1 through PZ-6 is presented in Figure 4-16.

Beginning with the first quarter 2011, both groundwater and surface water elevations were used to produce groundwater contour maps. Groundwater elevation data were derived from manual depth-to-groundwater measurements and from pressure transducer data recorded in piezometers PZ-1 through PZ-12. Manual groundwater measurements are provided in Table 4-3. The groundwater elevation data were combined with surface water elevations from manual staff gage readings and pressure transducer data recorded in stilling wells to produce quarterly groundwater elevation contour maps for the project area for the first and second quarters of 2011 (Figure 4-17 and Figure 4-18).

The process of constructing these groundwater contour maps using both surface water and groundwater elevations assumes that project area surface water bodies are in hydraulic communication with the weathered Bellingham glaciomarine drift. This approach is supported by hydrologic data collected from paired staff gages and piezometers (i.e., PZ-1/SG-1; PZ-5/SG-12; PZ-2/SG-4), which indicate that groundwater elevations in the glaciomarine drift are typically higher than surface water stage elevation. The direction of observed hydraulic gradient suggests that surface water features receive baseflow contributions as groundwater discharge from the Bellingham glaciomarine drift.

Groundwater flow directions in the weathered Bellingham glaciomarine drift are generally westward between Kickerville Road and Gulf Road. To the west of Gulf Road, groundwater flow directions are generally southerly toward the Strait of Georgia. Where Stream 1 flows through the ravine, groundwater flow exhibits a localized very steep hydraulic gradient oriented toward Stream 1. Groundwater elevations in the weathered Bellingham glaciomarine drift were generally very close to the ground surface during all three quarters, resulting in a groundwater potentiometric surface that closely resembles project area topographic contours (Figures 4-17 and 4-18).

Horizontal groundwater gradients were generally steepest in upland areas or areas that have steep topography (Figures 4-17 and 4-18). These areas included central portions of the project area between Henry Road and Lonseth Road that exhibit steep topography (i.e., from SG-16 northeast toward PZ-4), eastern portions of the project area between Lonseth Road and Aldergrove Road (i.e., PZ-4 northward toward SG-3), the incised portion of Stream 1, and areas south of Henry Road (i.e., areas surrounding PZ-6 through PZ-8). Especially flat horizontal gradients were located in the extreme northwestern portion of the project area near Stream 1 and extending toward PZ-1 and SG-1. Horizontal gradients within the project area vary from a maximum of approximately 0.047 in locations upgradient of PZ-5 and PZ-9 to a minimum of approximately 0.0010 in areas between PZ-1 and PZ-2. Comparison of staff gage elevations and groundwater elevations from paired instrumentation (i.e., PZ-1/SG-1; PZ-2/SG-4; and PZ-5/SG-12) indicate that streams and roadside ditches generally functioned as gaining surface water features during the study time period (Figures 4-17 and 4-18). In Figure 4-18, surface water elevation at SG-4 was slightly higher than the groundwater elevation recorded in PZ-2, which suggests Stream 1 was losing surface water to groundwater near SG-4 in early April 2011. Some streams and roadside ditches within the Terminal project area may transition from gaining to losing conditions during high-flow conditions, as observed in early April 2011. Losing conditions for streams and ditches in the Terminal project area are likely short in duration, as a groundwater-to-surface water flow direction is reestablished once surface water elevations recede following flood events.



Abbreviations:
ft = feet
sec = seconds

amec	SG-2 RATING CURVE Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		5/19//11	Figure No. 4-14

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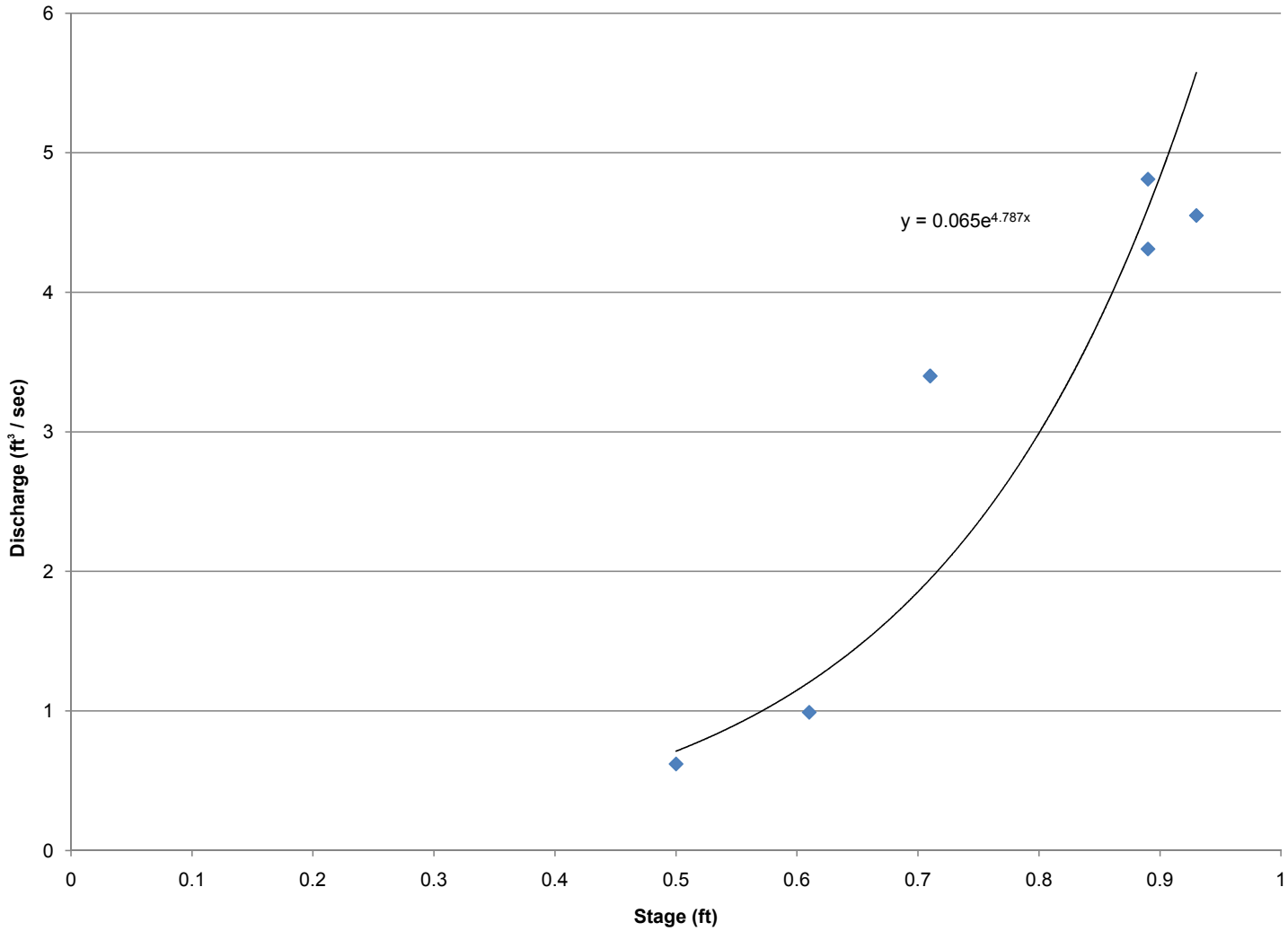

Abbreviations:
ft = feet
sec = seconds

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		5/19//11	Figure No. 4-15

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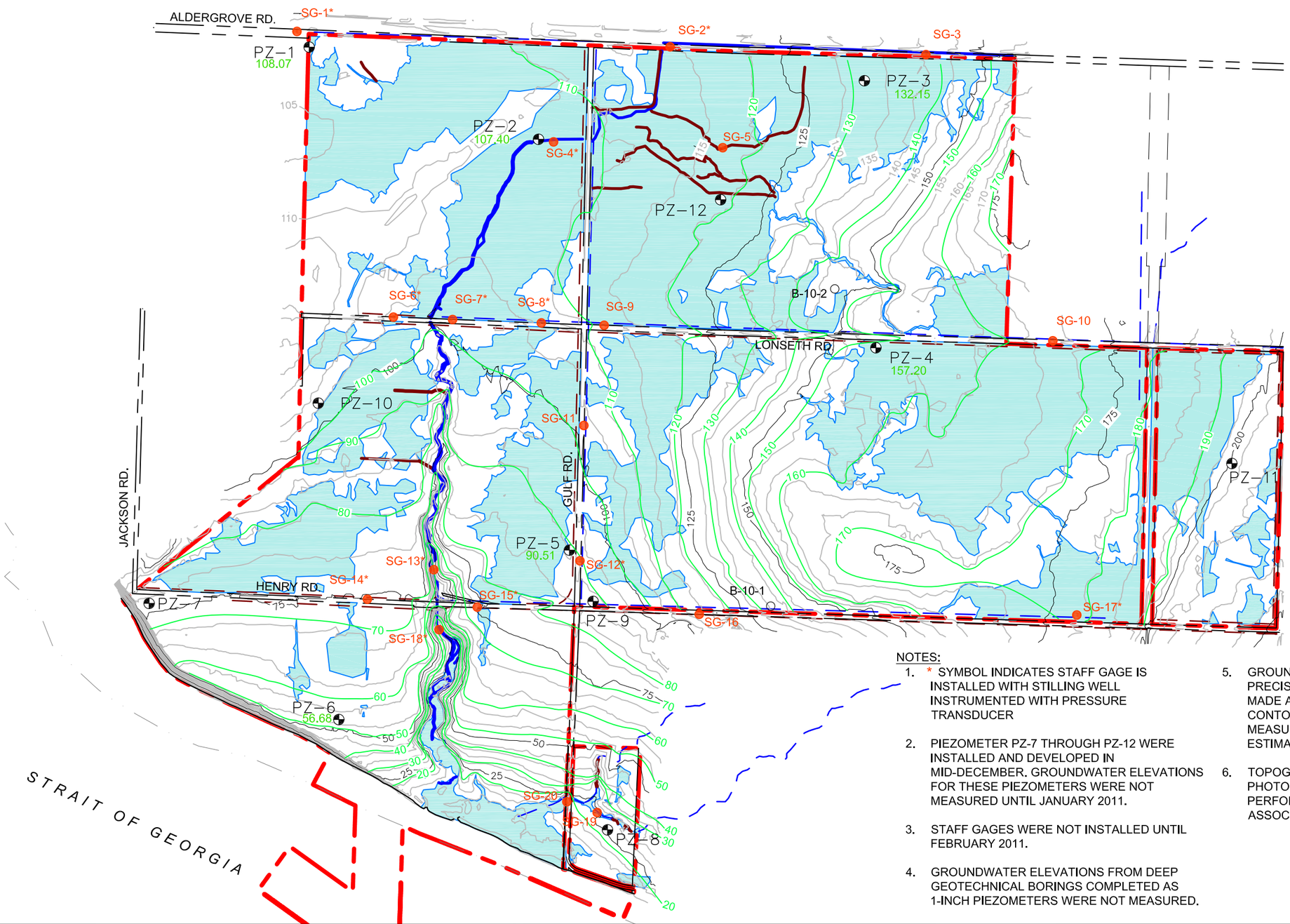

LEGEND

DATA MONITORING FEATURES

- PZ-3 — PIEZOMETER [2]
- SG-10 — STAFF GAGE [3]
- B-10-2 — GEOTECHNICAL BORING [4] COMPLETED AS 1-INCH PIEZOMETER
- 132.24 — GROUNDWATER OR SURFACE WATER STAGE ELEVATION (NAVD88 FT) (4TH QUARTER 2010)
- 170 — GROUNDWATER ELEVATION CONTOURS [5] (CONTOUR INTERVAL 10 FEET) (4TH QUARTER 2010)

HYDROLOGIC FEATURES

- STREAM LOCATION (DASHED WHERE APPROXIMATE)
- DRAINAGE LOCATION (DASHED WHERE APPROXIMATE)
- WETLAND AREA

OTHER FEATURES

- GROUND SURFACE ELEVATION CONTOUR [6] CONTOUR INTERVAL 5 FEET (NAVD 88 FT)
- PROJECT AREA BOUNDARY (WHARF NOT SHOWN IN ITS ENTIRETY)
- RIGHT-OF-WAY OR EASEMENT WITHIN PROJECT AREA VICINITY

NOTES:

1. * SYMBOL INDICATES STAFF GAGE IS INSTALLED WITH STILLING WELL INSTRUMENTED WITH PRESSURE TRANSDUCER
2. PIEZOMETER PZ-7 THROUGH PZ-12 WERE INSTALLED AND DEVELOPED IN MID-DECEMBER. GROUNDWATER ELEVATIONS FOR THESE PIEZOMETERS WERE NOT MEASURED UNTIL JANUARY 2011.
3. STAFF GAGES WERE NOT INSTALLED UNTIL FEBRUARY 2011.
4. GROUNDWATER ELEVATIONS FROM DEEP GEOTECHNICAL BORINGS COMPLETED AS 1-INCH PIEZOMETERS WERE NOT MEASURED.
5. GROUNDWATER ELEVATION DATA ARE PRECISE ONLY FOR POINT MEASUREMENTS MADE AT PIEZOMETERS. GROUNDWATER CONTOURS INTERPOLATED BETWEEN POINT MEASUREMENTS SHOULD BE CONSIDERED AS ESTIMATED GROUNDWATER ELEVATIONS.
6. TOPOGRAPHIC DATA IS A HYBRID OF AERIAL PHOTOGRAMMETRY AND A GROUND SURVEY PERFORMED BY DAVID EVANS AND ASSOCIATES.

N

0 500 1,000
APPROXIMATE SCALE IN FEET

DATA IS ONLY ACCURATE AT THE POINT MEASURED AND POINTS INBETWEEN ARE INTERPOLATED / EXTIMATED.

CLIENT LOGO

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	APS
CHK'D BY:	RH
DATUM:	NAD83
PROJECTION:	WA SP NORTH Ft.
SCALE:	AS SHOWN

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: FOURTH QUARTER 2010 (DECEMBER 15, 2010) GROUNDWATER CONTOUR MAP

DATE:	JUNE 2012
PROJECT NO:	5-91M-15338-0
REV. NO.:	A
FIGURE No.	FIGURE 4-16

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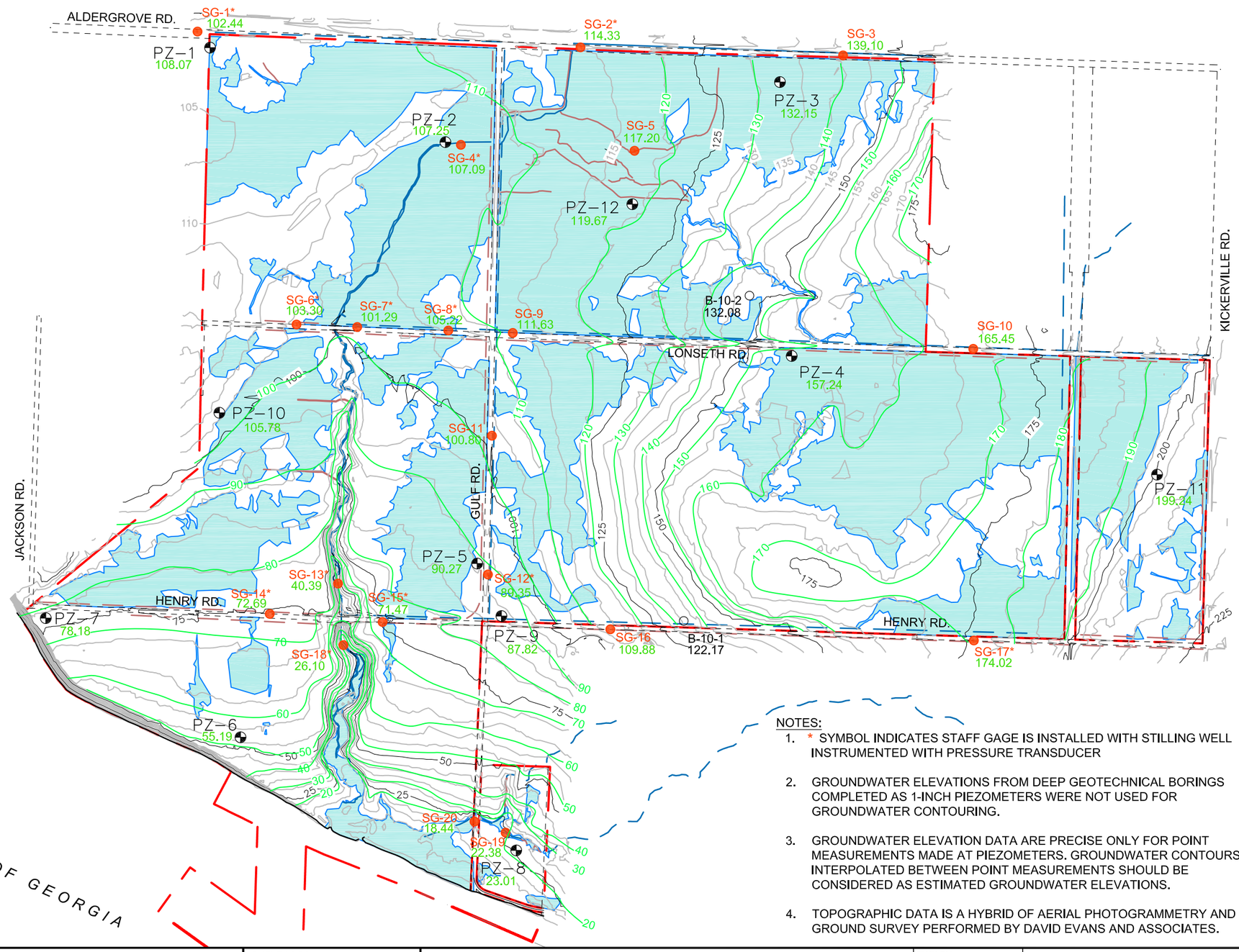

LEGEND

DATA MONITORING FEATURES

- PZ-3 — PIEZOMETER
- SG-10 — STAFF GAGE
- B-10-2 132.08 — GEOTECHNICAL BORING [2] COMPLETED AS 1-INCH PIEZOMETER WITH GROUNDWATER ELEVATION (FEET NAVD88)
- 132.15 — GROUNDWATER OR SURFACE WATER STAGE ELEVATION (NAVD88 FT) (1ST QUARTER 2011)
- 170 — GROUNDWATER ELEVATION CONTOURS [3] (CONTOUR INTERVAL 10 FEET) (1ST QUARTER 2011)

HYDROLOGIC FEATURES

- STREAM LOCATION (DASHED WHERE APPROXIMATE)
- DRAINAGE LOCATION (DASHED WHERE APPROXIMATE)
- WETLAND AREA

OTHER FEATURES

- GROUND SURFACE ELEVATION CONTOUR [4] CONTOUR INTERVAL 5 FEET (NAVD 88 FT)
- PROJECT AREA BOUNDARY (WHARF NOT SHOWN IN ITS ENTIRETY)
- RIGHT-OF-WAY OR EASEMENT WITHIN PROJECT AREA VICINITY

NOTES:

1. * SYMBOL INDICATES STAFF GAGE IS INSTALLED WITH STILLING WELL INSTRUMENTED WITH PRESSURE TRANSDUCER
2. GROUNDWATER ELEVATIONS FROM DEEP GEOTECHNICAL BORINGS COMPLETED AS 1-INCH PIEZOMETERS WERE NOT USED FOR GROUNDWATER CONTOURING.
3. GROUNDWATER ELEVATION DATA ARE PRECISE ONLY FOR POINT MEASUREMENTS MADE AT PIEZOMETERS. GROUNDWATER CONTOURS INTERPOLATED BETWEEN POINT MEASUREMENTS SHOULD BE CONSIDERED AS ESTIMATED GROUNDWATER ELEVATIONS.
4. TOPOGRAPHIC DATA IS A HYBRID OF AERIAL PHOTOGRAMMETRY AND A GROUND SURVEY PERFORMED BY DAVID EVANS AND ASSOCIATES.

N

0 500 1,000
APPROXIMATE SCALE IN FEET

DATA IS ONLY ACCURATE AT THE POINT MEASURED AND POINTS INBETWEEN ARE INTERPOLATED / ESTIMATED.

CLIENT LOGO: Pacific International Terminals. A Gavin Enterprise

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	APS
CHK'D BY:	RH
DATUM:	NAD83
PROJECTION:	WA SP NORTH Ft.
SCALE:	AS SHOWN

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: FIRST QUARTER 2011 (FEBRUARY 10, 2011) GROUNDWATER CONTOUR MAP

DATE:	JUNE 2012
PROJECT NO:	5-91M-15338-0
REV. NO.:	A
FIGURE No.	FIGURE 4-17

S:\AMEC-Offices\Bothell\15338c\003_HydrologyReport\GPT_GW-contours_1Q11_060612.dwg – Fig 4-17 1stQ11 – Jun. 14, 2012 11:31am – adam.stenberg

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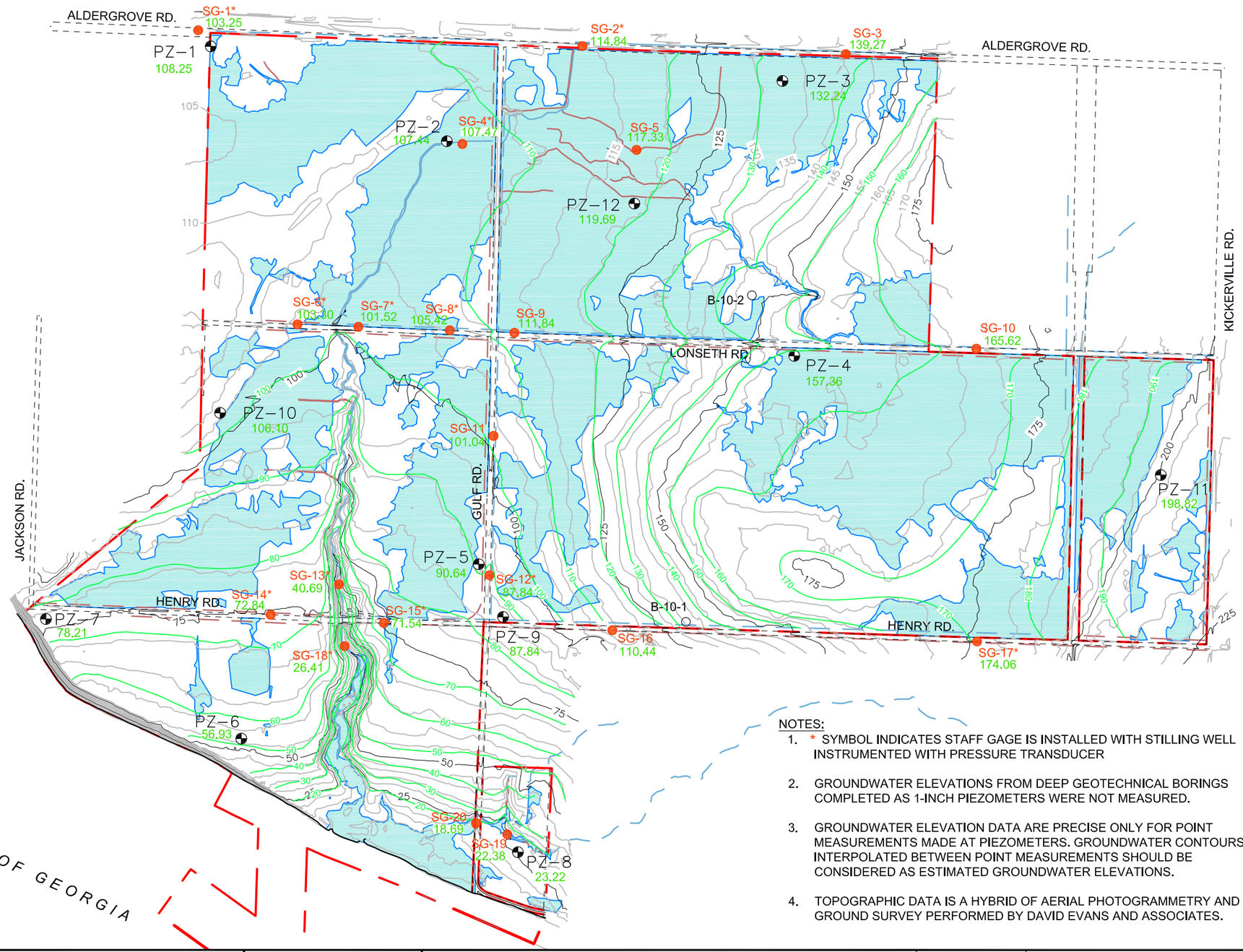

LEGEND

DATA MONITORING FEATURES

- PZ-3 — PIEZOMETER
- SG-10 — STAFF GAGE
- B-10-2 — GEOTECHNICAL BORING [2] COMPLETED AS 1-INCH PIEZOMETER
- 132.24 — GROUNDWATER OR SURFACE WATER STAGE ELEVATION (NAVD88 FT) (2ND QUARTER 2011)
- —170— GROUNDWATER ELEVATION CONTOURS [3] (CONTOUR INTERVAL 10 FEET) (2ND QUARTER 2011)

HYDROLOGIC FEATURES

- STREAM LOCATION (DASHED WHERE APPROXIMATE)
- DRAINAGE LOCATION (DASHED WHERE APPROXIMATE)
- WETLAND AREA

OTHER FEATURES

- GROUND SURFACE ELEVATION CONTOUR [4] CONTOUR INTERVAL 5 FEET (NAVD 88 FT)
- PROJECT AREA BOUNDARY (WHARF NOT SHOWN IN ITS ENTIRETY)
- RIGHT-OF-WAY OR EASEMENT WITHIN PROJECT AREA VICINITY

NOTES:

1. * SYMBOL INDICATES STAFF GAGE IS INSTALLED WITH STILLING WELL INSTRUMENTED WITH PRESSURE TRANSDUCER
2. GROUNDWATER ELEVATIONS FROM DEEP GEOTECHNICAL BORINGS COMPLETED AS 1-INCH PIEZOMETERS WERE NOT MEASURED.
3. GROUNDWATER ELEVATION DATA ARE PRECISE ONLY FOR POINT MEASUREMENTS MADE AT PIEZOMETERS. GROUNDWATER CONTOURS INTERPOLATED BETWEEN POINT MEASUREMENTS SHOULD BE CONSIDERED AS ESTIMATED GROUNDWATER ELEVATIONS.
4. TOPOGRAPHIC DATA IS A HYBRID OF AERIAL PHOTOGRAMMETRY AND A GROUND SURVEY PERFORMED BY DAVID EVANS AND ASSOCIATES.

N

0 500 1,000
APPROXIMATE SCALE IN FEET

DATA IS ONLY ACCURATE AT THE POINT MEASURED AND POINTS INBETWEEN ARE INTERPOLATED / ESTIMATED.

CLIENT LOGO: Pacific International Terminals. A Gavin Enterprise

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	APS
CHK'D BY:	RH
DATUM:	NAD83
PROJECTION:	WA SP NORTH Ft.
SCALE:	AS SHOWN

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: SECOND QUARTER 2011 (APRIL 1, 2011) GROUNDWATER CONTOUR MAP

DATE:	JUNE 2012
PROJECT NO:	5-91M-15338-0
REV. NO.:	A
FIGURE No.	FIGURE 4-18

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Table 4-3 Groundwater Elevation[1]

Date	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation
	B-10-1-TOC Elevation:				**134.60**	**B-10-2 - TOC Elevation:**				**141.60**
9/24/2010	8:05	16.80	--	--	**117.80**	8:23	13.05	--	--	**128.55**
10/27/2010	14:45	16.69	0.11	0.11	**117.91**	9:31	11.04	2.01	2.01	**130.56**
1/6/2011	--	--	--	--	**--**	--	--	--	--	**--**
2/10/2011	9:08	12.43	4.37	--	**122.17**	15:39	9.52	3.53	--	**132.08**
	PZ-1 - TOC Elevation:				**110.81**	**PZ-2- TOC Elevation:**				**110.85**
9/24/2010	8:55	19.64	--	--	**91.17**	10:00	5.45	--	--	**105.40**
10/27/2010	--	--	--	--	**--**	11:54	4.08	1.37	1.37	**106.77**
1/6/2011	11:25[2]	2.51	17.13	--	**108.30**	11:55[2]	3.30	2.15	0.78	**107.55**
2/10/2011	15:11	2.74	16.90	-0.23	**108.07**	15:01	3.60	1.85	-0.30	**107.25**
	PZ-3- TOC Elevation:				**134.78**	**PZ-4 - TOC Elevation:**				**159.21**
9/24/2010	9:25	3.43	--	--	**131.35**	8:15	14.40	--	--	**78.89**
10/27/2010	14:33	3.48	-0.05	-0.05	**131.30**	9:54	7.17	30.42	7.23	**86.12**
1/6/2011	10:40[2]	2.54	0.89	0.94	**132.24**	12:30[2]	1.82	35.767	5.35	**91.47**
2/10/2011	16:17	2.63	0.80	-0.09	**132.15**	15:52	1.97	35.62	-0.15	**91.32**

Table 4-3 Groundwater Elevation[1]

Date	PZ-5 - TOC Elevation: 93.29					PZ-6 - TOC Elevation: 59.82				
	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation
9/24/2010	7:38	4.12	--	--	**55.70**	7:49	10.69	--	--	**70.03**
10/27/2010	10:21	3.18	-13.39	0.94	**56.64**	10:40	5.82	4.87	4.87	**74.90**
1/6/2011	10:10[2]	2.63	-12.84	0.55	**57.19**	9:10[2]	2.22	8.47	3.60	**78.50**
2/10/2011	8:24	3.02	-13.23	-0.39	**56.80**	13:21	4.63	6.06	-2.41	**76.09**
	PZ-7[3] - TOC Elevation: 80.72					PZ-8[3] - TOC Elevation: 29.58				
Date	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation
9/24/2010	--	--	--	--	**--**	--	--	--	--	**--**
10/27/2010	--	--	--	--	**--**	--	--	--	--	**--**
1/6/2011	13:23	2.76	--	--	**26.82**	12:34	6.61	--	--	**-6.61**
2/10/2011	13:38	2.54	33.65	0.22	**27.04**	14:25	6.57	-6.57	0.04	**-6.57**
	PZ-9[3] - TOC Elevation: 89.86					PZ-10[3] - TOC Elevation: 108.77				
Date	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation	Time	Depth below TOC (ft)	Total Change in Level (ft)	Incremental Change in Level (ft)	Water Level Elevation
9/24/2010	--	--	--	--	**--**	--	--	--	--	**--**
10/27/2010	--	--	--	--	**--**	--	--	--	--	**--**
1/6/2011	11:40	2.00	--	--	**87.86**	14:30	3.35	--	--	**105.42**
2/10/2011	14:35	2.04	-0.04	-0.04	**87.82**	14:46	2.99	0.36	0.36	**105.78**

Table 4-3 Groundwater Elevation[1]

	PZ-11[3] - TOC Elevation: 203.41					PZ-12[3] - TOC Elevation: 121.73				
Date	**Time**	**Depth below TOC (ft)**	**Total Change in Level (ft)**	**Incremental Change in Level (ft)**	**Water Level Elevation**	**Time**	**Depth below TOC (ft)**	**Total Change in Level (ft)**	**Incremental Change in Level (ft)**	**Water Level Elevation**
9/24/2010	--	--	--	--	**--**	--	--	--	--	**--**
10/27/2010	--	--	--	--	**--**	--	--	--	--	**--**
1/6/2011	10:00	8.45	--	--	**194.96**	15:40	1.94	--	--	**119.79**
2/10/2011	16:02	4.17	4.28	4.28	**199.24**	15:25	2.06	-0.12	-0.12	**119.67**

Notes
1. Groundwater elevations in feet specified relative to North American Vertical Datum of 1988 (NAVD88).
2. Depth to water measurements at PZ-1 through PZ-6 collected on 1/7/2011.
3. Piezometers PZ-7 through PZ-12 were installed between 12/13/10 and 12/17/10.

Abbreviations
-- : Data point was either not measured or not calculated.
ft: feet
TOC: Top of Casing

The direction of vertical groundwater gradients between the weathered and non-weathered Bellingham glaciomarine drift were evaluated using the first quarter 2011 groundwater contour map and groundwater elevations obtained from geotechnical borings B-10-1 and B-10-2. Boring B-10-1 was advanced to a depth of 73 feet bgs, backfilled with grout to 30 feet bgs, and screened from 20 to 30 feet bgs within the non-weathered Bellingham glaciomarine drift. Similarly, B-10-2 was advanced to 130 feet bgs, backfilled with grout to 30 feet bgs, and screened from 20 to 30 feet bgs within the non-weathered Bellingham glaciomarine drift. Both B-10-1 and B-10-2 are 1-inch–diameter PVC piezometers with a screen slot width equal to 0.020 inch (see Appendix A for boring logs). Water levels collected from these piezometers in February 2011 are shown on the first quarter 2011 groundwater elevation contour map, but were not used to generate groundwater contours (Figure 4-17). Unlike groundwater elevations observed in piezometers PZ-1 through PZ-12, groundwater elevations in B-10-1 and B-10-2 were significantly lower than ground surface elevations. This finding suggests that:

- A downward groundwater gradient exists between the non-weathered and weathered Bellingham glaciomarine drift, as suggested by CH2M HILL (1985).
- Groundwater in the weathered Bellingham glaciomarine drift is perched above the non-weathered drift.

The non-weathered Bellingham glaciomarine drift likely behaves as an aquitard separating the weathered drift (i.e., water table aquifer) from the Deming Sand.

Groundwater hydrographs are presented for PZ-1 through PZ-12 in Figures 4-19 through 4-24. The hydrographs for PZ-1 through PZ-6 cover the interval from late October 2010 through early April 2011. Hydrographs for PZ-7 through PZ-12 cover the period from early January to early April 2011. Groundwater elevations observed in PZ-1 were low following well installation but gradually increased to an elevation of approximately 108 feet (NAVD88) by early December 2010 and then remained stable through early April 2011 (Figure 4-19). Groundwater elevations in PZ-2 and PZ-3 were positioned just below ground surface elevation from the fourth quarter 2010 through early second quarter 2011 (Figures 4-19 and 4-20). Similar to PZ-1, groundwater elevations were slightly low in PZ-4 following well installation; however, groundwater elevation in PZ-4 increased until the middle of November 2010, when water levels stabilized at a position just below ground surface (Figure 4-20). Groundwater elevation at PZ-5 remained relatively constant during the monitoring period and, like PZ-1 through PZ-4, was positioned just below ground surface (Figure 4-21).

At PZ-6, groundwater elevation exhibited flashy behavior, with increases in elevation associated with precipitation events and gradual groundwater elevation recession during drier periods (see Figure 4-21). During the installation of PZ-6, one of the PVC blank casing joints became loose and

inadvertently allowed a portion of the sand pack to enter the piezometer. This loose joint was retightened and the sand was removed from the piezometer during development; however, there may be a small gap in the sand pack that allows rapid infiltration of surface water into the piezometer, causing the sudden increases in groundwater elevation. The validity of this hypothesis will be tested against groundwater elevation data collected from PZ-6 in 2011 and 2012.

Groundwater elevations at PZ-7 and PZ-8 were relatively constant during the first three months of 2011; however, unlike other piezometers, the position of the water table at PZ-8 allowed the establishment of a vadose (unsaturated) zone a few feet thick (Figure 4-22). Data collected from PZ-9 and PZ-10 indicated the water table at these piezometers was positioned just below ground surface during the study period (Figure 4-23). Groundwater elevations at PZ-11 decreased slightly following piezometer installation. Piezometer PZ-11 had a slightly thicker vadose zone than observed at all other piezometers (except for PZ-8), especially following the initially high water table elevation observed in January 2011 (Figure 4-24). The groundwater elevation at PZ-12 was consistently located just below the ground surface for the first three months of 2011 (Figure 4-24).

Groundwater elevation data collected from piezometers in the Terminal project area indicated that water levels near groundwater monitoring piezometers screened within the weathered Bellingham glaciomarine drift were generally within 1 foot of ground surface during the wet season during the 2010-2011 study period. In areas where surface soils above the weathered glaciomarine drift are slightly thicker (i.e., PZ-8 and PZ-11), the depth to water increased, resulting in an unsaturated zone approximately 3 to 4 feet thick.

4.4 STEADY-STATE WATER BALANCE

The water balance is an important component of any conceptual hydrogeologic model. Elements of the water balance were estimated to quantify inflows and outflows to the subsurface flow system for an area slightly larger than the property owned by Pacific International Terminals. The area for the steady-state water balance was selected to coincide with either physical boundaries (i.e., Lake Terrell and the Strait of Georgia) or hydraulic boundaries that could be used to constrain the numerical groundwater model. Flux estimates from the steady-state water balance were also used to design boundary conditions and calibrate the numerical model, which is discussed in Section 5.0.

The subsurface water balance includes gains and losses to groundwater. The general saturated zone water balance is given by Equation (1):

$$\text{Inflow} = \text{Outflow} - \text{Change in Storage} \qquad (1)$$

The steady-state water balance uses project area hydrologic and hydrogeologic data to characterize average wet-season conditions for the shallow groundwater flow system. Under an assumption of steady-state conditions, there is no change in storage, which simplifies the above equation. The steady-state subsurface water balance can then be expressed in more specific terms by Equation (2):

$$R_{in} + SW_{in} + UF_{in} = SW_{out} + UF_{out} \quad (2)$$

Where:

R_{in} = precipitation or runoff that infiltrates to the water table
SW_{in} = stream loss to subsurface
UF_{in} = subsurface water contributions to the Terminal project area as underflow
SW_{out} = baseflow or subsurface discharge to streams and springs
UF_{out} = subsurface water discharge downgradient of the Terminal project area as underflow

4.4.1 Recharge

Areal recharge is water that infiltrates from precipitation and runoff, reaches the water table, and enters the groundwater flow system (Anderson and Woessner 2002; Schwartz and Zhang 2003). This definition considers evapotranspiration and runoff that is routed out of the watershed through stream and drainage flows as net losses to recharge. Recharge is difficult to quantify and is a function of precipitation, slope, aspect, soils, and vegetation. For modeling purposes, recharge is typically estimated as a spatially uniform recharge rate equal to a percentage of annual precipitation. Recharge is then one of the variables adjusted during the model calibration process to simulate observed groundwater heads and fluxes (Anderson and Woessner 2002).

4.4.2 Underflow

Darcy's Law was used to estimate underflow entering and leaving the study area. Darcy's Law can be expressed as:

$$Q = -KA\frac{dh}{dl} \quad (3)$$

Where:

Q = flow rate (volume per unit time)
K = hydraulic conductivity (distance per unit time)
A = cross sectional area for flow (distance squared)
dh/dl = hydraulic gradient (unitless)

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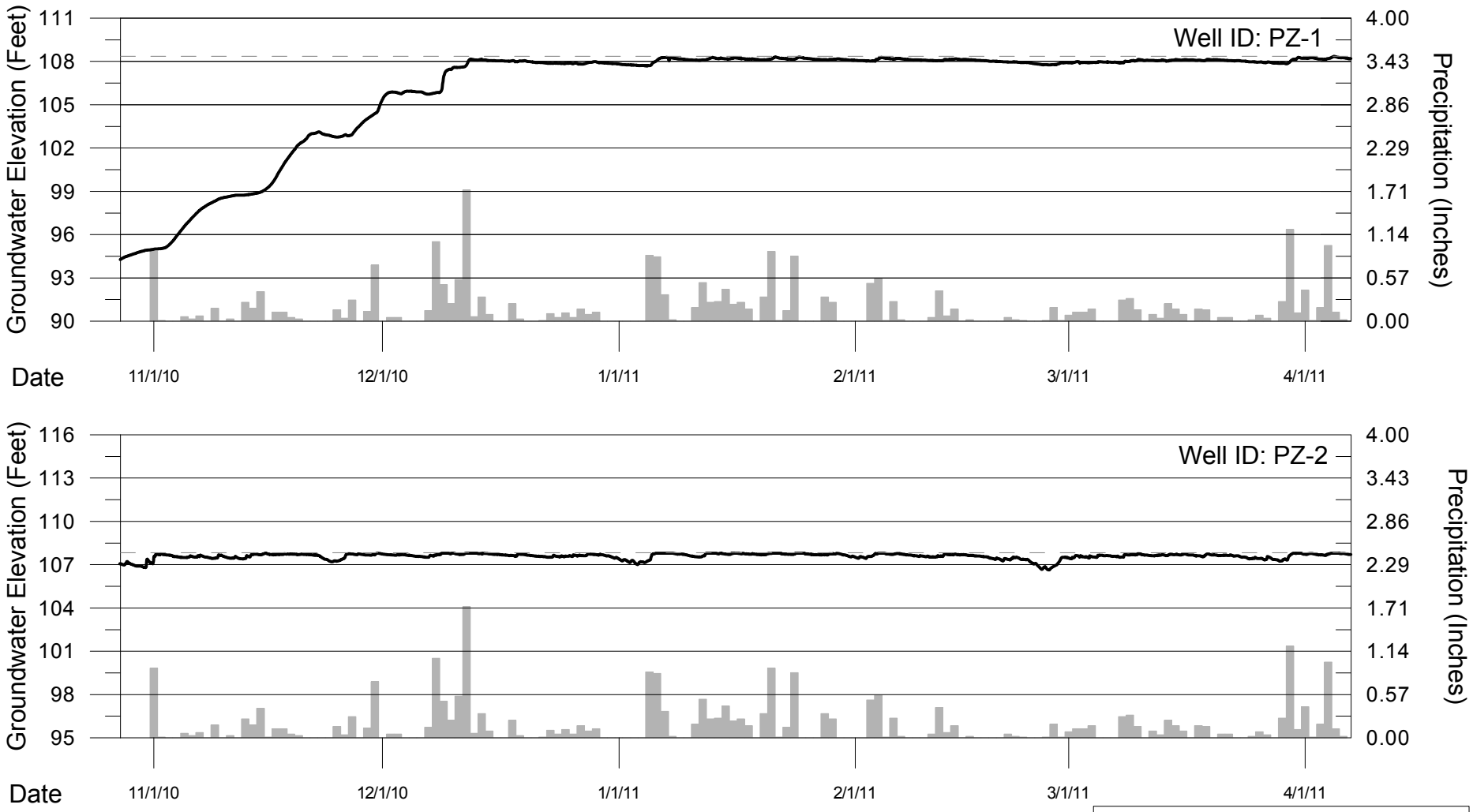

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. PZ-1 ground surface elevation = 108.37 feet (NAVD 88)
5. PZ-2 ground surface elevation = 107.80 feet (NAVD 88)

LEGEND
- Groundwater elevation time series
- Precipitation time series
- Ground surface elevation

amec	GROUNDWATER HYDROGRAPHS: WELLS PZ-1 AND PZ-2 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-19

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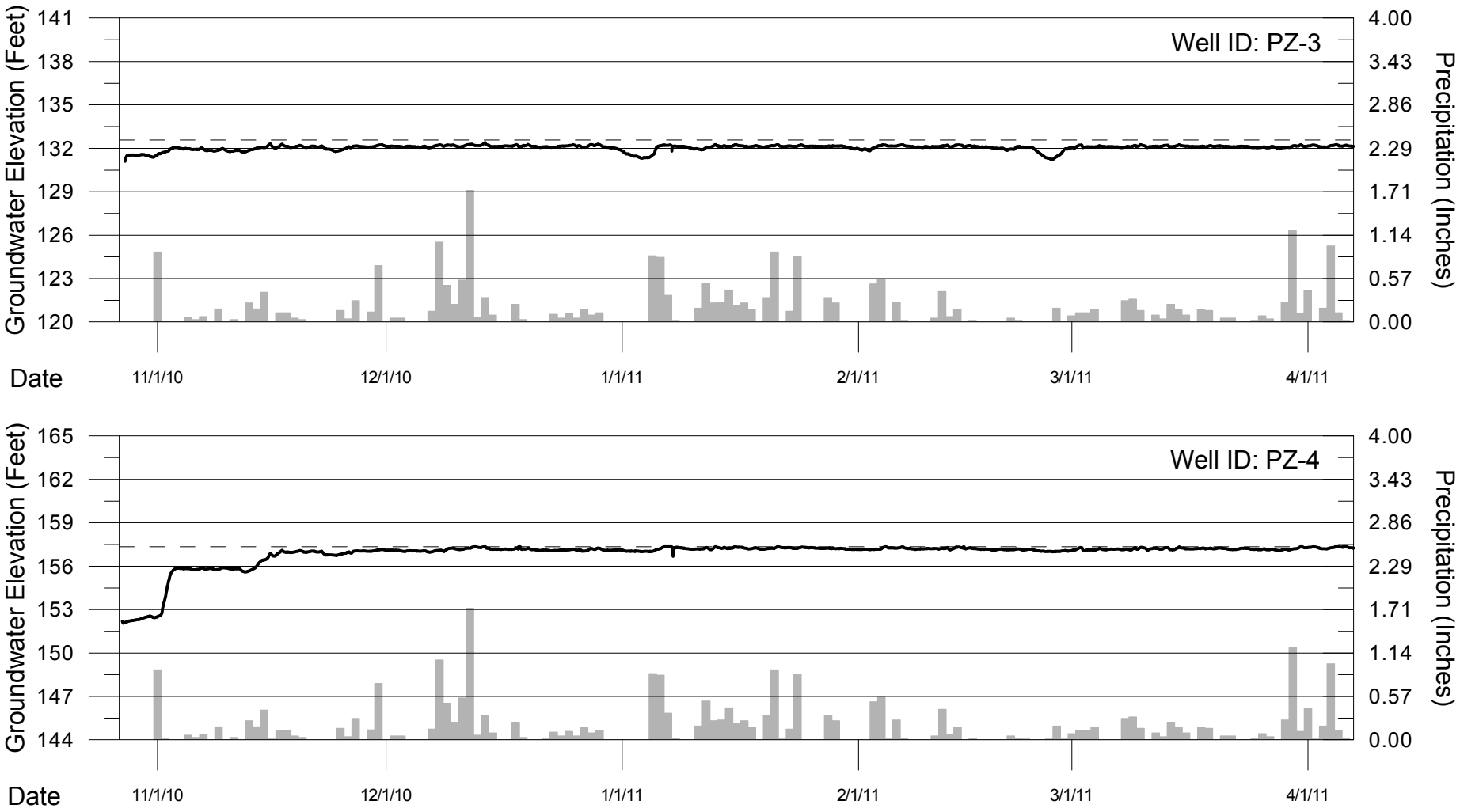

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. PZ-3 ground surface elevation = 132.57 feet (NAVD 88)
5. PZ-4 ground surface elevation = 157.34 feet (NAVD 88)

LEGEND
- Groundwater elevation time series
- Daily precipitation (inches)
- Ground surface elevation

amec	GROUNDWATER HYDROGRAPHS: WELLS PZ-3 AND PZ-4 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-20

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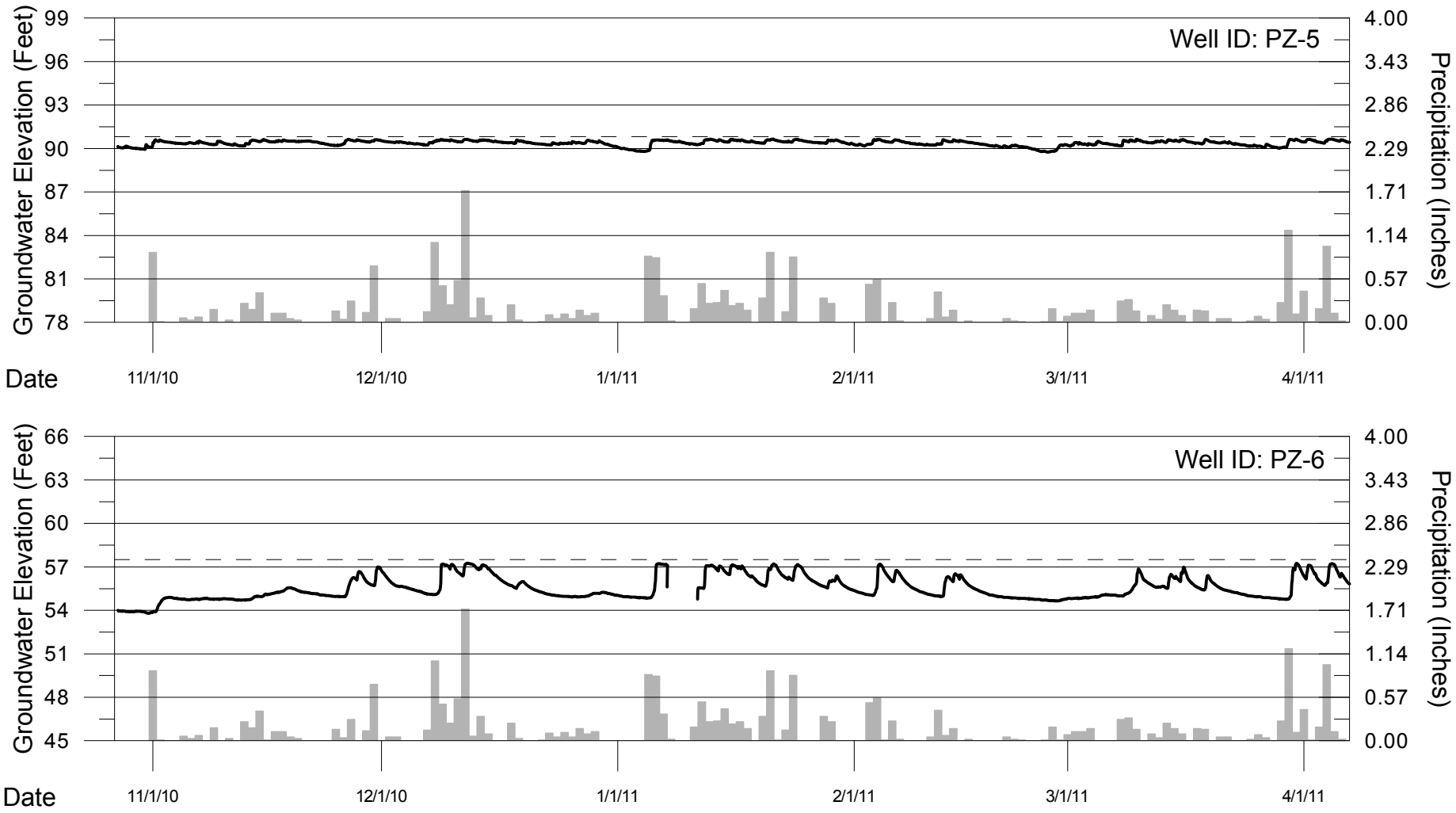

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. PZ-5 ground surface elevation = 90.81 feet (NAVD 88)
5. PZ-6 ground surface elevation = 57.49 feet (NAVD 88)

LEGEND
- Groundwater elevation time series
- Daily precipitation (inches)
- Ground surface elevation

amec	GROUNDWATER HYDROGRAPHS: WELLS PZ-5 AND PZ-6 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-21

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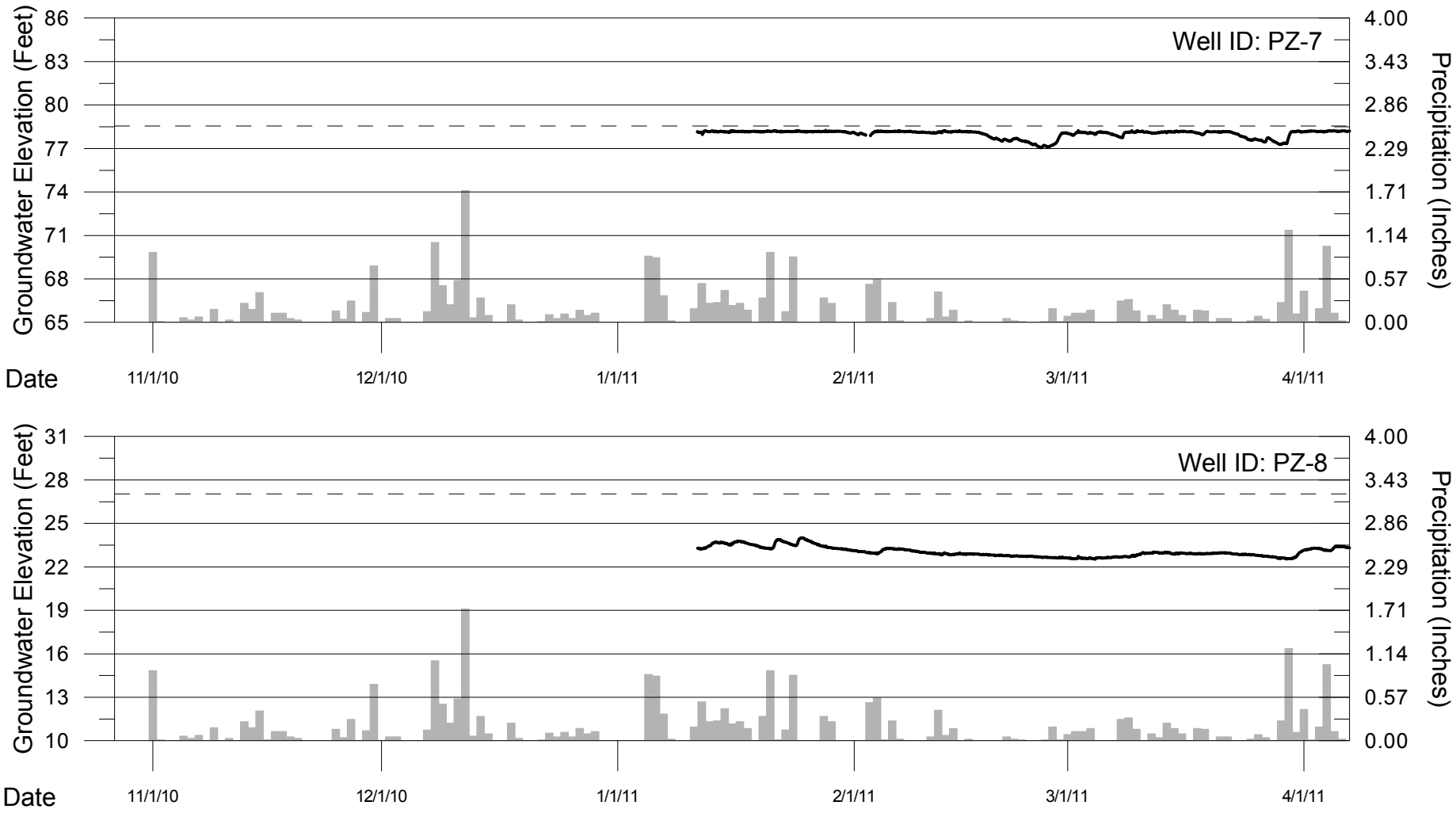

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. PZ-7 ground surface elevation = 78.56 feet (NAVD 88)
5. PZ-8 ground surface elevation = 27.04 feet (NAVD 88)

LEGEND
- Groundwater elevation time series
- Daily precipitation (inches)
- Ground surface elevation

amec	GROUNDWATER HYDROGRAPHS: WELLS PZ-7 AND PZ-8 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-22

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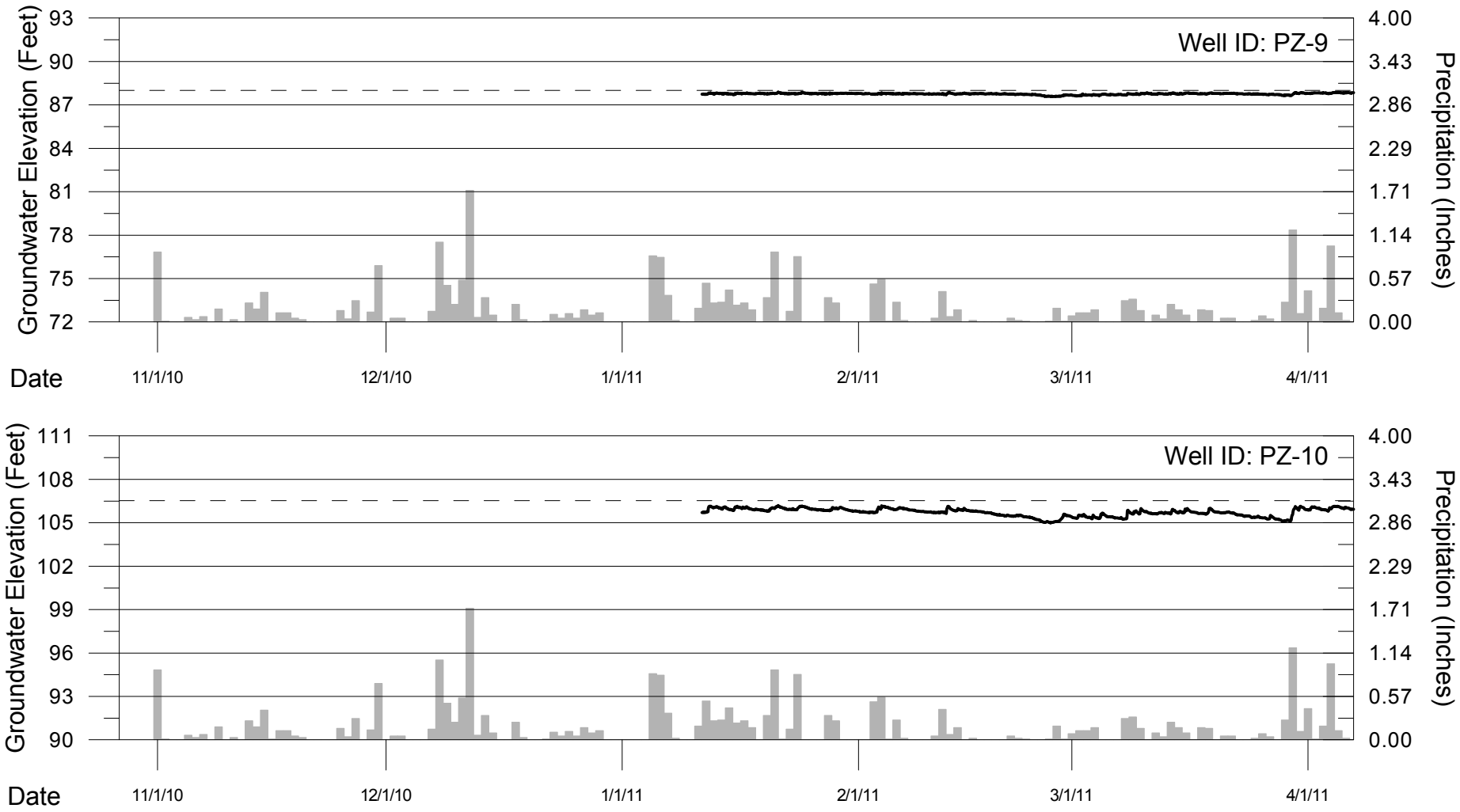

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. PZ-9 ground surface elevation = 88.01 feet (NAVD 88)
5. PZ-10 ground surface elevation = 106.52 feet (NAVD 88)

LEGEND
- Groundwater elevation time series
- Daily precipitation (inches)
- Ground surface elevation

amec	GROUNDWATER HYDROGRAPHS: WELLS PZ-9 AND PZ-10 Gateway Pacific Terminal Whatcom County, Washington	Prepared By: DO	Project No. 091515338C
		6/7/12	Figure No. 4-23

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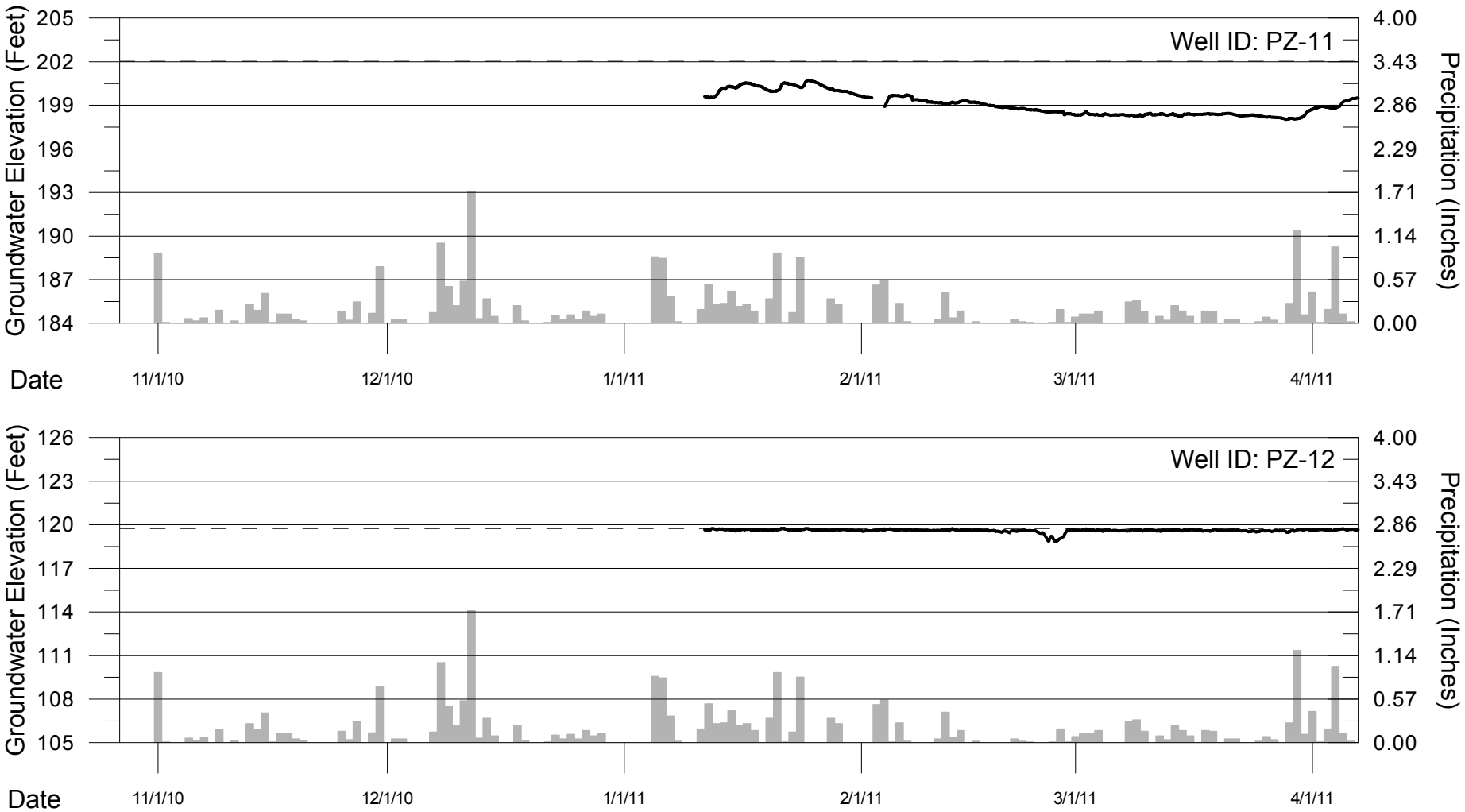

Notes:
1. Vertical datum is NAVD 88.
2. Precipitation data are recorded at a weather station on the neighboring BP Cherry Point Refinery property.
3. Precipitation data include rain and/or melted snow.
4. PZ-11 ground surface elevation = 202.04 feet (NAVD 88)
5. PZ-12 ground surface elevation = 119.74 feet (NAVD 88)

LEGEND
- Groundwater elevation time series
- Daily precipitation (inches)
- Ground surface elevation

amec

GROUNDWATER HYDROGRAPHS: WELLS PZ-11 AND PZ-12
Gateway Pacific Terminal
Whatcom County, Washington

Prepared By: DO	Project No. 091515338C
6/7/12	Figure No. 4-24

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Table 4-4 lists the parameters and hydraulic data used to estimate underflow gains and losses from the steady-state water balance.

Table 4-4 Steady-State Water Balance

		Precipitation Rate (ft/d)	Percentage of Precipitation as Recharge		Area (ft^2)	Estimated Flux (ft^3/d)
	Recharge	0.01294	3.4%		130,645,000	56,700
INFLOW		**Width (ft)**	**Avg. Sat. Thickness (ft)**	**Hydraulic K (ft/d)**	**Head Gradient (--)**	**Estimated Flux (ft^3/d)**
	Lake Terrell (Constant Flux - In)					
	Layer 3 (Non-Weathered BGD)	6,167	78.1	0.00085	0.0200	8
	Western Boundary (Constant Flux - In)					
	Layer 1 (Beach Deposits)	1,342	2	10.5	0.018	507
	Layer 2 (Weathered BGD)	1,342	13.3	0.54	0.018	180
	Layer 3 (Non-Weathered BGD)	1,342	94.8	0.00085	0.018	2
					Total Inflow	56,890
OUTFLOW		**Width (ft)**	**Avg. Sat. Thickness (ft)**	**Hydraulic K (ft/d)**	**Head Gradient (--)**	**Estimated Flux (ft^3/d)**
	Lake Terrell (Constant Head)					
	Layer 1 (Beach Deposits)	6,500	2	10.50	0.0160	2,184
	Layer 2 (Weathered BGD)	6,500	8.4	0.0050	0.0160	4
	Western Boundary Near BP (Constant Flux - Out)					
	Layer 1 (Beach Deposits)	1,231	2	4.50	0.018	199
	Layer 2 (Weather BGD)	1,231	12	2.00	0.018	532
	Layer 3 (Non-Weathered BGD)	1,231	74.2	0.00085	0.018	1
	Discharge Towards the Strait of Georgia					
	Layer 2 (Weathered BGD)	14,192	12.1	0.3000	0.180	9,273
	Layer 3 (Non-Weathered BGD)	14,192	24.0	0.00650	0.180	399
	Stream and Drainage Network Baseflow[1]					44,297
					Total Outflow	56,890

Notes
1. Stream and Drainage Network Baseflow calculated as:
   Total Inflow - (Lake Terrell Constant Head Outflow + Western Boundary Near BP Outflow + Discharge Beneath the Strait of Georgia Outflow)

Abbreviations
avg: average
--: unitless
BGD: Bellingham glaciomarine drift
d: day
ft: feet

The boundaries for the water balance calculations were set outside the Terminal project area. Because groundwater elevation data are not available outside the Terminal project area, hydraulic gradients in these locations were estimated based on topographic gradients. Groundwater inputs to the water balance include regional underflow in the non-weathered Bellingham glaciomarine drift from beneath Lake Terrell and an area of groundwater recharge located to the northwest of the Terminal project area within the Birch Bay watershed. Groundwater losses occur as shallow groundwater discharge to Lake Terrell from the weathered Bellingham glaciomarine drift, from the Everson beach deposits, and from surface silt; underflow toward the Strait of Georgia; and underflow to the northwest toward Birch Bay. Due to the steep hydraulic gradient observed along the shoreline bluffs, seepage losses are assumed to be incorporated into the underflow calculation for the weathered Bellingham glaciomarine drift discharge toward the Strait of Georgia.

The boundaries for the water balance calculations were set outside the Terminal project area. Because groundwater elevation data are not available outside the Terminal project area, hydraulic gradients in these locations were estimated based on topographic gradients. Groundwater inputs to the water balance include regional underflow in the non-weathered Bellingham glaciomarine drift from beneath Lake Terrell and an area of groundwater recharge located to the northwest of the Terminal project area within the Birch Bay watershed. Groundwater losses occur as shallow groundwater discharge to Lake Terrell from the weathered Bellingham glaciomarine drift, from the Everson beach deposits, and from surface silt; underflow toward the Strait of Georgia; and underflow to the northwest toward Birch Bay. Due to the steep hydraulic gradient observed along the shoreline bluffs, seepage losses are assumed to be incorporated into the underflow calculation for the weathered Bellingham glaciomarine drift discharge toward the Strait of Georgia.

4.4.3 Baseflow

Subsurface water contributes to stream and drainage baseflow within the study area. Stream and drainage network baseflow was estimated as the remaining balance between total inflows and underflow losses toward the Strait of Georgia, Lake Terrell, and Birch Bay. Using this approach, approximately 44,297 ft^3/day is discharged from the Everson beach deposits, surface silts, and Bellingham glaciomarine drift units as baseflow (see Table 4-4).

The baseflow calculation includes any seepage contributions from roadside drainages and the reach of Stream 1 that flows through the ravine. The volumetric flow rate calculated for the steady-state water balance translates to an average baseflow rate equal to 0.5 ft^3/sec. This value is comparable to the discharge measurements performed for the roadside streams and drainages listed in Table 4-2 and stream flow measurements for locations along Stream 1 (SG-4, SG-13, and SG-18) during extended periods without precipitation (e.g., March 22, 2011).

4.4.4 Water Balance

Table 4-4 summarizes the steady-state water balance for an area slightly larger than the Terminal project area. Estimates presented in Table 4-4 were developed based on the individual elements discussed above. In the water balance calculation, recharge and baseflow estimates are considered to have the greatest range of error. The primary fluxes identified from the steady-state water balance developed for the project area conceptual model are gains due to recharge and losses due to baseflow and discharge toward the Strait of Georgia.

4.5 GROUNDWATER AND SURFACE WATER QUALITY

During each of the first two quarters in 2011, groundwater samples were collected from PZ-1 through PZ-12, and surface water samples were collected from SW-1 through SW-3 (Figure 3-1). All samples were analyzed for total metals and general groundwater parameters, including major anions and cations, as well as a large suite of chemical analytes.

The concentrations of major anions, major cations, TDS, and fluoride (F^-) for each quarter are shown in Tables 4-5 and 4-6. Major cation and anion concentrations were used to calculate the charge balance for all surface water and groundwater samples. An example calculation is presented in Table 4-5. The charge balance in aqueous solution must be electrically neutral, meaning that the sum of all positive charges equals the sum of all negative charges. However, some error should be expected in the measurement of ion concentrations. An error of less than 5 percent in the charge balance calculation is generally considered acceptable for routine geochemical analyses (Deutsch 1997).

For the first quarter sampling, the cation/anion balances for all geochemical samples were less than 2.3 percent. During the second quarter, the cation/anion balances calculated for analytical samples from PZ-4, PZ-6, and PZ-7 exceeded 5 percent. Calculated charge balances for the remaining samples were below the 5 percent criterion. Possible explanations for the calculated electrical imbalance include the presence of a major dissolved species that was omitted from the analyses, laboratory error, using unfiltered water samples containing particulate matter that may have dissolved in the preservation acid, mineral precipitation that results in the removal of constituents from the water, or the presence of a dissolved species of an element or compound that did not correspond to the species used to calculate the ion balance (Deutsch 1997). For the second quarter results, it was requested that ARI review the data for possible laboratory error; however, no error was identified. Therefore, the second quarter geochemical results for PZ-4, PZ-6, and PZ-7 should be regarded as estimates.

Major anion and cation concentrations for surface water and groundwater were compared to identify baseflow sources to ditch and stream networks within the project area. Major anion and cation

concentrations observed in groundwater are generally higher relative to concentrations observed in surface water samples collected from Stream 1 (see Tables 4-5 and 4-6). This contrast in ion concentrations suggests that groundwater baseflow from the weathered Bellingham glaciomarine drift is not the primary source of surface water observed at the site. Instead, stream and ditch flow was likely sustained during the wet season by surface runoff from wetland areas and lateral groundwater flow through the Everson beach deposits and silt surface soils, which ultimately discharge to surface water features within the Terminal project area.

Surface water samples collected from the coastal wetland (SW-3) exhibited elevated concentrations of Na^+, K^+, Mg^{2+}, Cl^-, SO_4^{2-}, and NO_3^- relative to surface water samples collected from Stream 1 (SW-1 and SW-2). General water chemistry parameters from SW-3 also differ significantly from groundwater samples collected from PZ-6 and PZ-8, which suggest the wetland is not sustained by baseflow from the weathered Bellingham glaciomarine drift. Total salinity for samples collected from SW-3 was 0.4 parts per thousand (ppt) and 0.2 ppt during the first and second quarters of 2011, respectively. The observed analytical results for SW-3 suggest that adjacent marine waters affect water quality in the wetland.

To identify geological units with chemically similar water and to assess possible changes in water chemistry along groundwater flow paths, major anions and cations for piezometer groundwater samples were plotted on a Piper diagram. A *Piper diagram* provides a ready visual distinction of groundwater chemistry and typology.

Table 4-5 Analytical Data Summary – February 2011

	Sample	Alkalinity (mg/L $CaCO_3$)[1]	Na^+ (mg/L)[2]	K^+ (mg/L)[2]	Ca^{2+} (mg/L)[2]	Mg^{2+} (mg/L)[2]	Cl^- (mg/L)[3]	SO_4^{2-} (mg/L)[3]	NO_3^- (mg/L N)[3]	F^- (mg/L)[3]	TDS (mg/L)[4]	Anions (meq/L)	Cations (meq/L)	Charge Imbalance[5]
		Analyte												
Example Calculation	mg/meq	50	23	39	20	12	35.5	48	14	19				
	PZ-1 (mg/L)	482	129	6.7	132	64.3	265	45.6	0.4	0.2				
	PZ-1 (meg/L)[6,7]	9.64	5.6	0.2	6.6	5.4	7.5	1.0	0.0	0.0		18.1	17.7	
Groundwater Monitoring	PZ-1	482	129	6.7	132	64.3	265	45.6	0.4	0.2	929	18.1	17.1	1.2%
	PZ-2	322	47.2	3.9	65.8	36.8	49.0	47.4	0.1 U	0.3	432	8.8	7.8	2.1%
	PZ-3	308	44.5	5.0	50.4	34.6	34.4	29.1	0.5	0.2	386	7.8	7.4	2.3%
	PZ-4	516	103	7.1	87.4	60.7	104	49.7	1.5	0.2	721	14.4	14.0	1.4%
	PZ-5	233	36.4	3.4	32.1	21.1	10.6	8.9	0.1 U	0.2	270	5.2	5.0	1.5%
	PZ-6	177	34.0	3.3	27.1	17.2	17.3	11.8	0.1 U	0.2	252	4.3	4.3	0.0%
	PZ-7	242	93.6	6.5	40.3	29.2	99.7	31.9	0.2	0.3	458	8.3	8.7	1.8%
	PZ-8	121	34.6	3.6	19.9	11.4	22.0	17.9	2.4	0.2	214	3.6	3.5	0.9%
	PZ-9	311	56.5	4.0	52.6	33.2	53.2	25.4	0.5	0.2	418	8.3	7.9	2.3%
	PZ-10	104	16.6	1.8	20.3	11.2	12.0	15.4	0.2	0.1	156	2.8	2.7	0.1 meq/L
	PZ-11	110	73.2	2.3	11.6	8.7	66.3	22.8	0.6	0.2	258	4.6	4.5	0.7%
	PZ-12	406	75.4	4.9	55.8	40.2	37.8	25.0	0.1	0.2	474	9.7	9.5	1.2%
	Maximum	516	129	7.1	132	64.3	265	49.7	2.4	0.3	929	18.1	17.1	2.3%
	Minimum	104	16.6	1.8	11.6	8.7	10.6	8.9	0.1	0.1	156	2.8	2.7	0.0%
	Mean	278	62.0	4.4	49.6	30.7	64.3	27.6	1	0.2	414	8.0	7.7	1.4%
	Standard Deviation	140	33.4	1.7	33.9	18.3	70.5	13.8	0.8	0.1	222	4.5	4.3	0.7%

Table 4-5 Analytical Data Summary – February 2011

	Sample	Alkalinity (mg/L $CaCO_3$)[1]	Na^+ (mg/L)[2]	K^+ (mg/L)[2]	Ca^{2+} (mg/L)[2]	Mg^{2+} (mg/L)[2]	Cl^- (mg/L)[3]	SO_4^{2-} (mg/L)[3]	NO_3^- (mg/L N)[3]	F^- (mg/L)[3]	TDS (mg/L)[4]	Anions (meq/L)	Cations (meq/L)	Charge Imbalance[5]
		Analyte												
Surface Water Monitoring	SW-1	32.3	4.5	0.8	8.68	3.95	4.5	6.6	0.2	0.1	88	0.9	1.0	0.1 meq/L
	SW-2	27.2	5.0	1.0	8.79	3.96	5.1	7.5	0.7	0.1 U	105	0.9	1.0	0.1 meq/L
	SW-3	29.1	139	6.1	11.4	15.7	224	33.7	4.2	0.2	489	7.9	8.1	0.9%
	Maximum	32.3	139	6.10	11.4	15.7	224	33.7	4.2	0.2	489	7.9	8.1	NA[8]
	Minimum	27.2	4.5	0.80	8.68	3.95	4.5	6.6	0.2	0.1	88	0.9	1.0	NA[8]
	Mean	29.5	50	2.6	9.62	7.87	78	16	1.7	0.2	230	3.2	3.4	NA[8]

Notes
1. U.S. EPA method SM 2320
2. U.S. EPA method 6010B
3. U.S. EPA method 300.0
4. U.S. EPA method 160.1
5. If total anion sum is less than 3 meq/L, charge imbalance is calculated as the difference between total anions and total cations in meq/L.
6. meq/L is equal to mg/L divided by mg/meq.
7. Sum of anions = summation of meq/L for alkalinity, Cl^-, $SO4^{2-}$, $NO3^-$, and F^-.
   Sum of cations = summation of meq/L for Na^+, K^+, Ca^{2+}, and Mg^{2+}.
8. Charge imbalance statistics were not calculated for surface water data.

Abbreviations

Ca^{2+}: calcium
$CaCO_3$: calcium carbonate
Cl^-: chloride
F^-: fluoride
K^+: potassium
meq/L: milliequivalents per liter
mg/L: milligrams per liter
Mg^{2+}: magnesium
NA: not applicable
Na^+: sodium
NO_3^-: nitrate
SO_4^{2-}: sulfate
TDS: total dissolved solids
U.S. EPA: U.S. Environmental Protection Agency

Table 4-6 Analytical Data Summary – April 2011

	Sample	Alkalinity (mg/L $CaCO_3$)[1]	Na^+ (mg/L)[2]	K^+ (mg/L)[2]	Ca^{2+} (mg/L)[2]	Mg^{2+} (mg/L)[2]	Cl^- (mg/L)[3]	SO_4^{2-} (mg/L)[3]	NO_3^- (mg/L N)[3]	F^- (mg/L)[3]	TDS (mg/L)[4]	Anions (meq/L)	Cations (meq/L)	Charge Imbalance[5]	SVOCs[7] (µg/L)	TPH-G[8] (µg/L)	BTEX[9] (µg/L)
		Analyte															
Groundwater Monitoring	PZ-1	493	101	5.7	140	65.2	219	41.7	0.6	0.3	829	17.0	16.9	0.2%	10 U	0.10 U	0.50 U
	PZ-1-Duplicate	493	97.0	5.5	138	65.6	227	36.9	0.5	0.3	833	17.1	16.6	1.3%	10 U	0.10 U	0.50 U
	PZ-2	318	33.8	3.4	64.6	32.4	28.0	40.7	0.1	0.3	357	8.0	7.4	3.7%	1.8	0.10 U	0.50 U
	PZ-3	308	37.3	4.8	50.3	32.8	24.0	25.3	0.3	0.3	345	7.4	7.0	3.1%	10 U	0.10 U	0.50 U
	PZ-4	448	73.5	6.3	97.7	62.7	14.8	9.5	0.1 U	0.2	632	9.6	13.4	16.5%	10 U	0.10 U	0.50 U
	PZ-5	222	27.3	3.0	35.3	21.2	6.4	7.4	0.1 U	0.2	218	4.8	4.8	0.2%	1.2	0.10 U	0.50 U
	PZ-6	183	31.0	2.9	28.4	16.5	71.2	30.7	0.3	0.2	215	6.3	4.2	20.3%	10 U	0.10 U	0.50 U
	PZ-7	270	70.1	5.5	44.9	30.7	84.3	47.3	1.0	0.2	386	8.8	8.0	5.3%	10 U	0.10 U	0.50 U
	PZ-8	121	32.6	2.5	20.3	10.2	19.6	16.0	3.0	0.1	194	3.5	3.3	2.8%	12	0.10 U	0.50 U
	PZ-9	298	29.1	2.8	56.9	32.8	23.7	19.8	0.4	0.1	309	7.1	6.9	1.4%	10 U	0.10 U	0.50 U
	PZ-10	108	14.6	1.6	21.7	11.0	10.3	14.3	0.2	0.1 U	126	2.8	2.7	0.1 meq/L	10 U	0.10 U	0.50 U
	PZ-11	126	62.2	2.9	21.2	14.7	61.5	26.7	0.7	0.2	252	4.9	5	1.8%	10 U	0.10 U	0.50 U
	PZ-12	406	57.7	4.4	62.9	41.3	32.4	24.4	0.3	0.3	469	9.6	9.2	2.2%	10 U	0.10 U	0.50 U
	Maximum	493	101.0	6.3	140.0	65.6	227.0	47.3	3.0	0.3	833.0	17.1	16.9	20.3%	NA	NA	NA
	Minimum	108	14.6	1.6	20.3	10.2	6.4	7.4	0.1	0.1	126.0	2.8	2.7	0.2%	NA	NA	NA
	Mean	292	51.3	3.9	60.2	33.6	63.2	26.2	0.7	0.2	397.3	8.2	8.1	4.9%	NA	NA	NA
	Standard Deviation	138	27.8	1.5	41.3	20.0	74.8	12.8	0.8	0.1	232.8	4.5	4.7	6.5%	NA	NA	NA
Surface Water Monitoring	SW-1	48.3	5.3	0.9	11.6	5.0	3.7	4.4	0.1	0.2	83.0	1.2	1.2	0.1 meq/L	4.7	0.10 U	0.50 U
	SW-2	35.6	4.9	0.9	9.63	4.21	4.0	4.4	0.2	0.2	89.5	0.9	1.1	0.1 meq/L	10 U	0.10 U	0.50 U
	SW-3	36.8	65.2	3.1	7.98	8.16	96.3	18.4	1.3	0.2	228	3.9	4.6	0.6%	1.0	0.10 U	0.50 U
	Maximum	48.3	65	3.10	11.6	8.2	96	18.4	1.3	0.2	228	3.9	4.6	NA[6]	NA	NA	NA
	Minimum	35.6	4.9	0.90	7.98	4.21	3.7	4.4	0.1	0.2	83	0.9	1.1	NA[6]	NA	NA	NA
	Mean	40.2	25	1.6	9.74	5.79	35	9.1	0.5	0.2	230	2.0	2.3	NA[6]	NA	NA	NA

Notes
1. U.S. EPA Method SM 2320.
2. U.S. EPA Method 6010B
3. U.S. EPA Method 300.0
4. U.S. EPA Method 160.1
5. If total anion sum is less than 3 meq/L, charge imbalance is calculated as the difference between total anions and total cations in meq/L.
6. Charge imbalance statistics were not calculated for surface water data.
7. Samples analyzed using U.S. EPA Method 8270D. Results reported with a "U" indicate all compounds not detected, and value shown is highest reporting limit of all compounds reported. A value without a U qualifier indicates a detection of bis(2-ethylhexyl) phthalate at the concentration shown. Complete analytical results are provided in Appendix C.

Notes (Continued)
8. Samples analyzed by Ecology Method NWTPH-Gx. Results reported with a "U" are not detected at the reporting limit shown.
9. Samples analyzed using U.S. EPA Method 8021B. Results reported with a "U" indicate all compounds are not detected, and the value shown is the highest reporting limit of all the compounds reported. Complete analytical results are provided in Appendix C.

Abbreviations
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and xylenes
Ca^{2+}: calcium
$CaCO_3$: calcium carbonate
Cl^-: chloride
F^-: fluoride

Abbreviations (Continued)
K^+: potassium
meq/L: milliequivalents per liter
SVOCs: semi-volatile organic compounds
TPH-G: total petroleum hydrocarbons in the gasoline range
mg/L: milligrams per liter
Mg^{2+}: magnesium
NA: not applicable
Na^+: sodium
NO_3^-: nitrate
SO_4^{2-}: sulfate
TDS: total dissolved solids
U: not detected at the reporting limit shown.
U.S. EPA: U.S. Environmental Protection Agency

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The Piper diagram for analytical data collected during the first quarter 2011 is shown in Figure 4-25. Groundwater samples, excluding the sample collected from PZ-11, plotted as Ca^{2+}–Na^{+}–HCO_3^- water type.

The sample from PZ-11 fell within a Na^{+}–HCO_3^-–Cl^- water type, indicating that Ca^{2+} concentrations increased and Na^{2+}/K^{+} concentrations decreased downgradient of PZ-11. The dominant anion along groundwater flow paths was consistently HCO_3^-. Concentrations of Cl^- were elevated in piezometers PZ-1, PZ-7, and PZ-11 relative to concentrations in other groundwater samples collected in the first quarter of 2011.

The Piper diagram for analytical results from the second quarter of 2011 is provided in Figure 4-26. The majority of analytical results for samples collected from the piezometer network fall within the Ca^{2+}–Na^{+}–HCO_3^- groundwater type. As during the first quarter, the sample from PZ-11 exhibits characteristics of an Na^{+}–HCO_3^-–Cl^- water type. Analytical results for samples collected from PZ-2 and PZ-9 fall within a Ca^{2+}–HCO_3^- groundwater type. During the second quarter 2011, Ca^{2+} concentrations tended to increase downgradient of PZ-11. Concentrations of Cl^- were again elevated in samples from piezometers PZ-1, PZ-7, and PZ-11. During the second quarter, the Cl^- concentration was also elevated in the analytical sample collected at PZ-6.

During the second quarter, groundwater and surface water samples were also collected and analyzed for a large suite of analytes, including SVOCs, TPH-Gx, BTEX, and NWTPH-HCID. These analytes are likely constituents that could affect surface water and/or groundwater. NWTPH-HCID is a screening analysis used to determine the presence and types of petroleum products that may be present in soil or water. Analyses for TPH-Gx plus BTEX represent qualitative and quantitative methods for volatile petroleum products and BTEX in soil and groundwater (Ecology, 1997). Samples were analyzed for SVOCs using U.S. EPA method SW8270D.

Analytical results for the large suite of analyses performed during the second quarter 2011 indicated that neither groundwater nor surface water samples from the Terminal project area were impacted by SVOCs or petroleum hydrocarbons. Complete analytical reports for first and second quarter groundwater and surface water sampling are provided in Appendix C.

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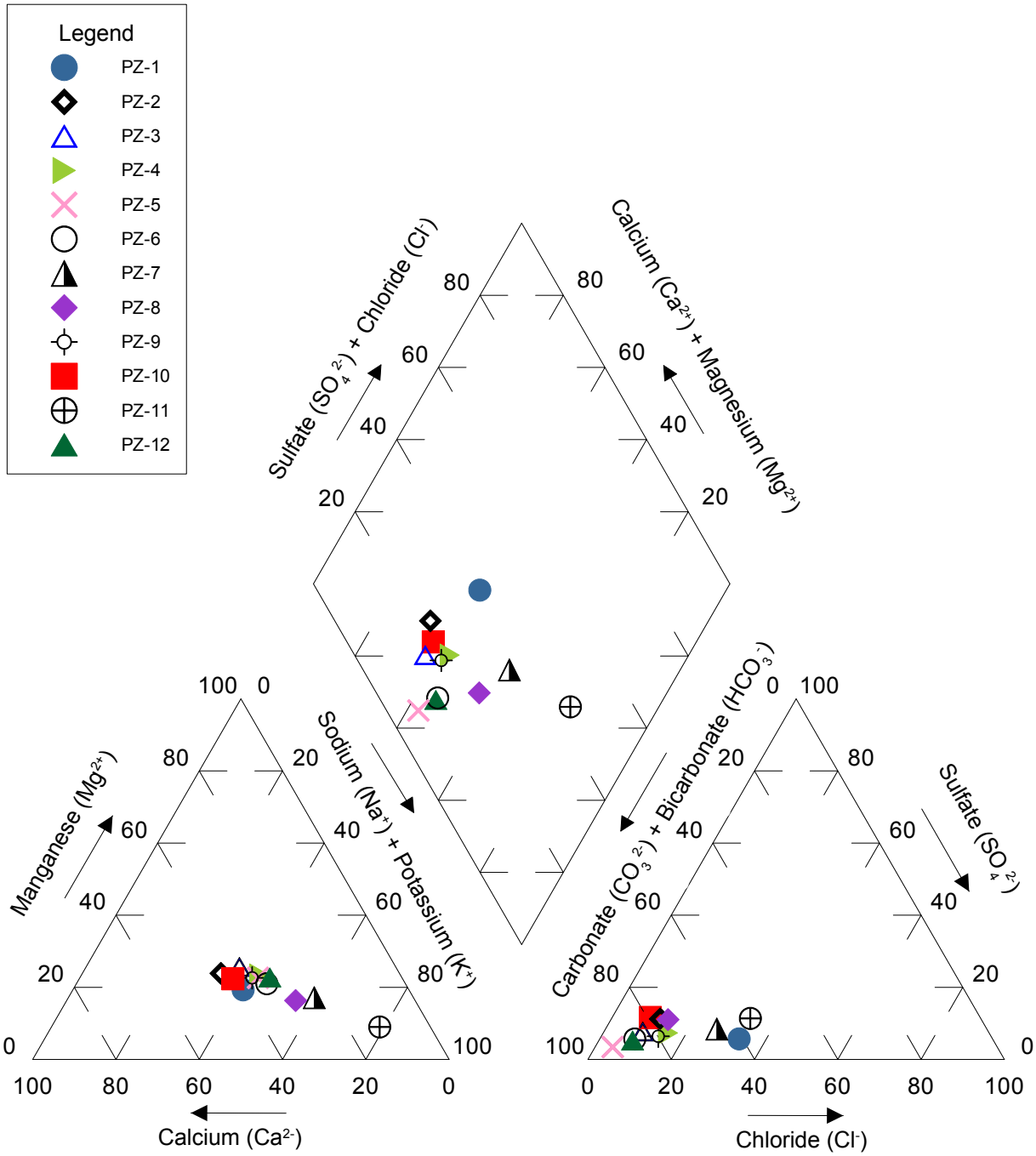

amec	PIPER DIAGRAM: FEBRUARY 2011 WATER QUALITY DATA Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		4/10/11	Figure 4-25

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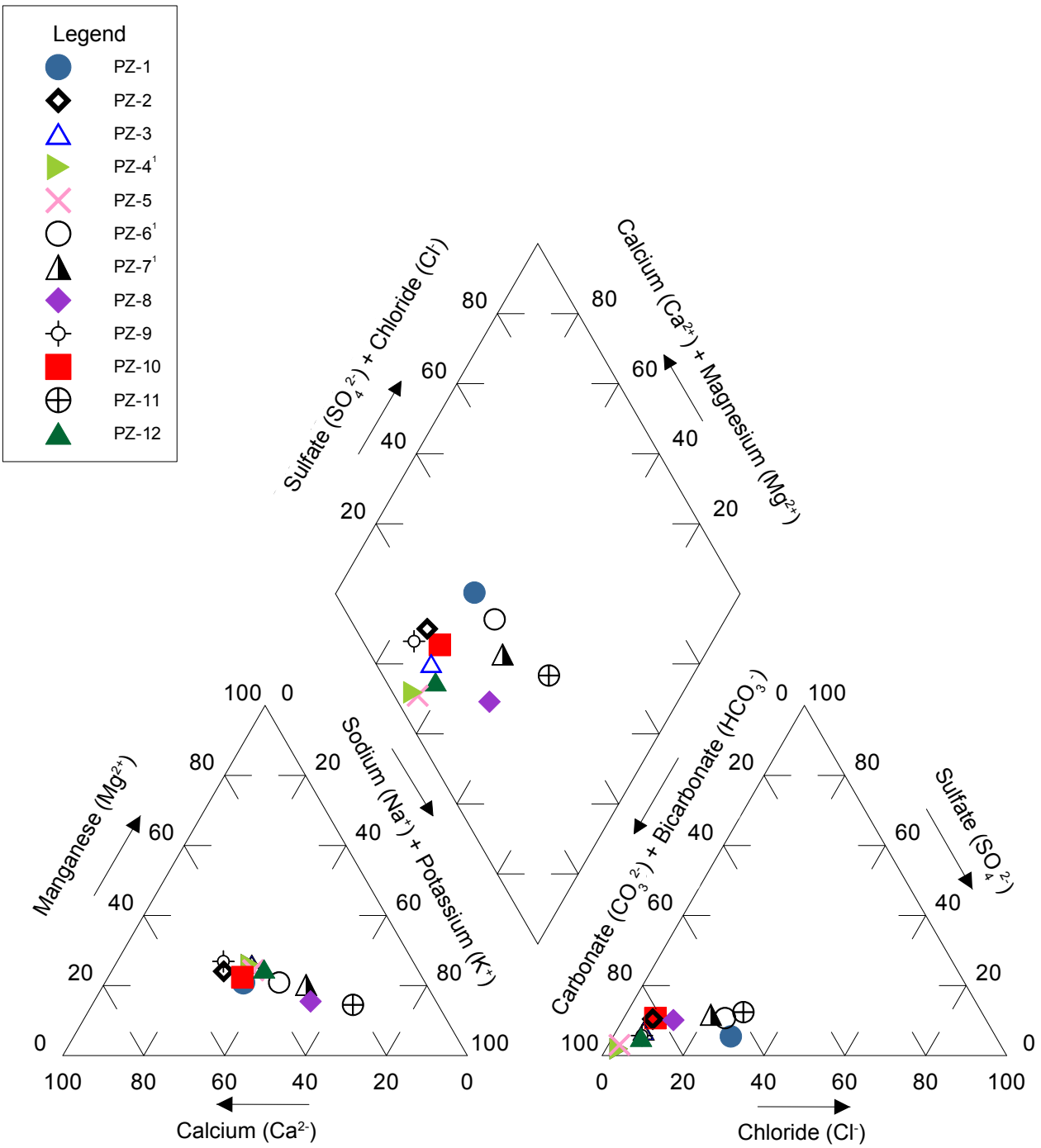

Note:
1. Constituent percentages for PZ-4, PZ-6, and PZ-7 are considered estimates due to elevated charge balance errors for groundwater samples.

amec	PIPER DIAGRAM: APRIL 2011 WATER QUALITY DATA Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		4/10/11	Figure 4-26

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5.0 DEVELOPMENT OF NUMERICAL GROUNDWATER MODEL

A numerical model was developed to simulate shallow groundwater flow conditions for the Terminal project area. The numerical model was based on the current site conceptual model. The numerical model was intended to serve as a decision-making tool to help understand the physical groundwater flow system, including surface water/groundwater interactions and advective transport.

5.1 NUMERICAL MODEL CODE

The three-dimensional shallow groundwater flow model for the Terminal project was developed using MODFLOW-SURFACT Version 3 (HydroGeoLogic, Inc. 1998), which is a comprehensive, block-centered finite-difference code based on the U.S. Geological Survey (USGS) modular groundwater flow code MODFLOW (McDonald and Harbaugh 1988). MODFLOW-SURFACT can simulate unconfined groundwater flow, including the resaturation or desaturation of aquifers, with fewer limitations than the MODFLOW code. This numerical modeling capability is advantageous for simulating hydrogeologic processes within the Terminal project area, where a seasonal dry period during the summer and early fall is followed by wetter winter months.

Advective groundwater movement was simulated using the particle tracking code MODPATH Version 3.0 (Pollock 1994). Advective transport occurs as contaminants are transported in groundwater at the speed of the average linear groundwater velocity (Ander and Woessner 2002). MODPATH is a three-dimensional, particle-tracking code that uses the output from MODFLOW-SURFACT to calculate changes in particle velocity over time in three dimensions. Particle tracking is a useful modeling tool that can be used to recognize conceptual errors that may not be identified by examining the simulated head distribution and to identify locations of recharge and discharge within the model domain. MODPATH also calculates groundwater seepage velocities and groundwater flow directions, which allows comparisons between observed and simulated flow fields during the model calibration process.

The commercial graphical-user-interface (GUI) software Groundwater Vistas (Version 5.51, Build 18) was used for pre- and post-processing.

5.2 MODEL DOMAIN AND DISCRETIZATION

The model domain (boundary) encompasses an area of approximately 2,999 acres including the Terminal project area. Figure 5-1 shows the entire groundwater model domain, which covers portions of the BP Cherry Point Refinery to the north and Alcoa Intalco Works to the southeast. External model boundaries were selected to coincide with either physical boundaries (i.e., Lake Terrell and the Strait of Georgia) or hydraulic boundaries. The model boundary on the east coincided with the shoreline of

Lake Terrell, while the western model boundary corresponded to the zero-foot elevation contour along the Strait of Georgia.

For the Terminal project area model, hydraulic boundaries occurred on the northern and southeastern portions of the model domain. At these locations, a no flow boundary condition was set parallel to the observed groundwater contours (Figures 4-17 and 4-18). All boundary conditions positioned at the edge of the model domain were set so that internal stresses would not reach external boundaries during the simulation period. The numerical model grid domain is shown in Figure 5-2. The numerical model used an irregular finite-difference grid that incorporated higher spatial resolution within areas containing roadside streams and drainage ditches. Refined grid spacing is typically used in numerical models where high curvature occurs in the water table or when representing narrow hydrologic features (Anderson and Woessner 2002). The model used a 100-foot by 100-foot grid cell resolution that is refined to 50 by 100 feet or 50 by 50 feet spacing where ditches and streams lie adjacent to roadways.

Topographic data at a resolution of approximately 6 feet by 6 feet were obtained from the Puget Sound LiDAR Consortium for most of the model domain (Puget Sound LiDAR Consortium 2005). These data were originally developed using Light Detection and Ranging (LiDAR) technology. The LiDAR data did not provide coverage across some areas within the extreme northern portion of the model domain. Raster elevation data for this area were obtained from the USGS National Elevation Dataset (NED) at a horizontal resolution of $^{1}/_{9}$ arc sec (approximately 9.8 feet). The USGS NED data were then merged with the LiDAR data. The merged dataset was then resampled to intervals of 100 feet by 100 feet and used to establish ground surface elevation within the numerical model.

Boring logs from the Terminal project area (see Appendix A), regional boring logs, and geologic cross sections (see Figures 4-2 and 4-3) were examined to construct model geometry consistent with major hydrostratigraphic units within the domain area. The boring logs included four geotechnical borings and 12 piezometer borings within the Terminal project area and select boring logs from the BP Cherry Point and Alcoa Intalco Works Refineries (CH2M HILL 1985; Converse Consultants NW 1989; GeoEngineers 1997, 2011; Ecology 2011).

Based on boring log stratigraphic data, the model was constructed using three layers:

- Model Layer 1 represents the Everson beach deposits and silt;
- Model Layer 2 represents the weathered Bellingham glaciomarine drift; and
- Model Layer 3 represents the non-weathered Bellingham glaciomarine drift.

LEGEND[1]

- PIEZOMETER
- STAFF GAGE
- TERMINAL PROJECT AREA STREAM AND DRAINAGE NETWORKS[2,3]
- NUMERICAL MODEL BOUNDARY

Notes:

1. Aerial photography source is the United States Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) (USDA, 2009).
2. Stream and drainage network representations for areas northwest and west of PZ-1 on the BP Cherry Point Refinery property are from the USGS National Hydrography Dataset (USGS, 2011)
3. Stream and drainage network representations for areas on Pacific International Terminal, Inc., property are based on a stream and drainage network delineation performed by David Evans and Associates.

CLIENT LOGO: Pacific International Terminals

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY: RW
CHK'D BY: --
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: GROUNDWATER NUMERICAL MODELING DOMAIN

DATE: FEBRUARY 2011
PROJECT NO.: 091515338C-12-04
REV. NO.: 1
FIGURE NO.: FIGURE 5-1

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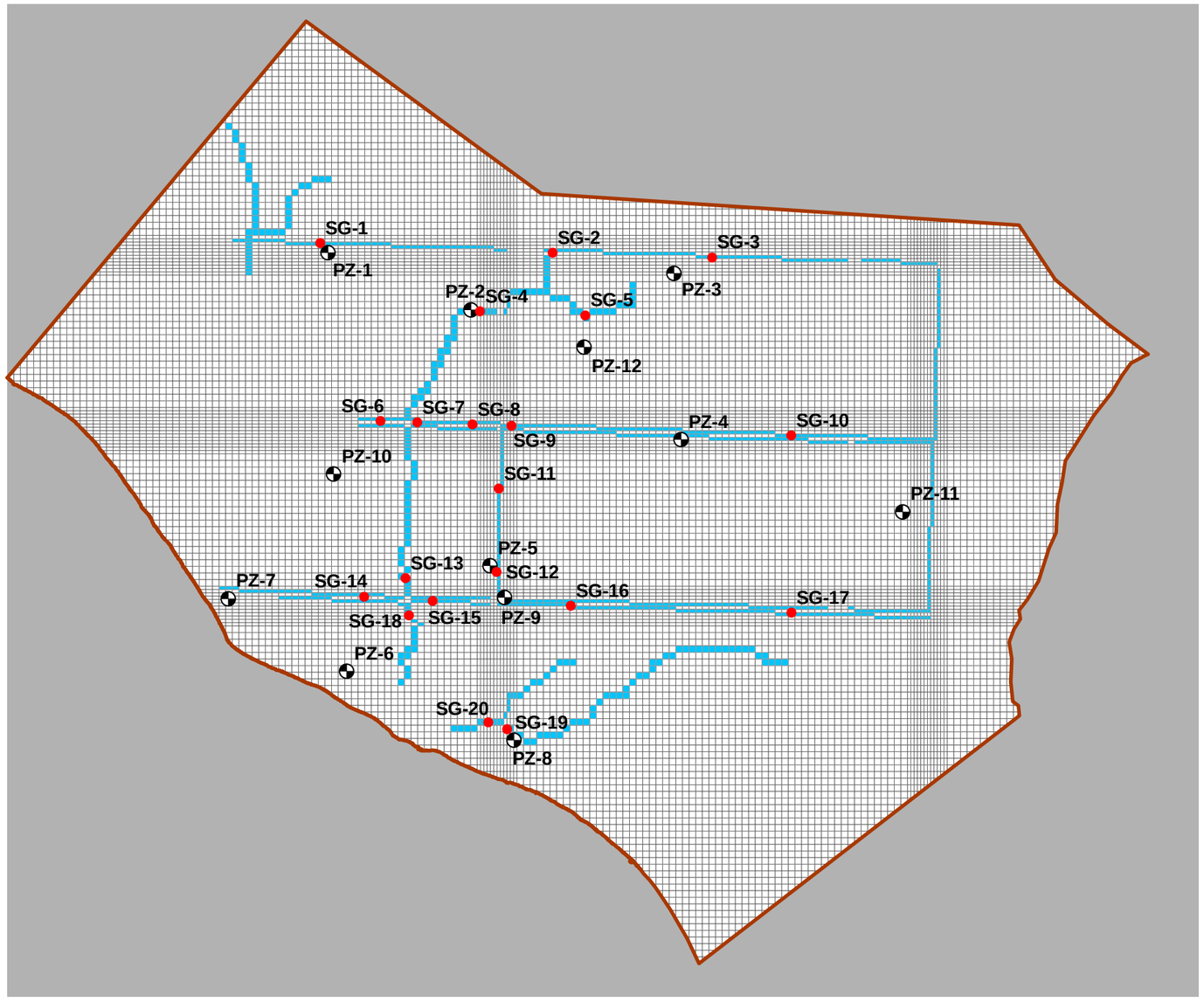

LEGEND

- Piezometer
- Staff Gage
- Numerical Model Boundary
- Numerical Model Stream and Drainage Network Representation
- Active Model Domain[1]
- No Flow Boundary

Notes:

1. Background numerical model grid spacing is equal to 100 feet by 100 feet. In areas with roadside streams and drainages, model spacing is refined to 50 feet in width. This results in grid dimensions of either 50 feet by 100 feet or 50 feet by 50 feet in areas with roadside streams and drainages.

0 1,000 2,000 3,000 Feet

CLIENT LOGO: Pacific International Terminals. A Cermix Enterprise	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: RW CHK'D BY: -- DATUM: NAD83 PROJECTION: WA SP North, Ft. SCALE: 1 inch = 2,000 feet	PROJECT: GATEWAY PACIFIC TERMINAL	DATE: FEBRUARY 2011 PROJECT NO.: 091515338C-12-04	
	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201		TITLE: GROUNDWATER NUMERICAL MODEL GRID SPACING	REV. NO.: 1 FIGURE NO.: FIGURE 5-2	

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The contact between Layer 1 (Everson beach deposits and silt) and Layer 2 (weathered Bellingham glaciomarine drift) was assumed to occur 4 feet bgs uniformly across the entire model domain. Based upon contact observations described in available boring logs, 4 feet was considered an appropriate average thickness for the Everson beach deposit and silt stratigraphic unit.

The contact between Layer 2 (weathered Bellingham glaciomarine drift) and Layer 3 (non-weathered Bellingham glaciomarine drift) was delineated using the contact observations described in available boring logs. A kriging approach was then used to interpolate a surface representing the contact between the weathered versus non-weathered Bellingham glaciomarine drift over the entire numerical modeling domain.

The bottom elevation of Layer 3 was delineated using data from deeper borings that reached the contact between the non-weathered Bellingham glaciomarine drift and the underlying Deming Sand. The deepest extent of boring for PZ-5 was assumed to have almost encountered the Deming Sand, based upon observed contact elevation between the non-weathered Bellingham glaciomarine drift and the Deming Sand during geotechnical investigations performed within the Terminal project area. Therefore, the bottom elevation of PZ-5 was included as a data point for the non-weathered Bellingham glaciomarine drift/Deming Sand contact. A kriging approach was used to produce a surface representing the contact, which also defines the deepest vertical extent of the numerical model. The depth of Layer 3 is considered sufficient to minimize any boundary effects imposed on shallow model layers as a result of the no flow boundary condition located at the bottom of the numerical model domain.

5.3 BOUNDARY CONDITIONS

Model boundary conditions were assigned based on groundwater flow directions and gradients inferred from groundwater contour maps and the steady-state water balance model developed for the model domain area. The Everson beach deposits and silt layer (Layer 1) includes constant flux boundaries in the northwest corner of the model domain (Figure 5-3). The northernmost constant flux boundary removes groundwater from the modeling domain, which simulates groundwater flow toward Birch Bay. The other constant flux boundary located on the northwest side of the model introduces water to the domain, which occurs due to the presence of recharge along a topographic high (see Figure 5-3).

In addition to flux boundaries, Layer 1 contains a constant head boundary representing Lake Terrell surface water elevation. Lake Terrell is a shallow water body that covers approximately 500 acres directly east of the model domain. An engineered spillway on the north side of the lake controls surface water elevation. The water elevation in Lake Terrell was surveyed on May 11, 2011. Lake

elevation was measured as 217.6 feet (NAVD88). This elevation was used to define the constant head boundary on the east side of the model (Figure 5-3).

In Layer 2 (weathered Bellingham glaciomarine drift), constant flux boundaries and constant head boundaries are located in the same position as Layer 1 (Figure 5-4). Fluxes simulated in Layer 2 are minimal relative to fluxes in Layer 1, which is consistent with the low hydraulic conductivity associated with the weathered Bellingham glaciomarine drift. The constant head boundary representing Lake Terrell was assigned the same elevation as in Layer 1.

A general head boundary (GHB) is located along the southwest side of the numerical model in Layer 2, which allows groundwater to exit the model domain as throughflow beneath the Strait of Georgia (see Figure 5-4). The GHB assigns a head-dependent boundary condition that allows flow either to enter or exit the aquifer depending on the head assigned to the boundary and the conductance term. The head in the aquifer is then compared to the GHB head, and the GHB either removes or introduces water to the aquifer depending on the direction of the gradient.

Conductance (*C*) in the GHB is defined as:

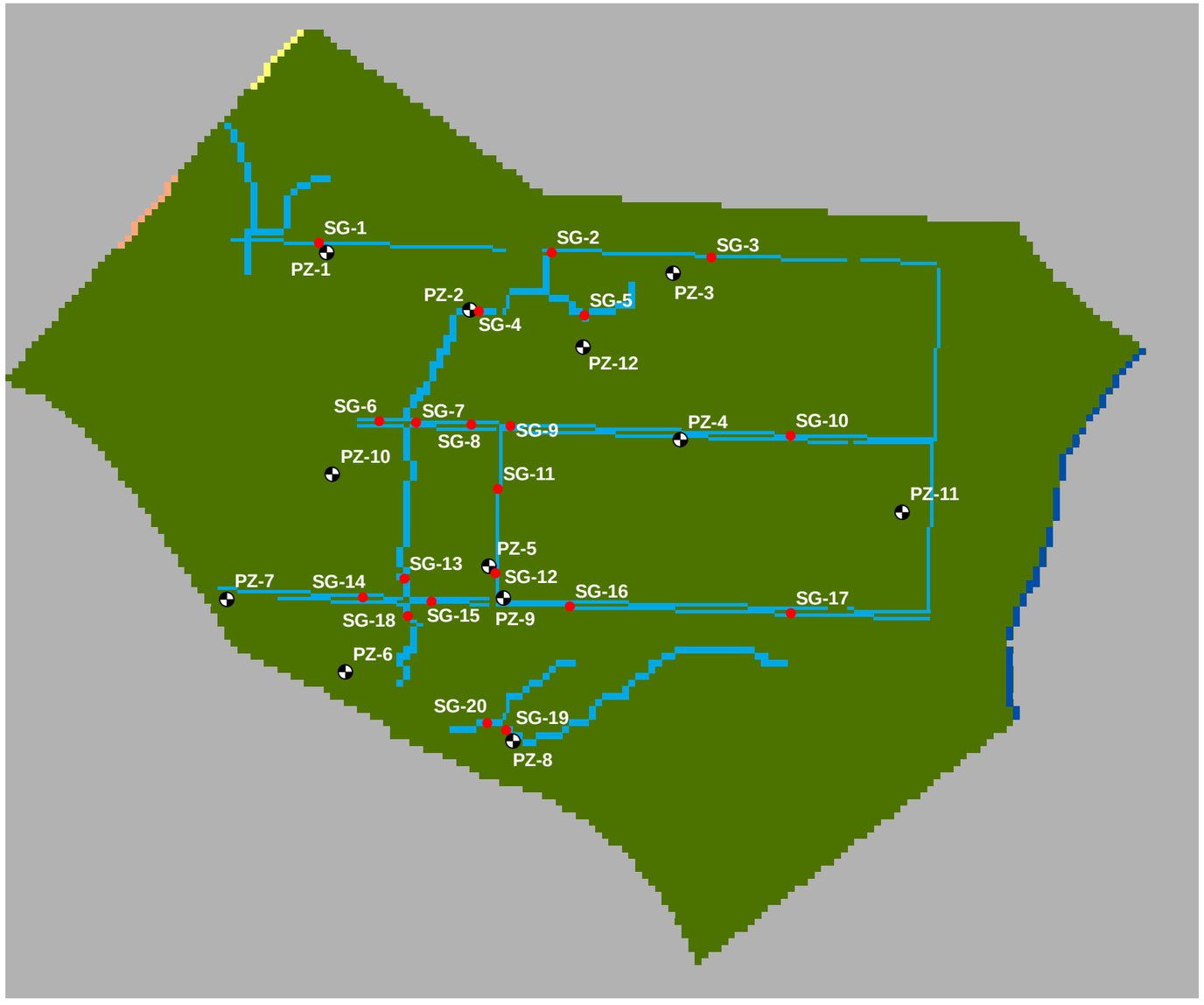
$$C = \frac{T*K*W}{X} \tag{4}$$

Where:

K is the hydraulic conductivity of the aquifer,
T is the thickness of the cell,
W is the width of the cell, and
X is the distance to the GHB head (assumed to be outside of the model domain).

In Layer 3, constant flux boundaries are located on the northwest side and east side of the model domain (Figure 5-5). As in Layer 2, the fluxes imposed by these boundary conditions are minimal relative to fluxes in overlying layers due to the very low permeability associated with the non-weathered Bellingham glaciomarine drift. The flux boundary on the east side of the domain represents regional throughflow that occurs beneath Lake Terrell (see Figure 5-5). A GHB on the southwest side of the model domain allows groundwater to leave the domain as throughflow beneath the Strait of Georgia (see Figure 5-5).

Stream 1, Stream 2, and roadside ditches and streams were simulated using the DRAIN package in MODFLOW-SURFACT (see Figure 5-3). Surface water features were simulated using the DRAIN boundary condition because field observations indicated these reaches are often dry during parts of the year. The DRAIN package assigns a head-dependent boundary condition that removes water from the aquifer once the simulated water table is higher than the drain head (McDonald and Harbaugh 1988).



LEGEND

PIEZOMETER[1]

STAFF GAGE[1]

BOUNDARY TYPE:

CONSTANT FLUX BOUNDARY (OUT)

CONSTANT FLUX BOUNDARY (IN)

CONSTANT HEAD BOUNDARY
LAKE TERRELL ELEVATION = 217.6 FEET (NAVD 88)

DRAIN PACKAGE

RECHARGE = 1.9 INCHES / YEAR

NO FLOW BOUNDARY

Note:
1. Piezometers and staff gage locations are provided for spatial reference.

0 1,000 2,000 3,000 Feet

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	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201		TITLE: GROUNDWATER NUMERICAL MODEL LAYER 1 BOUNDARY CONDITIONS	REV. NO.: 1 FIGURE NO.: FIGURE 5-3	

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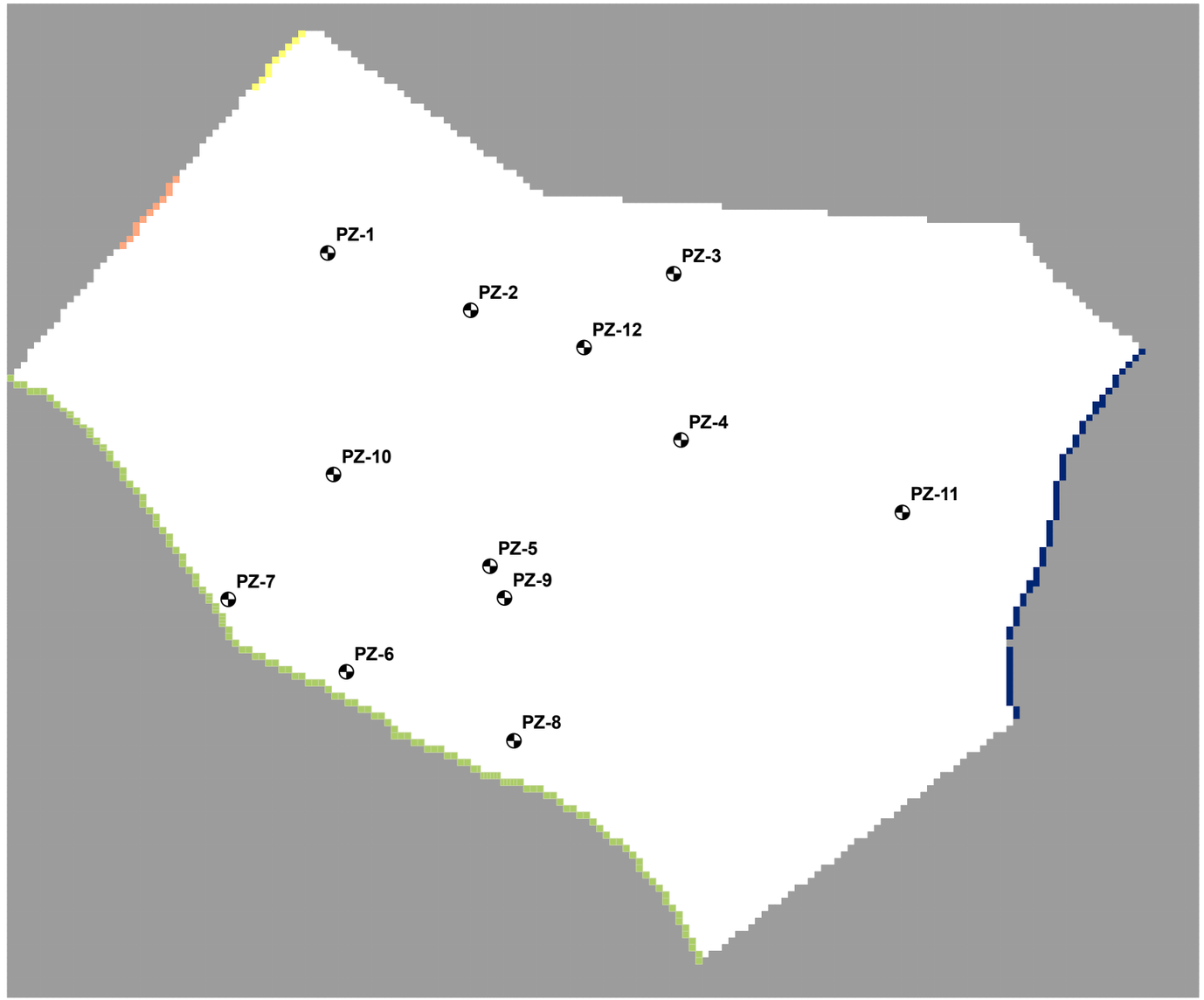

LEGEND

PIEZOMETER[1]

BOUNDARY TYPE:

- CONSTANT FLUX BOUNDARY (OUT)
- CONSTANT FLUX BOUNDARY (IN)
- GENERAL HEAD BOUNDARY
- NO FLOW BOUNDARY
- CONSTANT HEAD BOUNDARY
  LAKE TERRELL ELEVATION = 217.6 FEET (NAVD88)

Notes:
1. Piezometer locations are provided for spatial reference.

0 1,000 2,000 3,000 Feet

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	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201 amec		TITLE: GROUNDWATER NUMERICAL MODEL LAYER 2 BOUNDARY CONDITIONS	REV. NO.: 1 FIGURE NO.: FIGURE 5-4

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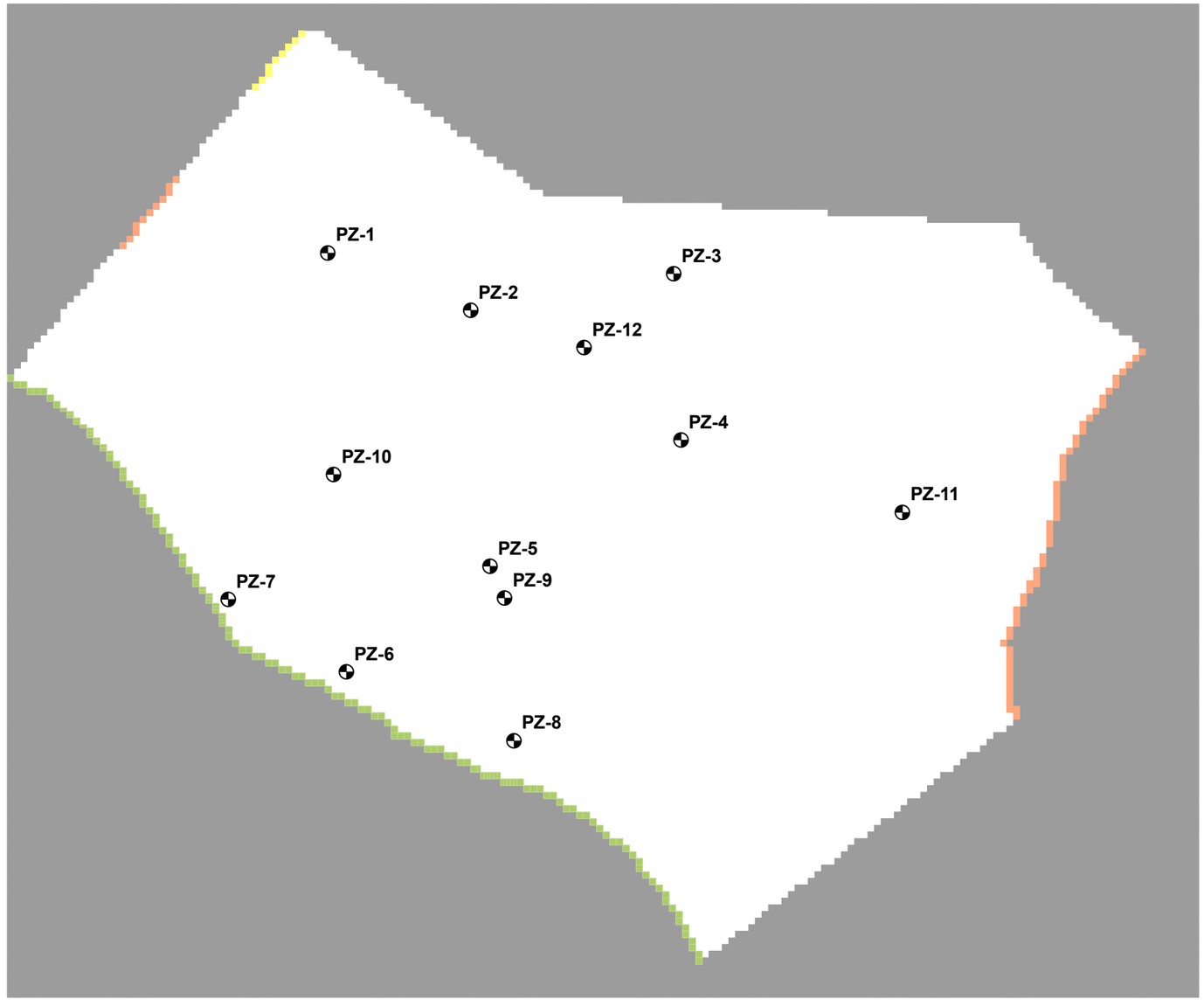

LEGEND

PIEZOMETER[1]

BOUNDARY TYPE:

- CONSTANT FLUX BOUNDARY (OUT)
- CONSTANT FLUX BOUNDARY (IN)
- GENERAL HEAD BOUNDARY
- NO FLOW BOUNDARY

Notes:
1. Piezometer locations are provided for spatial reference.

0 1,000 2,000 3,000 Feet

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	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201		TITLE: GROUNDWATER NUMERICAL MODEL LAYER 3 BOUNDARY CONDITIONS	REV. NO.: 1 FIGURE NO.: FIGURE 5-5

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Surface water stage measurements were used to define stage elevation for each drainage reach in the numerical model. Conductance parameters within the DRAIN package were used to match simulated groundwater-surface water fluxes to values consistent with the steady-state water balance and to match observed and simulated heads for piezometer measurements adjacent to surface drainages.

Stream conductance for each DRAIN reach is calculated as:

$$C = \frac{K*L*W}{D} \tag{5}$$

Where:

C is conductance (square feet/day),
K is stream or ditch bed hydraulic conductivity (feet/day),
L is the length of each drain reach (feet),
W is the stream width (feet), and
D is the thickness of the bed material.

Because the model was developed with an irregular grid, the length of each reach was either 50 feet or 100 feet. The width of each stream was assigned a value based upon field measurements. In cases where measurements were not available, the width parameter was estimated based upon surface water features of similar width that had been measured within the project area. Hydraulic conductivity values were estimated based upon observed stream and ditch bed properties. Estimates were used for the thickness of bed material considering the size and discharge of each drainage. Conductance values ranged from 212.5 square feet/day to 14,600 square feet/day in the steady-state numerical model.

Cells assigned the DRAIN package boundary condition were identified using the project area stream and drainage survey, evaluation of site aerial photos, and data from the USGS National Hydrography dataset (USGS, 2011). Only major surface water features were parameterized within the numerical model. Stream 2 was simulated as a continuous reach despite the water retention dam located immediately upstream of the project area.

5.4 RECHARGE ZONATION AND VALUES

Within the numerical groundwater model, recharge was applied uniformly throughout the domain. Precipitation data from the BP Cherry Point Refinery meteorological station were obtained for the period October 27, 2010, through April 5, 2011. Total precipitation during this period was equal to 25.00 inches. Initially, the numerical model recharge rate was assigned a value equal to 3.5 percent of

total precipitation; however, the recharge rate was adjusted slightly downward to 3.4 percent of total precipitation during model calibration (see Section 6.0).

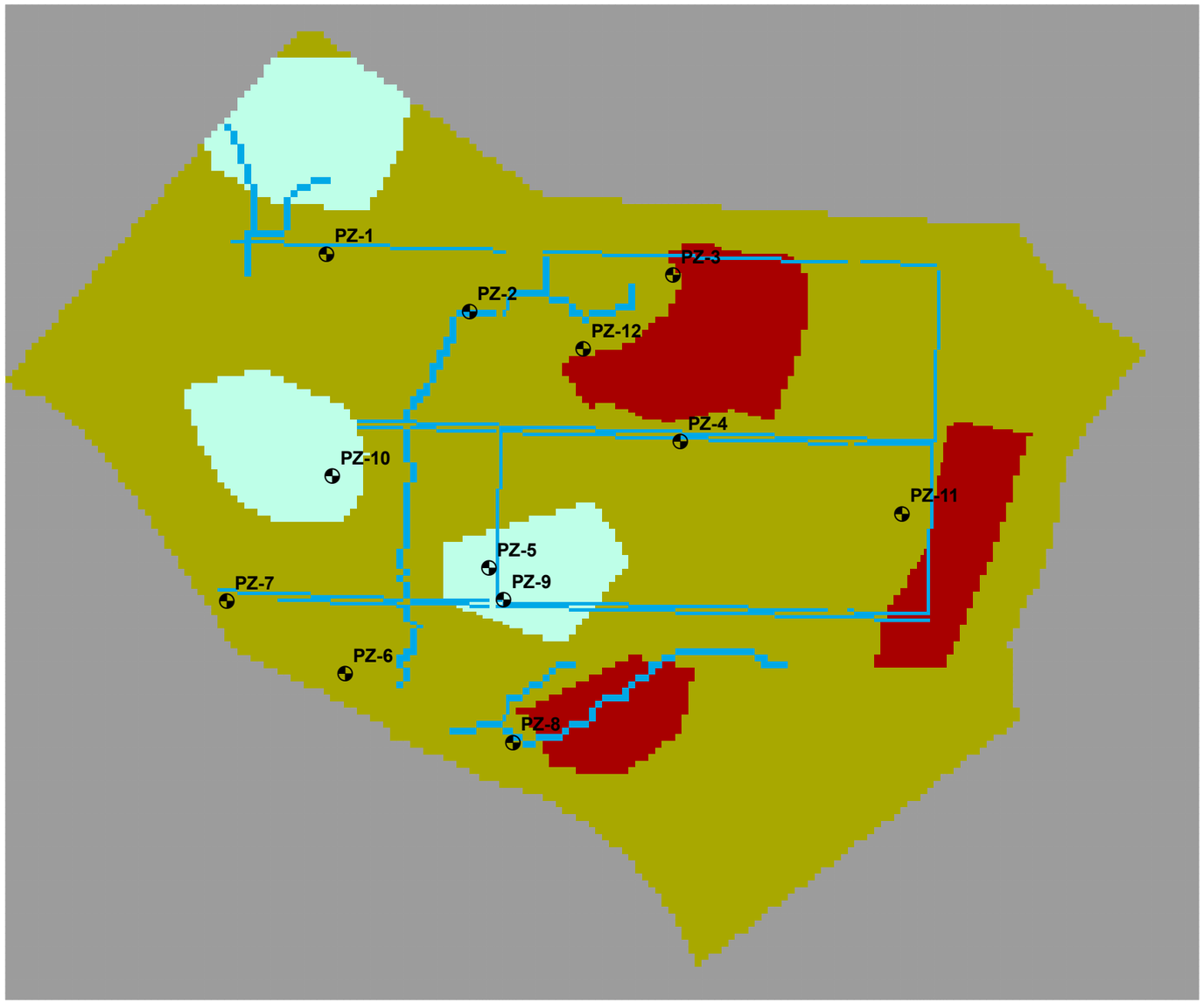
5.5 HYDRAULIC PARAMETER ZONATION AND VALUES

Zones of hydraulic conductivity within the numerical groundwater model were assigned based on slug test results and geotechnical sample analyses from monitoring wells at the BP Cherry Point Refinery (CH2MHill 1985) and results of geotechnical sample analyses from piezometers within the Terminal project area. Initial hydraulic conductivity values were then adjusted as part of model calibration. For the calibrated model, horizontal hydraulic conductivity values in Layer 1 ranged from 2 feet/day to 10.5 feet/day (Figure 5-6).

Slug test data from three BP Cherry Point monitoring wells suggested hydraulic conductivity for the Everson beach and silt deposit was approximately 1.0 foot/day. However, two of the wells on the BP Cherry Point Refinery property were only partially screened within the weathered Bellingham glaciomarine drift, suggesting that hydraulic conductivity values for this hydrostratigraphic unit may be slightly greater than 1.0 foot/day (CH2M HILL 1985). The lower end of values used in Layer 1 of the numerical model (2 feet/day and 4.5 feet/day) are generally consistent with higher hydraulic conductivity values associated with a sandy silt or silty sand classification. The background hydraulic conductivity value of 10.5 feet/day in Layer 1 is slightly higher than typical values for sandy silts, but may be representative of fine sand that is slightly silty (Schwartz and Zhang 2003). Many piezometer boring logs from the Terminal project area indicate sand and gravel contents in near-surface soils that would lead to hydraulic conductivity values more indicative of sand with some silt (i.e., PZ-2, PZ-6, PZ-7, PZ-8, PZ-10, and PZ-11).

To represent anisotropy in the model, vertical hydraulic conductivity values in Layer 1 were scaled to 1/10 the horizontal hydraulic conductivity (Figure 5-6).

Slug testing and geotechnical analyses for the weathered Bellingham glaciomarine drift indicate that hydraulic conductivity within this hydrostratigraphic unit is highly variable. Slug test results for four wells on the BP Cherry Point Refinery property screened within the weathered glaciomarine drift provided hydraulic conductivity values ranging from 0.2 foot/day (6.70×10^{-5} cm/sec) to 1.5 foot/day (5.15×10^{-4} cm/sec). Shelby tube samples from the weathered Bellingham glaciomarine drift collected during installation of piezometers PZ-4 and PZ-5 were analyzed for hydraulic conductivity. Results for the Shelby tube samples varied from 2.42×10^{3} foot/day (8.54×10^{-7} cm/sec) to 5.75×10^{-3} foot/day (2.03×10^{-6} cm/sec). The large range in hydraulic conductivity values from slug test and analytical samples from the weathered Bellingham glaciomarine drift may be a result of variability in secondary porosity or a result of sand and gravel lenses that provide preferential flow paths.



LEGEND

- PIEZOMETER[1]
- DRAIN PACKAGE[1]

HYDRAULIC CONDUCTIVITY (K)

- Kx,y = 2 ft/d; Kz = 0.2 ft/d
- Kx,y = 4.5 ft/d; Kz = 0.45 ft/d
- Kx,y = 10.5 ft/d; Kz = 1.05 ft/d

Notes:
1. Drain Package and piezometer locations are shown for spatial reference.

Abbreviations:
K = Hydraulic Conductivity
ft = feet
d = day

0 1,000 2,000 3,000 Feet

CLIENT LOGO: Pacific International Terminals. A Cantix Enterprise	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: RW CHK'D BY: -- DATUM: NAD83 PROJECTION: WA SP North, Ft. SCALE: 1 inch = 2,000 feet	PROJECT: GATEWAY PACIFIC TERMINAL	DATE: JUNE 2011 PROJECT NO.: 091515338C-12-04
	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201		TITLE: GROUNDWATER NUMERICAL MODEL LAYER 1 HYDRAULIC CONDUCTIVITY DISTRIBUTION	REV. NO.: 1 FIGURE NO.: FIGURE 5-6

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Within the numerical model, a background hydraulic conductivity of 0.005 foot/day was assigned in Layer 2, which is consistent with the hydraulic conductivity value from the PZ-4 Shelby tube sample collected from the PZ-4 boring (Figure 5-7). Near the BP Cherry Point Refinery, horizontal hydraulic conductivity values were 2.0 feet/day, which is slightly higher than slug test results for wells on the BP Cherry Point Refinery property (Figure 5-7). Hydraulic conductivity near PZ-8 was also 2.0 feet/day, which is consistent with the Quaternary alluvium and terrace deposits observed by Easterbrook (1976). Vertical hydraulic conductivity values in Layer 2 were assigned a value equal to 1/10 the horizontal hydraulic conductivity to represent anisotropy.

Geotechnical analyses for samples from the BP Cherry Point Refinery monitoring well borings and from piezometer PZ-5 and slug test results from the BP Cherry Point Refinery monitoring wells provided hydraulic conductivity estimates for the non-weathered Bellingham glaciomarine drift. These hydraulic conductivity values ranged from 2.8×10^{-4} foot/day (9.93×10^{-8} cm/sec) to 3.2×10^{-3} foot/day (1.12×10^{-6} cm/sec). Within the numerical model, a uniform hydraulic conductivity of 0.00085 foot/day (3.0×10^{-7} cm/sec) was assigned to Model Layer 3 (see Figure 5-8). This value is equal to the geometric mean of the slug test and geotechnical analytical results. To represent anisotropy, the vertical hydraulic conductivity value in Layer 3 was assigned a value equal to 1/10 the horizontal hydraulic conductivity.

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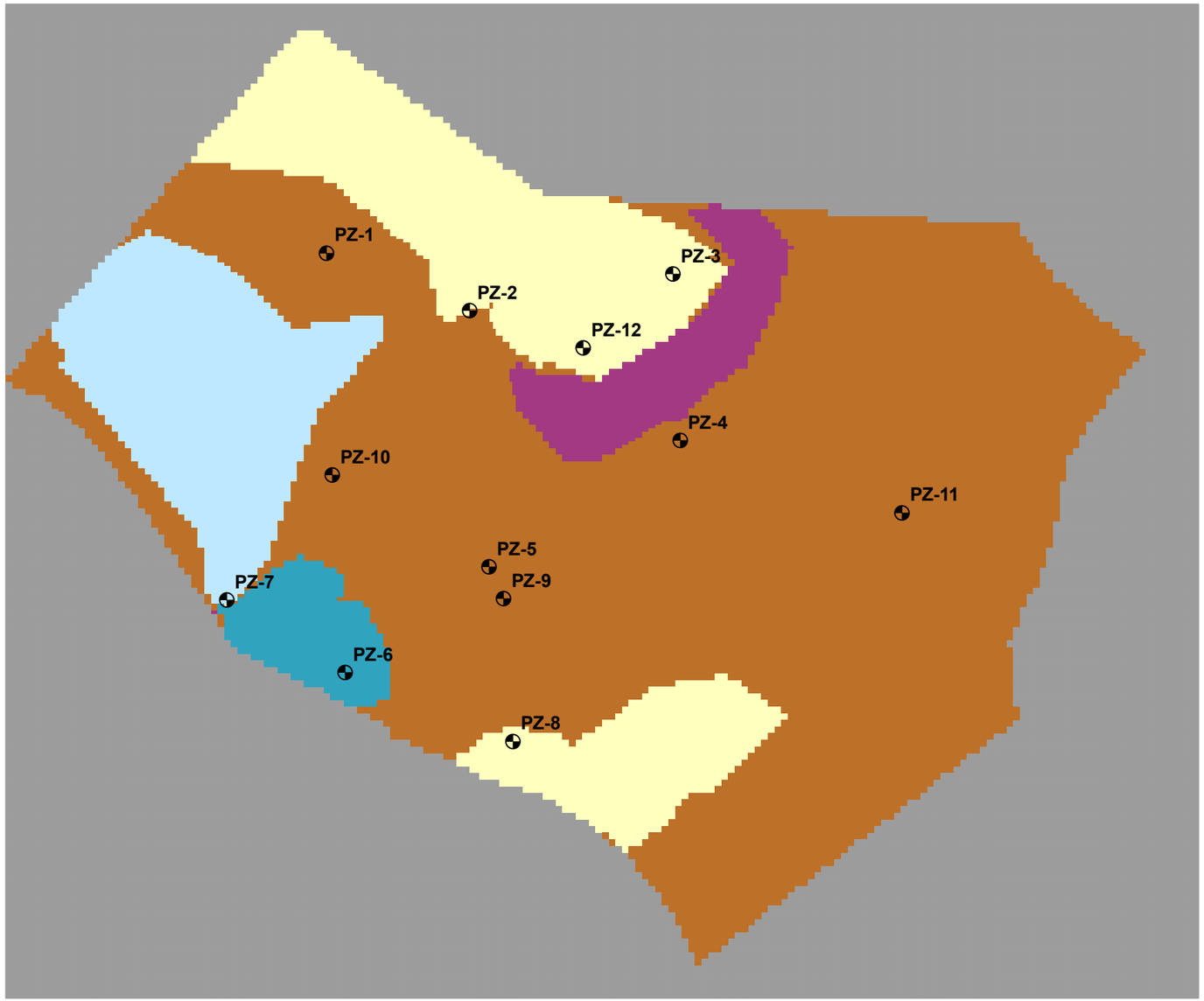

LEGEND

PIEZOMETER[1]

HYDRAULIC CONDUCTIVITY (K)

- Kx,y = 0.001 ft/d; Kz = 0.0001 ft/d
- Kx,y = 0.005 ft/d; Kz = 0.0005 ft/d
- Kx,y = 0.008 ft/d; Kz = 0.0008 ft/d
- Kx,y = 0.5 ft/d; Kz = 0.05 ft/d
- Kx,y = 2.0 ft/d; Kz = 0.2 ft/d

Notes:
1. Piezometer locations are shown for spatial reference.

Abbreviations:
K = Hydraulic Conductivity
ft = feet
d = day

0 1,000 2,000 3,000 Feet

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CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

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11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

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CHK'D BY:	--
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: GROUNDWATER NUMERICAL MODEL LAYER 2 HYDRAULIC CONDUCTIVITY DISTRIBUTION

DATE:	JUNE 2011
PROJECT NO.:	091515338C-12-04
REV. NO.:	1
FIGURE NO.:	FIGURE 5-7

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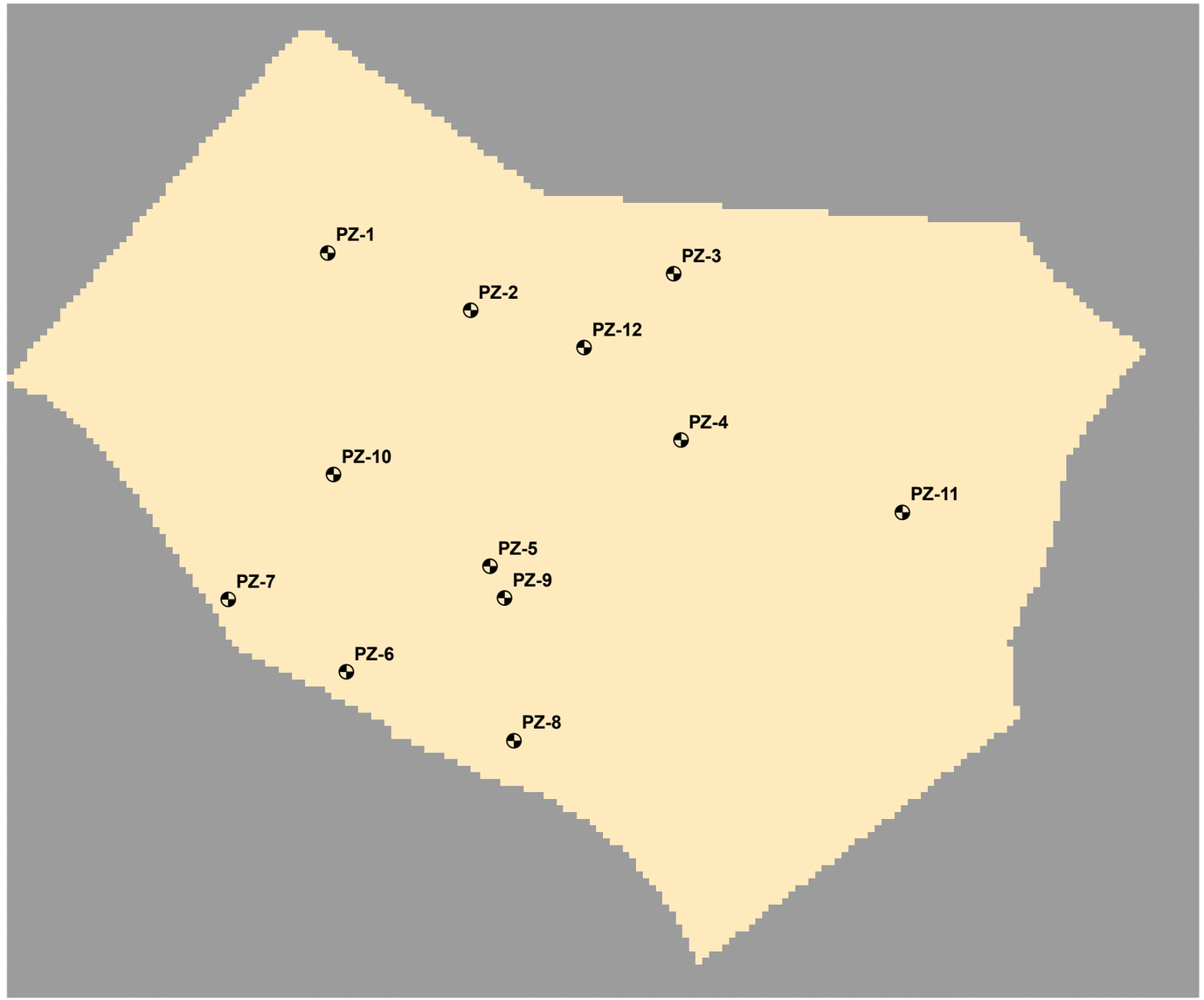

LEGEND

PIEZOMETER

Kx,y = 0.00085 ft/d; Kz = 0.00085 ft/d

N

0 1,000 2,000 3,000 Feet

CLIENT LOGO: Pacific International Terminals. A Cermix Enterprise	CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.	DWN BY: RW	PROJECT: GATEWAY PACIFIC TERMINAL	DATE: JUNE 2011
		CHK'D BY: --		PROJECT NO.: 091515338C-12-04
	AMEC 11810 North Creek Parkway North Bothell, WA, U.S.A. 98011-8201 amec	DATUM: NAD83	TITLE: GROUNDWATER NUMERICAL MODEL LAYER 3 HYDRAULIC CONDUCTIVITY DISTRIBUTION	REV. NO.: 1
		PROJECTION: WA SP North, Ft.		FIGURE NO.: FIGURE 5-8
		SCALE: 1 inch = 2,000 feet		

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6.0 MODEL CALIBRATION, MODEL RESULTS, AND SENSITIVITY ANALYSIS

This section describes model calibration procedures, presents the model results, and discusses results of a model sensitivity analysis. Model calibration is an iterative process of modifying model parameters until the model output most closely matches observed data. Sensitivity analysis is a process used to assess the sensitivity of the model calibration to certain model parameters by adjusting the parameters within a plausible range and observing the effect on model error. The model calibration procedures are described in Section 6.1, model results are presented in Section 6.2, and the sensitivity analysis is discussed in Section 6.3.

6.1 MODEL CALIBRATION

This section describes model calibration targets, calibration goals and procedures, and calibration results.

6.1.1 Model Calibration Targets

Average groundwater elevations derived from pressure transducers installed in the 12 weathered Bellingham glaciomarine drift piezometers (PZ-1 through PZ-12) were used as targets for model outputs of hydraulic head during model calibration. The hydraulic head targets for piezometers PZ-1 through PZ-6 were derived from pressure transducer data collected between October 27, 2010, and April 5, 2011. Hydraulic head targets for piezometers PZ-7 through PZ-12 were derived from pressure transducer data recorded between January 11, 2011, and April 5, 2011. Hydraulic conductivity and recharge were adjusted in an iterative manner within a reasonable range until an acceptable match between model output and field-measured hydraulic head readings was achieved, as judged by calibration statistics.

6.1.2 Calibration Goals and Procedures

Steady-state model calibration was evaluated both quantitatively and qualitatively using a suite of criteria, including:

- Visual comparison of modeled groundwater elevation contour maps versus maps based on measured field-measured groundwater elevation;
- Visual evaluation of a scatter plot comparing measured versus simulated heads;
- Statistical evaluation of residuals;
- Simulated flux compared to estimated fluxes calculated for the steady-state water balance calculation; and
- Water balance error in model output (less than 1 percent).

Two model calibration goals were established related to the targets for hydraulic head:

1. Reduce the simulated hydraulic head residuals (difference between simulated values and target values) to ± 2.0 feet;
2. Produce a low ratio of standard deviation in residuals compared with the observed range of hydraulic head readings (< 2 percent). According to Anderson and Woessner (2002) and Rumbaugh (1998), residual standard deviation should be a small portion of the total range in head across the model domain (less than 10 percent).

6.1.3 Calibration Results

The calibrated model adequately reproduced field-measured values of hydraulic head. Table 6-1 summarizes calibration statistics. Positive and negative residuals indicate simulated heads are lower and higher, respectively, than target values. The arithmetic mean of the residuals is -0.51 foot. A residual mean close to zero indicates that model heads are not biased too high or too low. The negative value for the mean residual for the project area model indicates that the model overestimates groundwater elevation in the weathered Bellingham glaciomarine drift by approximately 0.5 foot.

Figure 6-1 is a plot of simulated head versus observed (target) head for the steady-state calibration. This graph shows that positive and negative residuals were evenly distributed around the linear regression line. A y-intercept value of 0 and a slope of the trend line equal to 1 would be the result of a model that perfectly replicates observed heads.

The mean of the absolute residuals is a measure of the average difference between the modeled and target value, regardless of whether the modeled value is greater than or less than the true value. The absolute residual mean for the calibrated model is relatively low (0.68 foot). The residual standard deviation divided by the range of observed values is 0.46 percent, which is well below the acceptable range established in Section 6.1.2 (less than 2 percent).

Figure 6-2 shows the potentiometric contours for the weathered Bellingham glaciomarine drift based on simulated heads. Figure 6-2 also shows point values of simulated heads at piezometer locations within the Terminal project area. Comparison of Figure 6-2 to Figures 4-17 and 4-18 indicated that the model was able to simulate groundwater flow directions and gradients accurately based on values of head measured in the field.

Table 6-2 compares estimated fluxes to simulated fluxes for the steady-state numerical model. The simulated fluxes generally fell within the estimated ranges. The simulated inflow from the topographic high point in Layer 1 was less than the estimated flux. The simulated flux leaving the model domain through the constant head boundary condition in Layer 2 representing Lake Terrell was greater than the estimated value.

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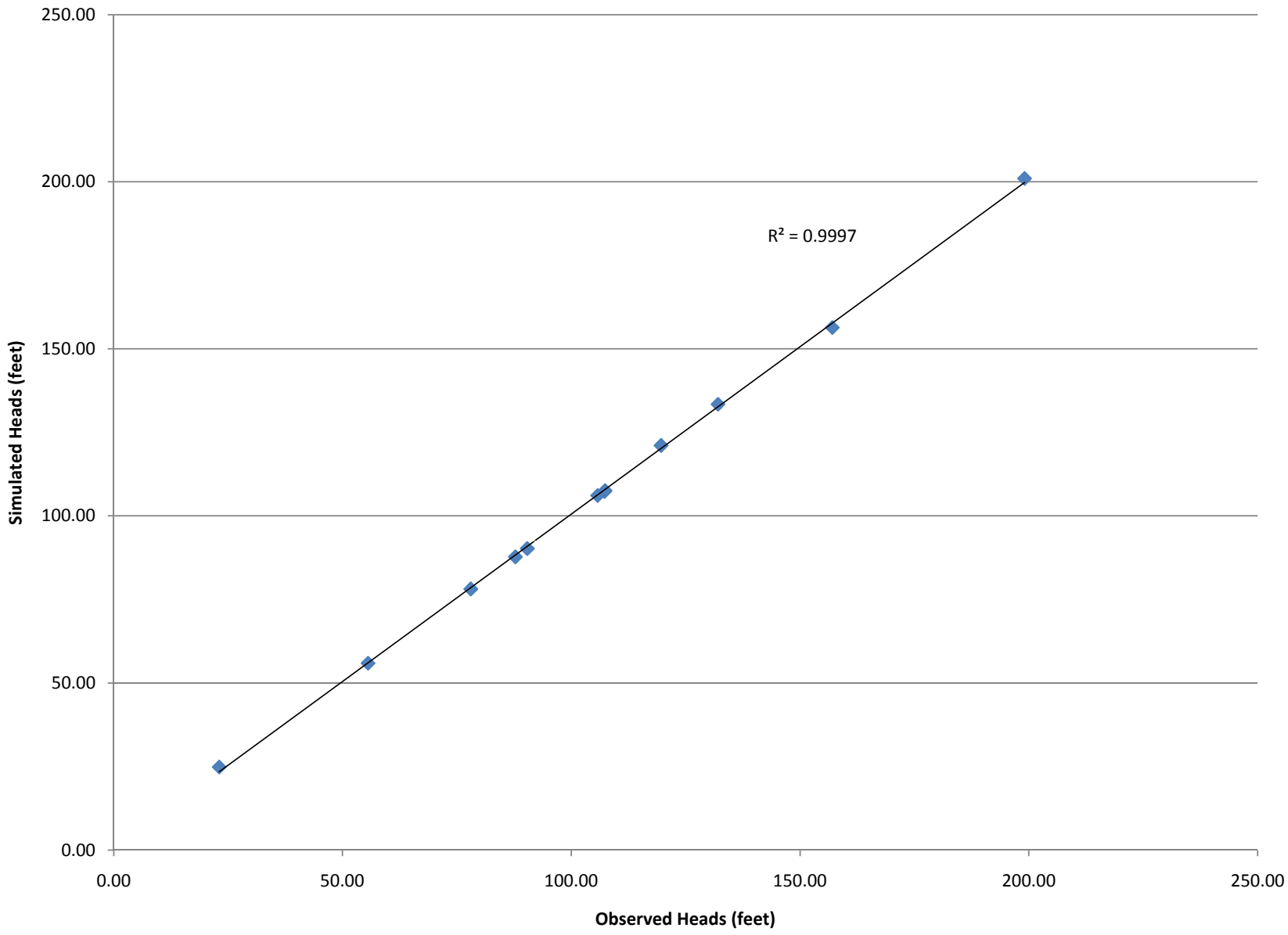

amec	SIMULATED VERSUS OBSERVED HEADS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		5/24/11	Figure No. 6-1

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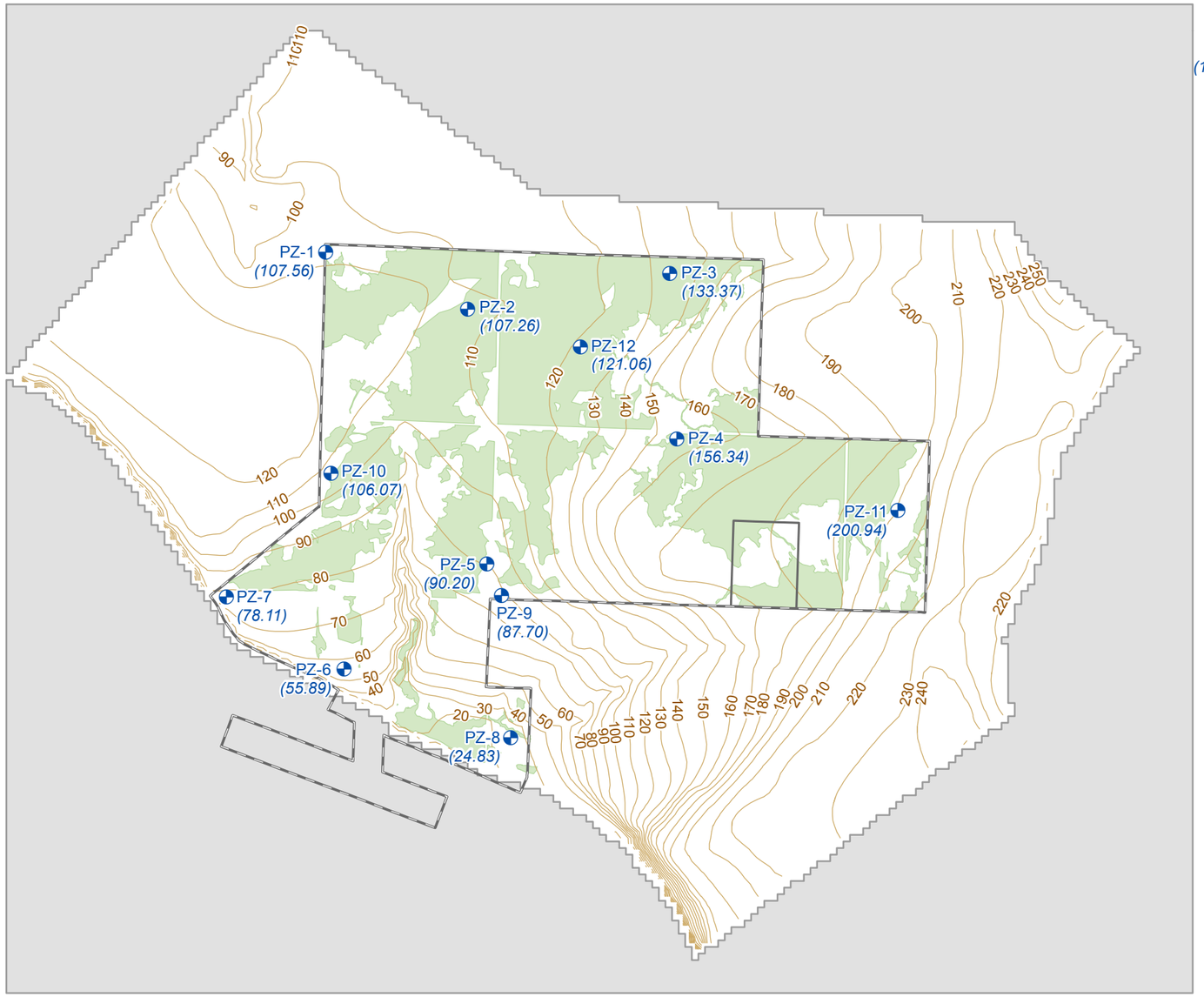

LEGEND

- PZ-1 (107.56) — PIEZOMETER AND SIMULATED HEAD (FEET)
- SIMULATED POTENTIOMETRIC CONTOUR (FEET)
- NO FLOW BOUNDARY
- EXISTING WETLAND AREA
- PROPERTY BOUNDARY
- PROJECT AREA BOUNDARY

NOTE:
1. Existing wetland area is provided for spatial reference.

0 1,000 2,000 3,000 Feet

Pacific International Terminals
A Carrix Enterprise

CLIENT: PACIFIC INTERNATIONAL TERMINALS, INC.

AMEC
11810 North Creek Parkway N
Bothell, WA 98011

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DWN BY: SD
CHK'D BY: MZ
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: SIMULATED POTENTIOMETRIC CONTOURS: WEATHERED BELLINGHAM GLACIOMARINE DRIFT

DATE: JUNE 2012
PROJECT NO.: 091515338C-12-04
REV. NO.: -
FIGURE NO.: FIGURE 6-2

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-12-04 - 2011 Hydrology Report\dwg\Figure 6-2 - Simulated Potentiometric Contours.mxd

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However, both of these fluxes were small components of the overall water balance. Moreover, larger fluxes simulated by the model (i.e., recharge, stream and drainage network baseflow, and discharge toward the Strait of Georgia) were consistent with estimates from the calculation presented in Section 4.4 and summarized in Table 6-2.

Overall, the numerical model exhibited a 0.0003 percent difference between simulated inflows and outflows, which is significantly less than the 1 percent criterion.

Table 6-1 Calibration Statistics

Piezometer	Layer	Observed Head (feet)	Computed Head (feet)	Residual (feet)
PZ-1	weathered BGD	107.40	107.56	-0.16
PZ-2	weathered BGD	107.27	107.26	0.01
PZ-3	weathered BGD	132.08	133.37	-1.29
PZ-4	weathered BGD	157.07	156.34	0.73
PZ-5	weathered BGD	90.39	90.20	0.19
PZ-6	weathered BGD	55.60	55.89	-0.29
PZ-7	weathered BGD	78.05	78.11	-0.06
PZ-8	weathered BGD	23.07	24.83	-1.76
PZ-9	weathered BGD	87.80	87.70	0.10
PZ-10	weathered BGD	105.78	106.07	-0.29
PZ-11	weathered BGD	199.09	200.94	-1.85
PZ-12	weathered BGD	119.65	121.06	-1.41

Residual Mean	-0.51
Absolute Residual Mean	0.68
Residual Standard Deviation	0.81
Sum of Squares	10.95
RMS Error	0.96
Minimum Residual	-1.85
Maximum Residual	0.73
Range in Observations	176.02
Standard Deviation/Range	0.0046

Abbreviations
BGD = Bellingham Glaciomarine Drift
RMS = root mean square

Table 6-2 Simulated and Estimated Steady-State Water Balance

		Estimated Flux (ft^3/d)	Simulated Flux (ft^3/d)
INFLOW	**Recharge**	56,700	56,469.9
	Lake Terrell (Constant Flux - In)		
	Layer 3 (Non-Weathered BGD)	8	7.0
	Western Boundary (Constant Flux - In)		
	Layer 1 (Beach Deposits)	507	179.4
	Layer 2 (Weathered BGD)	180	179.4
	Layer 3 (Non-Weathered BGD)	2	2.0
	Total Inflow	56,890	56,837.7
OUTFLOW	**Lake Terrel (Constant Head)**		
	Layer 1 (Beach Deposits)	2,184	2,060.4
	Layer 2 (Weathered BGD)	4	38.2
	Western Boundary Near BP (Constant Flux - Out)		
	Layer 1 (Beach Deposits)	199	199.8
	Layer 2 (Weather BGD)	532	531.9
	Layer 3 (Non-Weathered BGD)	1	1.4
	Discharge Towards the Strait of Georgia		
	Layer 2 (Weathered BGD)	9,273	9,252.7
	Layer 3 (Non-Weathered BGD)	399	463.0
	Stream and Drainage Network Baseflow[1]	44,297	44,290.1
	Total Outflow	56,890	56,837.5
	Total Inflow - Total Outflow		0.2

Notes
1. Estimated stream and drainage network baseflow calculated as:
   Total Inflow - (Lake Terrell Constant Head Outflow + Western Boundary Near BP Outflow + Discharge Beneath the Strait of Georgia Outflow)

Abbreviations
avg: average
--: unitless
BGD: Bellingham Glaciomarine Drift
d: day
ft: feet

6.2 MODEL RESULTS

This section presents results from the calibrated model.

6.2.1 Simulated Areas of Soil Saturation

To test the validity of the steady-state numerical model, the model was used to plot areas within the Terminal project area where the simulated water table reached the ground surface, resulting in saturated soils. Wetlands are defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (Environmental Laboratory 1987). Figure 6-3 shows actual delineated wetland boundaries in comparison to areas of saturation simulated by the numerical model. The area of saturated surface soil simulated by the numerical groundwater model was similar to the area of delineated wetlands. However, the model simulated an unsaturated area between PZ-3 and PZ-12 and another unsaturated area south of PZ-2, which are known existing wetlands. The model also simulated an area of wetland between PZ-3 and PZ-4, which is known to be upland. Despite these inconsistencies, the overall representation of saturated surface soil produced by the numerical model generally coincided with existing project area wetlands (see Figure 6-3) and, considering the limited data set used for development, demonstrated the efficacy of the model.

There are a number of explanations for the aforementioned inconsistencies. First, this steady-state model provides no indication of duration of saturation (as used in wetland delineation), but rather simulates a single point in time. It is likely that the higher than normal precipitation observed during the study period, which is used as input in the model, resulted in simulated areas of saturation that exceed mapped wetland areas within some portions of the project area. Second, over/under-estimation of saturated soils by the model might also be attributable to the numerical model grid cell resolution, which is much coarser than the resolution used to map project area wetlands. Finally, the model residual mean of 0.5 foot indicated that, on average, the model tended to overestimate groundwater elevations.

6.2.2 Advective Groundwater Flow Paths

Particle tracking methods using the computer code MODPATH (Version 3), along with the calibrated steady-state numerical groundwater model, were used to assess groundwater flow paths within the project area. Particles representing potential constituents were placed within the general area of the proposed Terminal footprint.

Particle tracking results indicate that particles released in the central areas of Layer 1 were captured by Stream 1, Stream 2, or the roadside drainage along Lonseth Road (Figure 6-4). Other roadside drainages did not capture a significant number of particles, indicating that groundwater flow transported particles beneath the drainage. Particles released to the west of Stream 1 from areas near PZ-10 and Henry Road ultimately flowed toward the Strait of Georgia. In the extreme northwest

portion of the project area, particles traveled to the northwest toward Terrell Creek in the Birch Bay Watershed.

Travel times, as indicated by the arrows placed at 3-year increments along flow path lines, indicated most particles released within Layer 1 reached a stream or drainage within 6 years. Particles released west of Stream 1 had travel times typically exceeding 6 years prior to reaching the model boundary condition, which represented underflow toward the Strait of Georgia. Because total porosity, instead of effective porosity, is assigned in the model, the particle travel time may have been underestimated.

Tracking of particles that infiltrate vertically and reach Layers 2 and 3 of the model is shown in Figures 6-5 and 6-6. Very few particles migrated beneath Layer 1. This was expected since deeper layers within the model domain were parameterized with lower hydraulic conductivity values relative to Layer 1. Particles that reached the underlying weathered Bellingham glaciomarine drift and non-weathered glaciomarine drift exhibited longer travel times relative to particle transport in Layer 1 due to the lower permeability associated with the deeper units.

6.3 UNCERTAINTY AND SENSITIVITY ANALYSIS

Sensitivity analyses were performed to assess the sensitivity of the model calibration to certain model inputs by adjusting the inputs within a plausible range and observing the effect on model error.

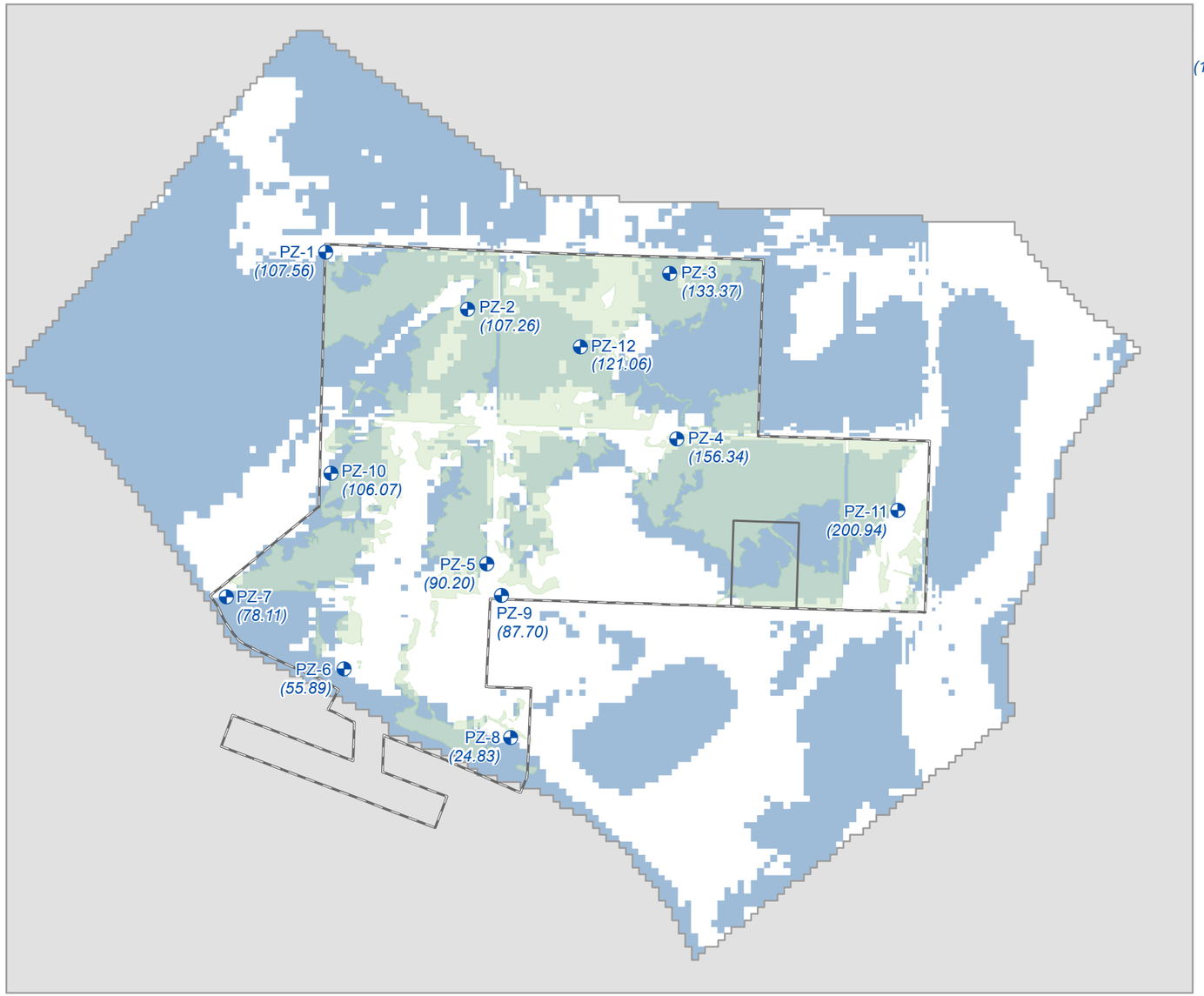
Hydrogeological parameters adjusted to assess sensitivity included:

- Background horizontal hydraulic conductivity in all three layers: the Everson beach deposits and silt, the weathered Bellingham glaciomarine drift, and the non-weathered Bellingham glaciomarine drift;
- Recharge rate;
- Layer 1 flux boundaries; and
- General head boundaries in Layers 2 and 3.

The metric used to quantify model error is the residual standard deviation (RSD) divided by the observed range in head (RSD/range ratio).

6.3.1 Summary of Sensitivity Analysis

Results of the sensitivity study indicated that model calibration was most sensitive to variation in the simulated recharge rate and the background hydraulic conductivity value in Layer 1 (Everson beach deposits and silt).



LEGEND

- PZ-1 (107.56) — PIEZOMETER AND SIMULATED HEAD (FEET)
- SIMULATED UNSATURATED SURFACE SOILS
- SIMULATED SATURATED SURFACE SOILS
- NO FLOW BOUNDARY
- EXISTING WETLAND AREA
- PROPERTY BOUNDARY
- PROJECT AREA BOUNDARY

NOTE:
1. Existing wetland area is provided for spatial reference.

N

0 1,000 2,000 3,000 Feet

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Bothell, WA 98011

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DWN BY: SD
CHK'D BY: MZ
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: SIMULATED SATURATED SURFACE SOILS (LAYER 1)

DATE: JUNE 2012
PROJECT NO.: 091515338C-12-04
REV. NO.: -
FIGURE NO.: FIGURE 6-3

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-12-04 - 2011 Hydrology Report\dwg\Figure 6-3 - Simulated Saturated Surface Soils.mxd

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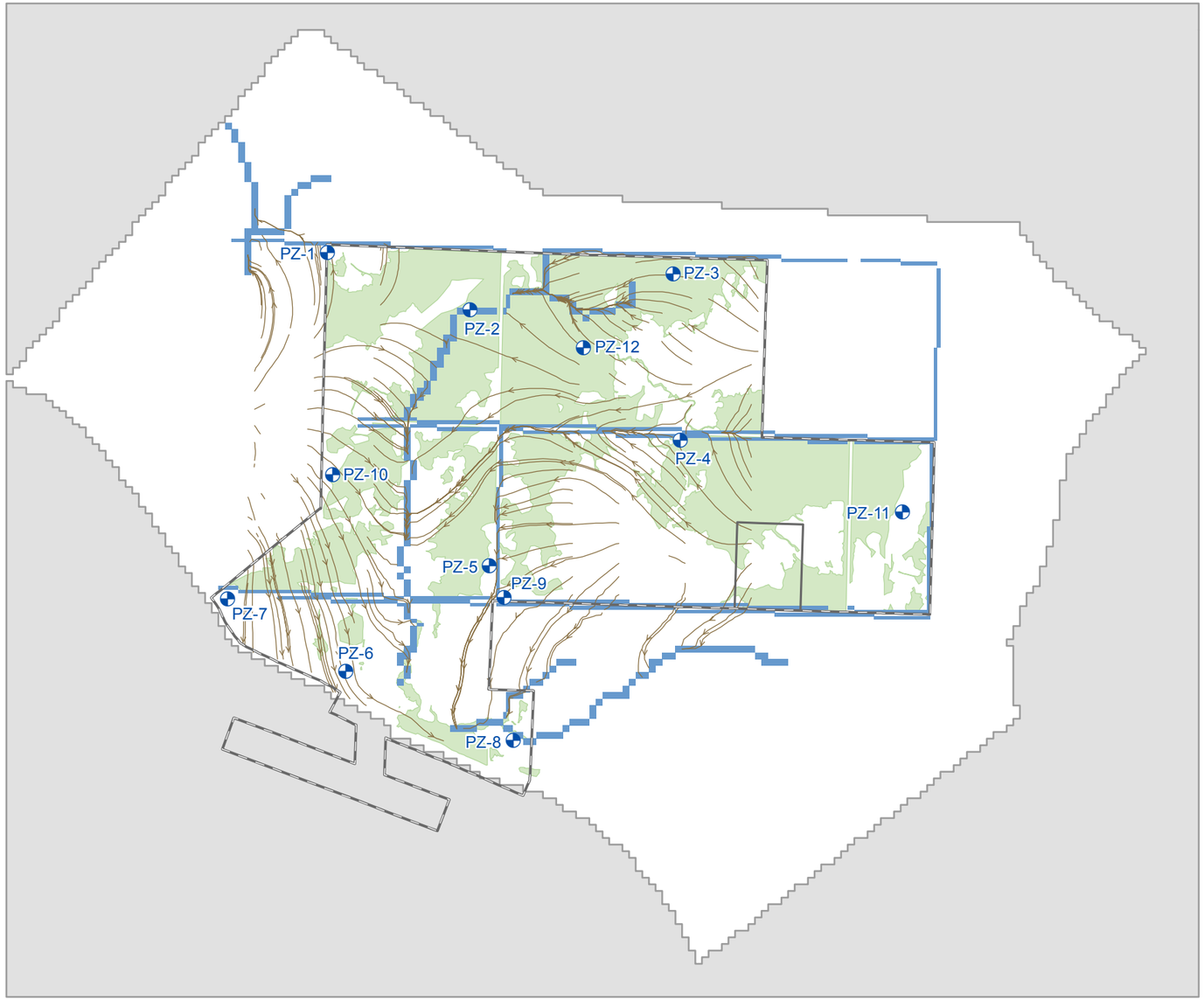

LEGEND

- PZ-1 PIEZOMETER
- LAYER 1 PARTICLE TRACKING (TRACK ARROWS PLACED AT 3-YEAR INTERVALS)
- DRAIN PACKAGE
- NO FLOW BOUNDARY
- EXISTING WETLAND AREA
- PROPERTY BOUNDARY
- PROJECT AREA BOUNDARY

NOTE:
1. Existing wetland area is provided for spatial reference.

0 1,000 2,000 3,000 Feet

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SCALE: 1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: PARTICLE TRACK SIMULATION RESULTS FOR MODEL LAYER 1

DATE: JUNE 2012
PROJECT NO.: 091515338C-12-04
REV. NO.: -
FIGURE NO.: FIGURE 6-4

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-12-04 - 2011 Hydrology Report\dwg\Figure 6-4 - Particle Track Simulation Layer 1.mxd

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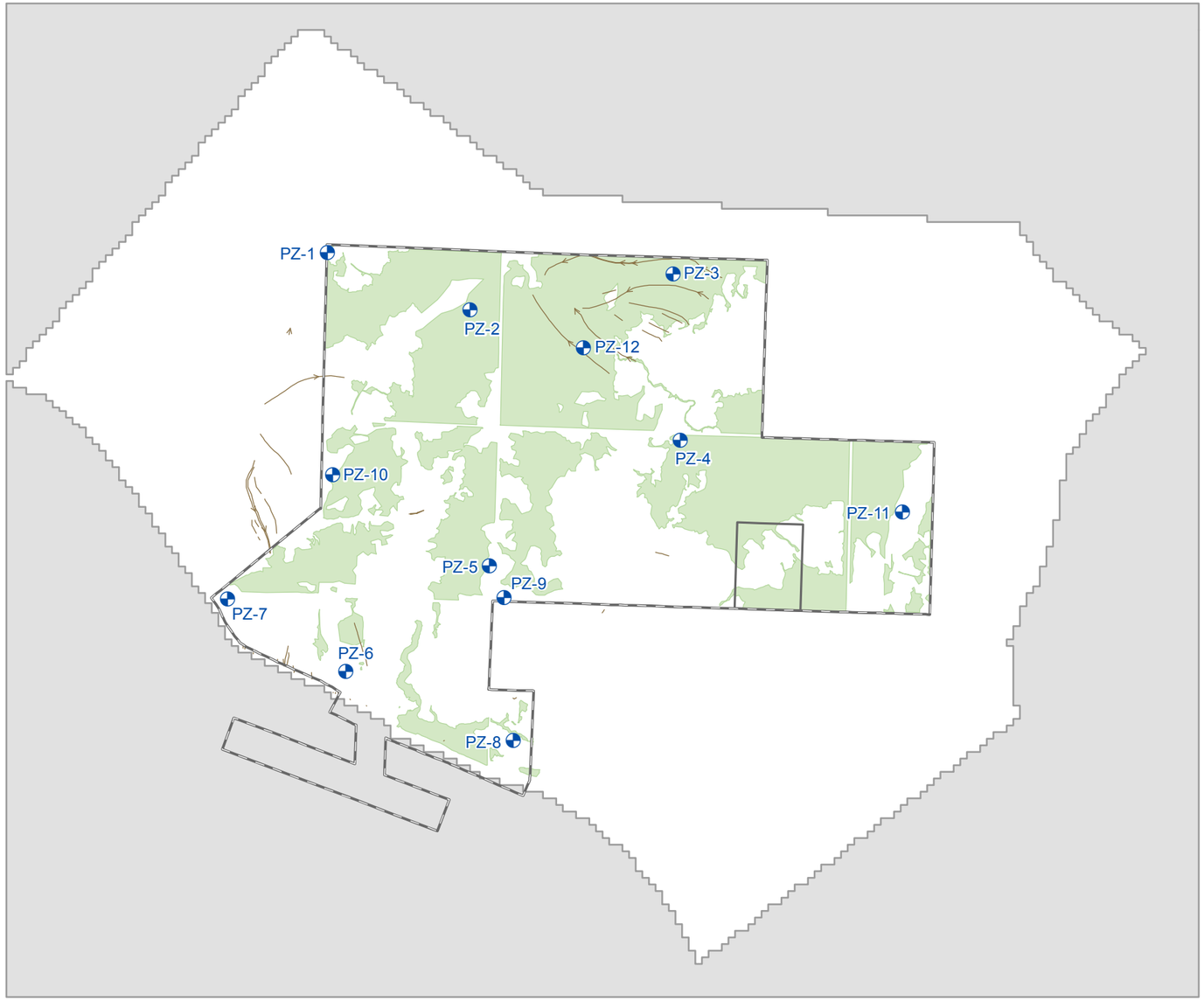

LEGEND

PZ-1 PIEZOMETER

LAYER 2 PARTICLE TRACKING
(TRACK ARROWS PLACED AT 3-YEAR INTERVALS)

NO FLOW BOUNDARY

EXISTING WETLAND AREA

PROPERTY BOUNDARY

PROJECT AREA BOUNDARY

NOTE:
1. Existing wetland area is provided for spatial reference.

0 1,000 2,000 3,000 Feet

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SCALE: 1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: PARTICLE TRACK SIMULATION RESULTS FOR MODEL LAYER 2

DATE: JUNE 2012
PROJECT NO.: 091515338C-12-04
REV. NO.: -
FIGURE NO.: FIGURE 6-5

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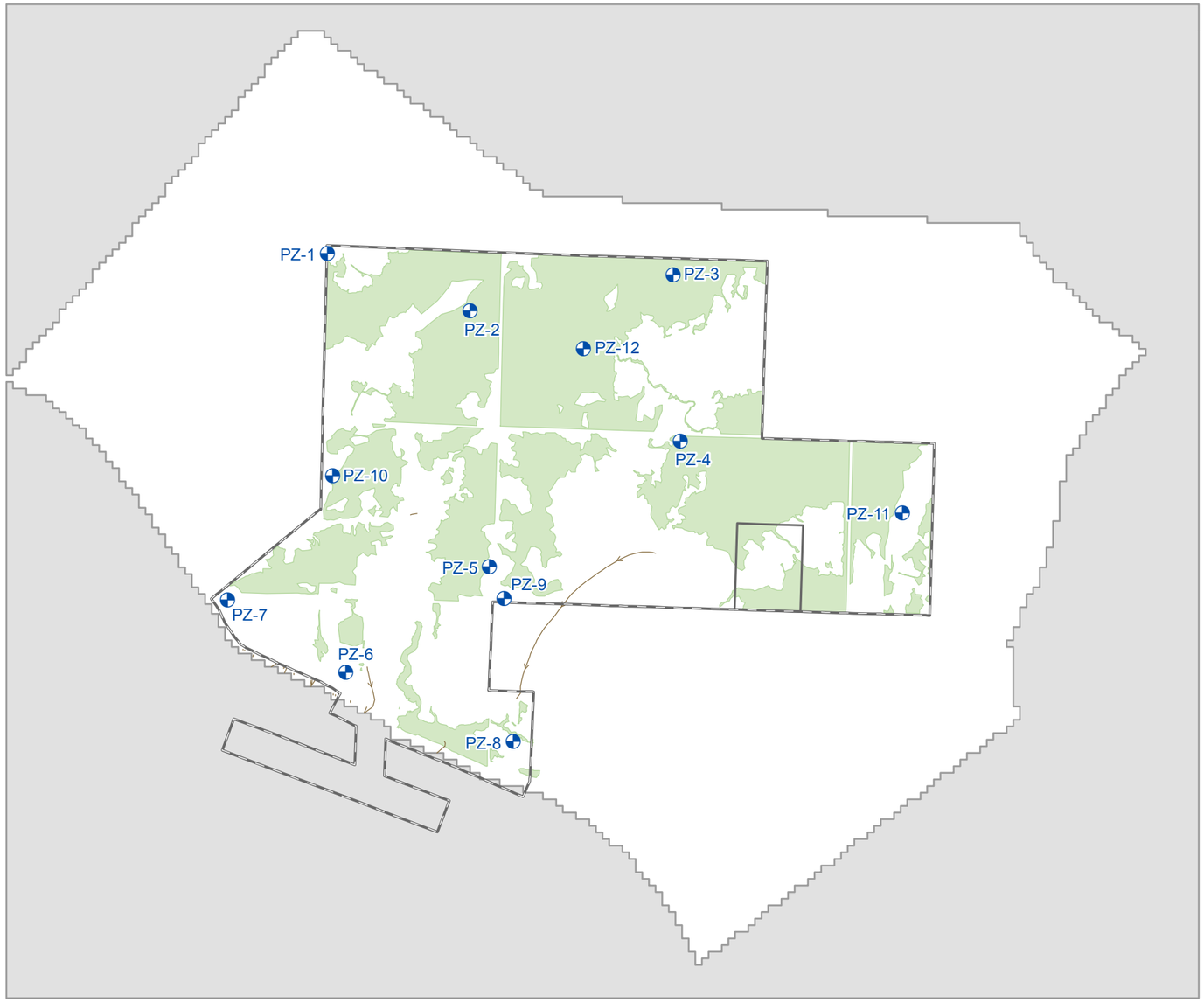

LEGEND

PZ-1 PIEZOMETER

LAYER 3 PARTICLE TRACKING
(TRACK ARROWS PLACED AT 3-YEAR INTERVALS)

NO FLOW BOUNDARY

EXISTING WETLAND AREA

PROPERTY BOUNDARY

PROJECT AREA BOUNDARY

NOTE:
1. Existing wetland area is provided for spatial reference.

0 1,000 2,000 3,000 Feet

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CHK'D BY:	MZ
DATUM:	NAD83
PROJECTION:	WA SP North, Ft.
SCALE:	1 inch = 2,000 feet

PROJECT: GATEWAY PACIFIC TERMINAL

TITLE: PARTICLE TRACK SIMULATION RESULTS FOR MODEL LAYER 3

DATE:	JUNE 2012
PROJECT NO.:	091515338C-12-04
REV. NO.:	-
FIGURE NO.:	FIGURE 6-6

K:\AMEC US OFFICES\KIRKLAND\15338-0\15338C\T-12-04 - 2011 Hydrology Report\dwg\Figure 6-6 - Particle Track Simulation Layer 3.mxd

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Model calibration was relatively insensitive to:

- background hydraulic conductivity parameterization in Layer 2 (weathered Bellingham glaciomarine drift) and Layer 3 (non-weathered Bellingham glaciomarine drift);
- flux boundaries in Layer 1;
- general head boundary conductance terms in Layer 2 and 3; and
- DRAIN package conductance terms in Layer 1.

6.3.2 Sensitivity to Recharge Rate

Sensitivity analysis was performed for the recharge rate by scaling the calibrated recharge rate by factors of 0.85, 0.90, 0.95, 1.0, 1.25, and 1.5, respectively, where a scaling factor equal to 1.0 reproduces results from the calibrated model. The sensitivity analysis indicates that the model was sensitive to increases and decreases in the recharge rate (see Figure 6-7). The minimum RSD/range ratio corresponded to the recharge rate used in the calibrated model (0.000434 foot/day).

6.3.3 Sensitivity to Hydraulic Conductivity

Sensitivity analyses for background horizontal hydraulic conductivity in Layers 1 through 3 were performed by scaling hydraulic conductivity by factors of 0.5, 0.75, 1.0, 1.25, and 1.5 (Figures 6-8 through 6-10). Model calibration was sensitive to decreases in hydraulic conductivity in Layer 1, which causes an increase in model error. The model was relatively insensitive to increases in background horizontal hydraulic conductivity in Layer 1 (Figure 6-8). Likewise, the model was relatively insensitive to reductions in background hydraulic conductivity from the calibrated model value of 0.005 foot/day for Layer 2 (Figure 6-9). An increase from the calibrated Layer 2 horizontal hydraulic conductivity value resulted in a slight increase in model error. Figure 6-10 shows that the model was relatively insensitive to changes in Layer 3 horizontal hydraulic conductivity values.

6.3.4 Sensitivity to Flux and Constant Head Boundaries

Model sensitivity to the constant flux boundaries specified in Layer 1 were evaluated by scaling the assigned boundary flux value by factors of 0.5, 0.75, 0.9, 1.0, 1.1, 1.25, and 1.5. One set of sensitivity analyses were performed for the inflow flux boundary, and a separate set of analyses were done for the outflow flux boundary (Figure 5-3). The results for both inflow and outflow flux boundary sensitivity analyses are presented in Figure 6-11. The numerical model was relatively insensitive to changes in the magnitude of both the inflow and outflow flux boundaries in Layer 1.

Model sensitivity to general head boundaries in Layers 2 and 3 were evaluated by scaling the conductance terms in each general head boundary cell by the same scaling factor. Because

conductance terms vary from cell to cell, the model error metric was plotted as a function of the scaling factor, instead of the actual conductance values. Scaling factors applied to the conductance term were 0.5, 0.75, 0.9, 1.0, 1.1, 1.25, and 1.5, respectively. For the general head boundary in Layer 2 (Figure 6-12), the minimum model error metric occurred when the conductance term was near the calibrated value (i.e., scaling factor equal to 1). A small increase in the conductance term resulted in a slight decrease in model error, but model error began to increase with greater increases in the conductance.

As shown in Figure 6-13, model calibration was relatively insensitive to variations in general head boundary conductance values in Layer 3.

6.3.5 Sensitivity to DRAIN Package Conductance

Finally, model sensitivity to the DRAIN package conductance term was evaluated. The conductance term was scaled by factors of 0.5, 0.75, 0.9, 1.0, 1.1, 1.25, and 1.5. As with the general head boundary, conductance terms vary from cell to cell. Thus, the error metric is plotted as a function of the scaling factor. Results provided in Figure 6-14 indicate that the numerical model was relatively insensitive to variations in the DRAIN boundary conductance values.

6.4 MODEL LIMITATIONS

Calibration of the numerical groundwater model demonstrates that the model is capable of simulating groundwater flow under steady-state conditions for the project area within a reasonable range of error; however, the model is currently applicable only to wet season conditions similar to those observed during the data collection period used to calculate fluxes and head targets for model calibration.

Inherent in any numerical groundwater modeling effort is a degree of uncertainty. For example, there is a fair degree of uncertainty related to stream and drainage network baseflow, recharge rates, and the hydraulic conductivity in Layer 1. Other sources of uncertainty include hydraulic conductivity values in the weathered Bellingham glaciomarine drift, which appear to vary over several orders of magnitude.

Additional data collection activities would reduce model uncertainty. Performing slug tests using piezometers in the Terminal project area would yield data that could be used to calculate improved estimates of hydraulic conductivity for the weathered Bellingham glaciomarine drift and to verify the hydraulic conductivity values used in the model. In addition, when sufficient stream flow data are collected and stream rating curves are completed, baseflow analyses could be performed for project area streams and drainages to better constrain the baseflow component of the water balance.

Overall, model assumptions used are reasonable and conservative. Uncertainty analyses suggest that the calibrated shallow subsurface system model is not a unique solution, but is a good numerical representation of the flow behavior observed from field data under the wet season conditions.

Upon refinement based on additional data, the model will be an appropriate tool for assessing hydrologic and hydrogeologic impacts due to the proposed terminal footprint, terminal activities, and possibly for wetland mitigation scenarios.

6.5 POSSIBLE FUTURE MODELING OBJECTIVES

The calibrated numerical model presents a tool that could be used to evaluate potential impacts on shallow groundwater and surface water resulting from the proposed terminal construction and operation. Data collection as part of the Terminal project area hydrologic and hydrogeologic study will continue. Continuous data collection for a period of one year would allow the entire dry season hydrologic and hydrogeologic response to be considered within the transient model portion of the study.

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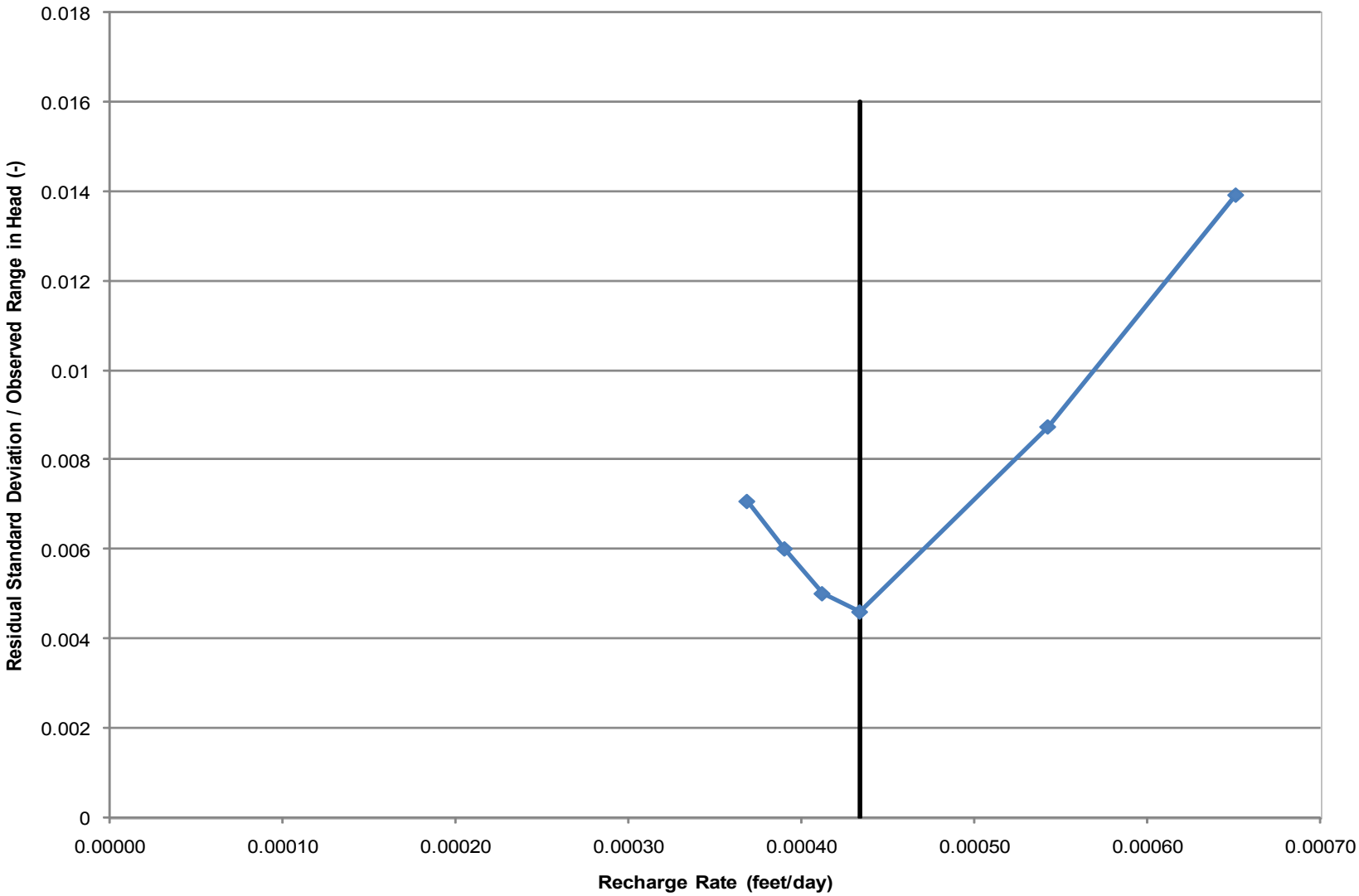

Note: Solid vertical line corresponds to the recharge rate used in the calibrated model.

Abbreviation: - = unitless

amec	RECHARGE RATE SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		6/27/11	Figure No. 6-7

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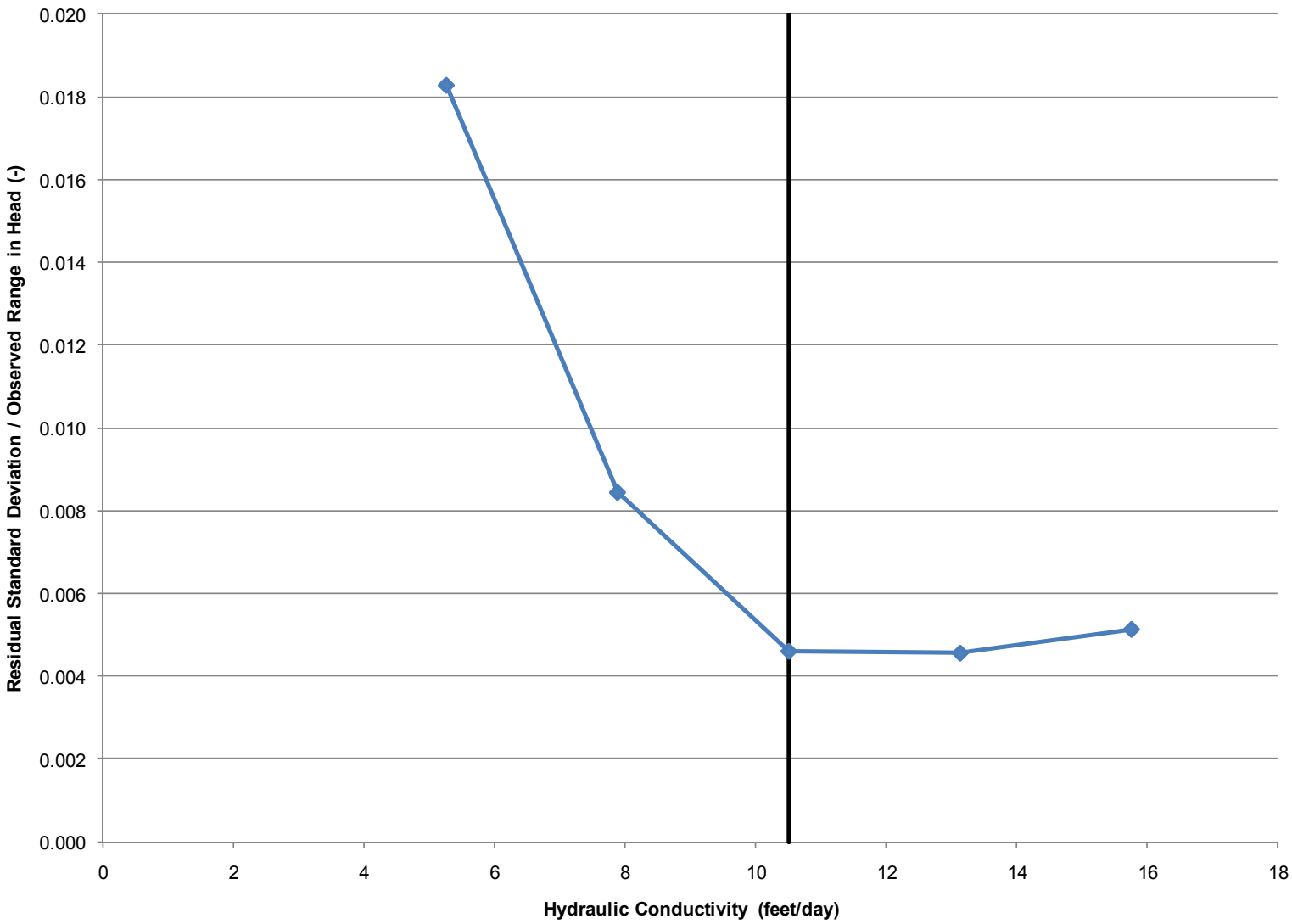

Note: Solid vertical line corresponds to the hydraulic conductivity value used in the calibrated model.

Abbreviation: - = unitless

amec	EVERSON BEACH DEPOSITS AND SILT (LAYER 1): BACKGROUND HYDRAULIC CONDUCTIVITY SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW 6/27/11	Project No. 091515338C Figure No. 6-8

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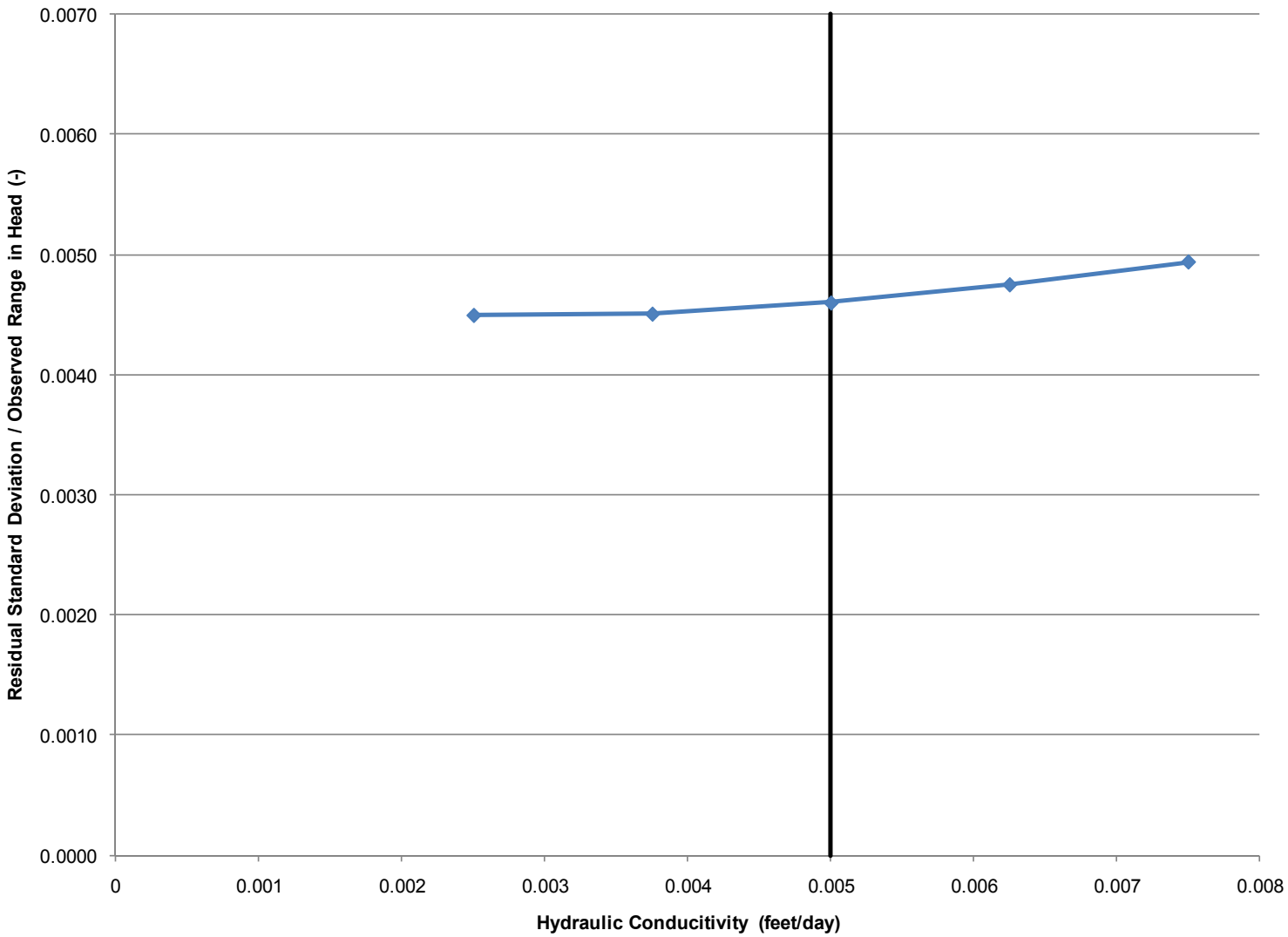

Note: Solid vertical line corresponds to the hydraulic conductivity value used in the calibrated model.

Abbreviation: - = unitless

amec	WEATHERED BELLINGHAM GLACIOMARINE DRIFT (LAYER 2): BACKGROUND HYDRAULIC CONDUCTIVITY SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW 6/27/11	Project No. 091515338C Figure No. 6-9

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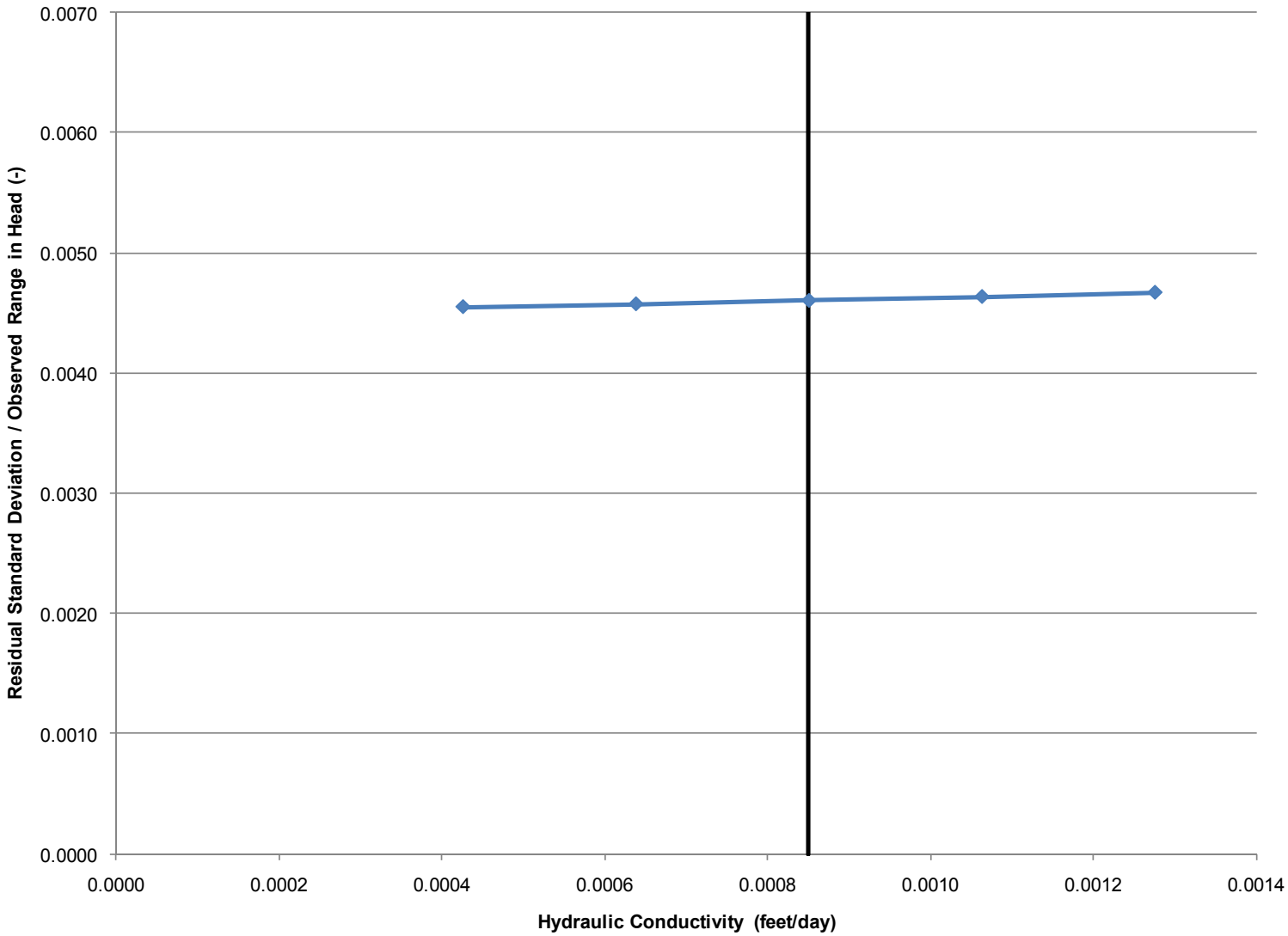

Note: Solid vertical line corresponds to the hydraulic conductivity value used in the calibrated model.

Abbreviation: - = unitless

amec	NON-WEATHERED BELLINGHAM GLACIOMARINE DRIFT (LAYER 3): BACKGROUND HYDRAULIC CONDUCTIVITY SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW 6/27/11	Project No. 091515338C Figure No. 6-10

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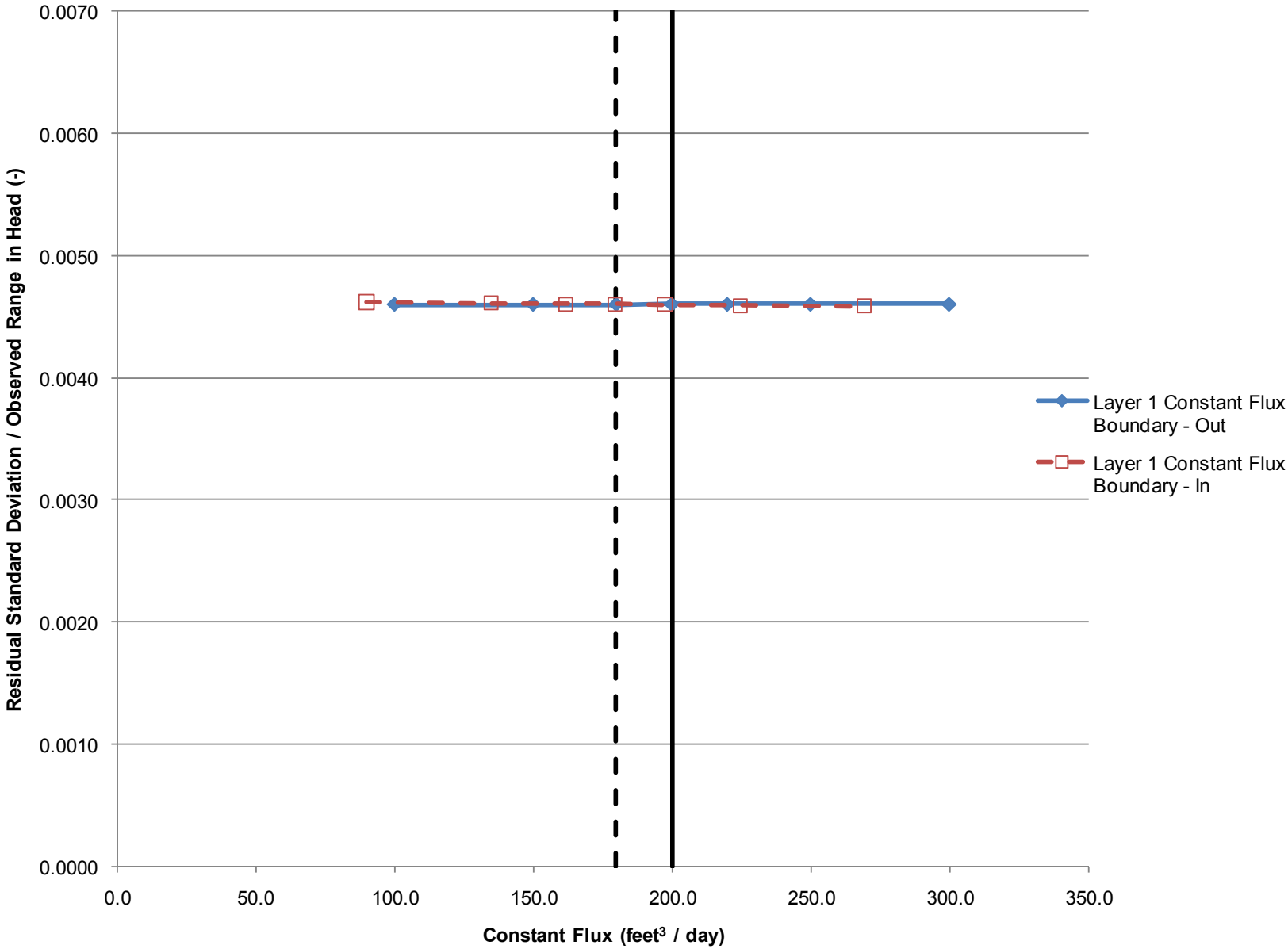

Notes:
1. Solid vertical line corresponds to constant flux "out" value used in the calibrated model.

2. Dashed vertical line corresponds to contant flux boundary "in" value used in the calibrated model.

Abbreviation:
- = unitless

amec	EVERSON BEACH DEPOSITS AND SILT (LAYER 1): CONSTANT FLUX SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		6/27/11	Figure No. 6-11

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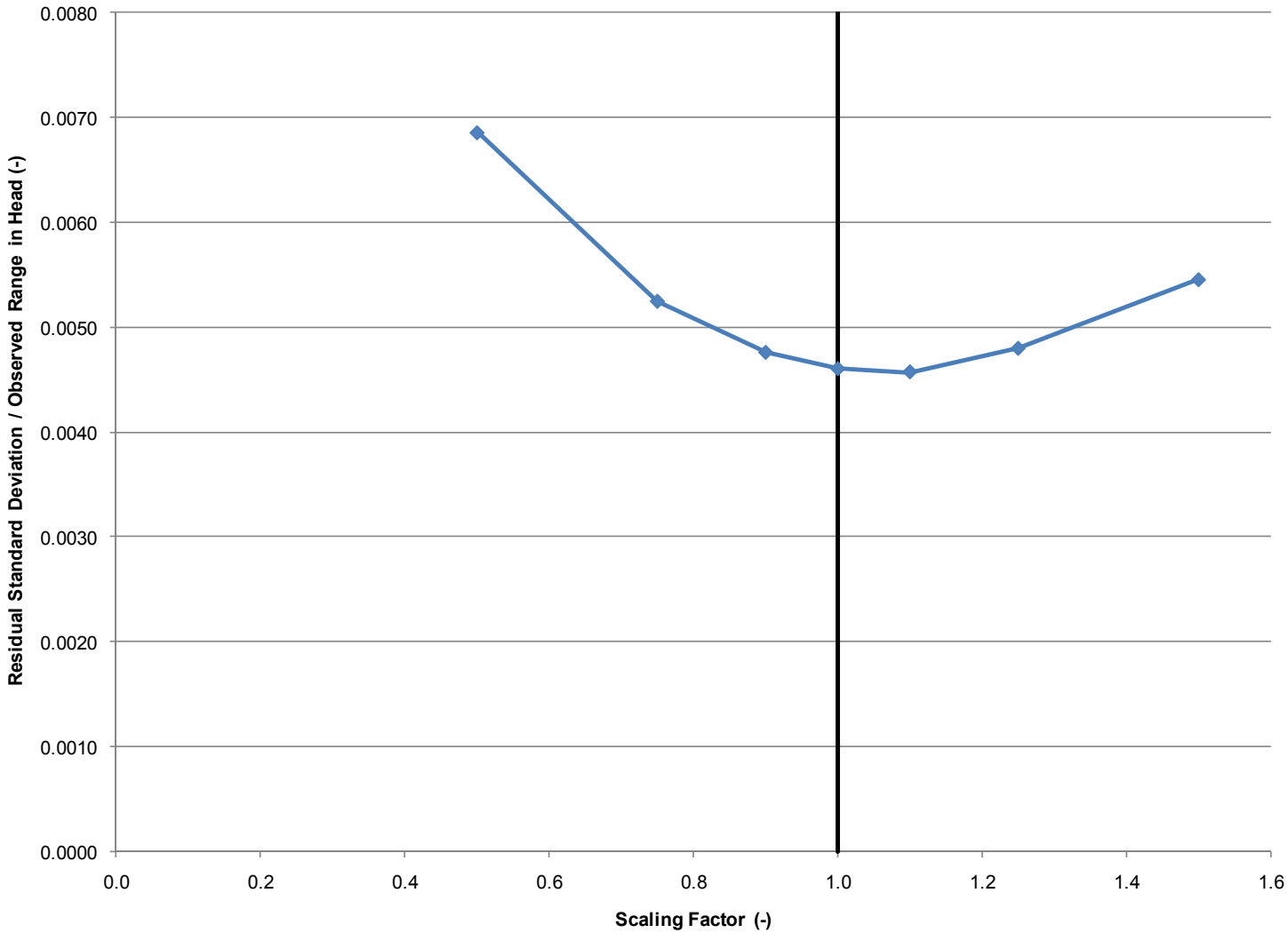

Notes: Solid vertical line corresponds to general head boundary parameterization used in the calibrated model.

Abbreviation: - = unitless

amec	WEATHERED BELLINGHAM GLACIOMARINE DRIFT (LAYER 2): GENERAL HEAD BOUNDARY SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW 6/27/11	Project No. 091515338C Figure No. 6-12

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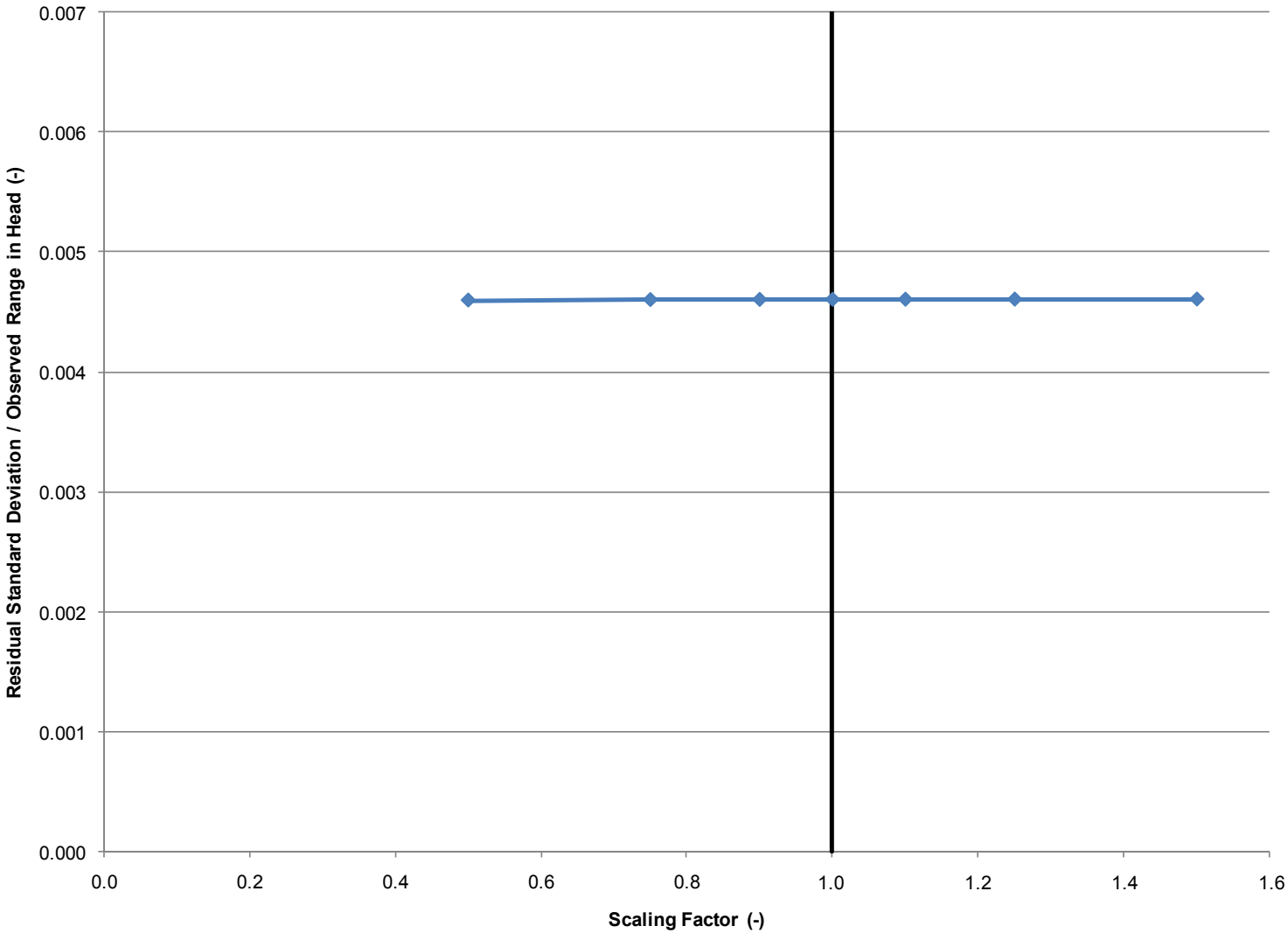

Notes: Solid vertical line corresponds to general head boundary parameterization used in the calibrated model.

Abbreviation: - = unitless

amec	NON-WEATHERED BELLINGHAM GLACIOMARINE DRIFT (LAYER 3): GENERAL HEAD BOUNDARY SENSITIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW 6/27/11	Project No. 091515338C Figure No. 6-13

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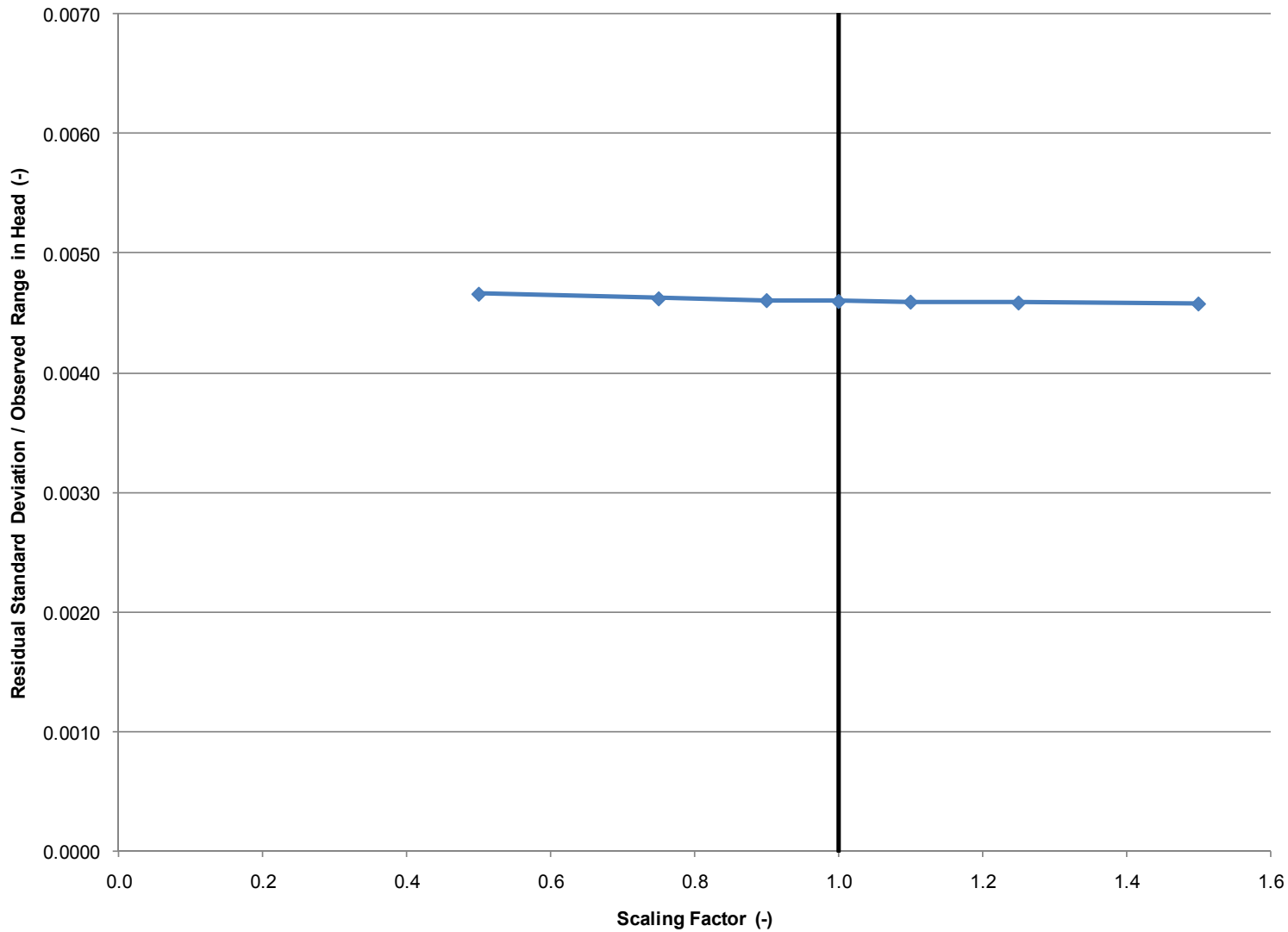

Note: Solid vertical line corresponds to drain package parameterization used in the calibrated model.

Abbreviation: - = unitless

amec	DRAIN PACKAGE CONDUCTANCE SENSTIVITY ANALYSIS Gateway Pacific Terminal Whatcom County, Washington	Prepared By: RLW	Project No. 091515338C
		6/27/11	Figure No. 6-14

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7.0 SUMMARY AND CONCLUSIONS

AMEC has prepared this report to present baseline wet-season groundwater and surface water data for the Terminal project area and a project area hydrologic conceptual and numerical model. The following is a summary of results for the shallow hydrogeologic and surface water investigation based on data collected from late October 2010 through early April 2011.

- Geotechnical samples from the weathered Bellingham glaciomarine drift indicate that porosity ranged from 0.360 to 0.374. Hydraulic conductivity samples for the weathered unit varied from 2.42×10^{-3} foot/day (8.54×10^{-7} cm/sec) to 5.75×10^{-3} foot/day (2.03×10^{-6} cm/sec).
- A geotechnical sample collected from the non-weathered Bellingham glaciomarine drift exhibited porosity equal to 0.358 and hydraulic conductivity equal to 2.82×10^{-4} foot/day (9.93×10^{-8} cm/sec)
- Groundwater within the weathered Bellingham glaciomarine drift is perched due to the low conductivity of the underlying non-weathered Bellingham glaciomarine drift.
- Water levels from the weathered Bellingham glaciomarine drift indicate groundwater flow directions are generally westward between Kickerville and Gulf Roads. To the west of Gulf Road, groundwater flow directions are oriented southward toward the Strait of Georgia.
- Steep hydraulic gradients are present adjacent to the portion of Stream 1 flowing within the ravine and along steep bluffs bordering the Strait of Georgia.
- Discharge values in roadside ditches and streams ranged from 0.1 ft^3/sec to 2.16 ft^3/sec.
- Discharge in Stream 1 increases in the downstream direction. Major stream flow contributions to Stream 1 include runoff that is conveyed within roadside ditches along Lonseth Road and Henry Road.
- Streams and roadside ditches generally receive groundwater flow and were classified as gaining reaches during the study period.
- Surface water stage hydrographs indicated that most roadside ditches, roadside streams, and Stream 1 transmit flood waves following precipitation events. Very small flood waves to no flood waves were observed at SG-6 and SG-12 following precipitation events, which is likely due to the small upstream contributing areas at both of these locations.
- Groundwater samples during first and second quarter 2011 fell within the Ca^{2+}–Na^{+}–HCO_3^{-} water type. Samples from PZ-11 consistently exhibited characteristics of a Na^{+}–HCO_3^{-}–Cl^{-} groundwater type.

- Major anion and cation concentrations observed in groundwater were generally higher relative to concentrations observed in surface water samples collected from Stream 1. This contrast in concentrations suggested that groundwater baseflow was not the primary source of surface water observed at the site during the study period. Instead, stream and ditch flow was likely sustained during the wet season by gradual surface water runoff from adjacent wetland areas.
- Analytical results of water quality sampled in the second quarter indicated that neither groundwater nor surface water samples from the Terminal project area were impacted by SVOCs or petroleum hydrocarbons.
- The water balance indicates that major groundwater inflows to the project area occur as recharge. Major groundwater outflows from the project area include underflow towards the Strait of Georgia and baseflow to streams and drainages.
- The Gateway Pacific Terminal groundwater model spanned a total area of approximately 3,000 acres. The numerical model had an irregular finite-difference grid that incorporated higher spatial resolution within areas containing roadside streams and drainage ditches. The model used a 100-foot by 100-foot grid cell resolution that was refined to 50-foot by 100-foot or 50-foot by 50-foot spacing where ditches and streams were adjacent to roadways. The model was bounded on the north and southeast by a hydraulic no-flow boundary. In the shallow layers on the eastern side of the model domain, the model was bounded by Lake Terrell. Along the southern boundary, the model was bounded by the Strait of Georgia. The northwest edge of the model domain was formed by a combination of constant flux boundaries and a hydraulic no-flow boundary.
- The Gateway Pacific Terminal groundwater model was calibrated to steady-state conditions based on wet season head and groundwater flux data from 2010 and early 2011.
- Results from particle tracking analysis indicated that the majority of particles released within the model ultimately discharged to project area streams and drainages. Particles that originated west of Stream 1 near Henry Road discharged to the Strait of Georgia. Particle tracking results also suggested that the extreme northwest corner of the project area near PZ-1 contributed groundwater to the Birch Bay Watershed. Very few particles reached deeper layers within the groundwater model. Particles that infiltrated to the weathered or non-weathered Bellingham glaciomarine drift layers exhibited longer travel times due to the lower permeability associated with these hydrostratigraphic units.
- Qualitative and quantitative evaluation of the numerical model calibration demonstrated that the model adequately represents the flow behavior observed from project area surface and groundwater data under wet season conditions.

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APPENDIX A

Boring Logs

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PROJECT: Gateway Pacific Terminal Whatcom County, Washington				**Log of Well No. Explanation**	
BORING LOCATION:				TOP OF CASING ELEVATION AND DATUM:	
DRILLING CONTRACTOR:				DATE STARTED:	DATE FINISHED:
DRILLING METHOD:				TOTAL DEPTH (ft.):	SCREEN INTERVAL (ft.):
DRILLING EQUIPMENT:				DEPTH TO WATER (ft.): FIRST / COMPL.	CASING:
SAMPLING METHOD:				LOGGED BY:	
HAMMER WEIGHT:		DROP:		RESPONSIBLE PROFESSIONAL:	REG. NO.

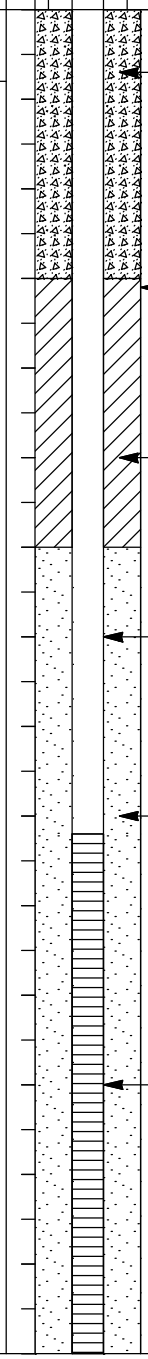
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
1					Notes 1. Soil descriptions are in accordance with the USCS as set forth by ASTM D2488-90 "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)." 2. Soil color described according to Munsell Color Chart.	
2						
3					3. Dashed lines separating soil strata represent inferred boundaries between sampled intervals that may be abrupt or gradual transitions.	
4					4. Solid lines represent approximate boundaries observed within sample intervals. 5. NA = Not applicable.	
5						
6						
7	6P091023-5-7				Interval of soil sampled for geotechnical data analysis.	
8						
9	6P091023-5-7.5	S			Interval of soil sampled for geotechnical analysis using Shelby tube.	
10					Interval of recovered soil collected with split spoon sampler.	
11						
12					Interval of no recovery.	
13						
14						
15						

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-1**
BORING LOCATION: N 690554.4 E 1180945.4	TOP OF CASING ELEVATION AND DATUM: 110.81' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 9/21/10 / DATE FINISHED: 9/21/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 19.5 / SCREEN INTERVAL (ft.): 9.2 to 19.2
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: John Long
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 108.37'
			8 10 11		SILT (ML): dark brown (10YR 3/3), moist, 90% fines, 10% fine sand, medium plasticity
1					LEAN CLAY with SAND (CL): grayish brown (2.5Y 5/2), moist, 80% fines, 15% fine sand, 5% fine gravel, mottled, high plasticity
2			20 24 37		light brownish gray (2.5Y 6/2), decreasing moisture content, rootlets
3			34 35 50		moist, light olive brown (2.5Y 5/3), mottled
4					
5			23 33 38		grayish brown (2.5Y 5/2), high plasticity
6			24 34 39		
7					
8			25 36 40		
9			25 35 38		shell fragments, mottling, increasing moisture content
10					
11			17 22 35		
12			18 38 45		moist, shell fragments, mottling
13					
14			36 42 50		SILTY SAND (SP-SM)
15					70% fines, 25% fine to coarse sand, 5% fine gravel

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-1 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
			12 18 23		LEAN CLAY with SAND (CL): cont.	
16						Schedule 40 PVC well screen, 0.010-inch slot
17			12 18 22		moist, gray (2.5Y 5/1), soft, no mottling	2/12 filter pack sand
18						8" diameter borehole
			18 28 34		moist, 75% fines, 15% fine sand, 5% fine gravel, very soft, high plasticity	
19						Schedule 40 PVC end cap
					Bottom of boring at 19.5 feet.	
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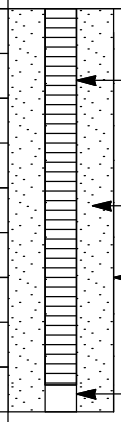
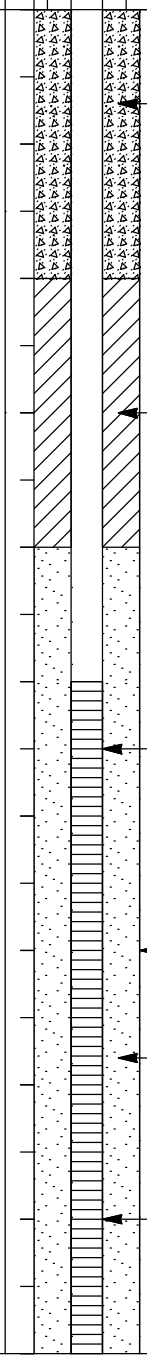


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-2**
BORING LOCATION: N 689686.4 E 1183101.5	TOP OF CASING ELEVATION AND DATUM: 110.85' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 9/21/10 / DATE FINISHED: 9/21/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 19.5 / SCREEN INTERVAL (ft.): 5.0 to 15.0
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: John Long
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 107.80'
			5 5 5		SILT (ML): very dark brown (10YR 2/2), moist, 90% fines, 10% fine to medium sand, organics, roots, medium plasticity
1					
			12 18 20		SILTY SAND (SM): light olive brown (2.5Y 5/3), moist, 90% fine to medium sand, 10% non plastic fines
2					
3			18 21 23		LEAN CLAY with SAND (CL): light olive brown (2.5Y 5/3), moist, 80% fines, 15% fine sand, 5% fine gravel, mottled, high plasticity
4					
5			16 21 23		
6			9 14 15		
7					
8			7 14 15		moist, shell fragments, mottled
9			14 14 15		75% fines, 15% fine sand, 10% fine gravel, olive brown (2.5Y 4/3)
10					

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-2 (cont'd)

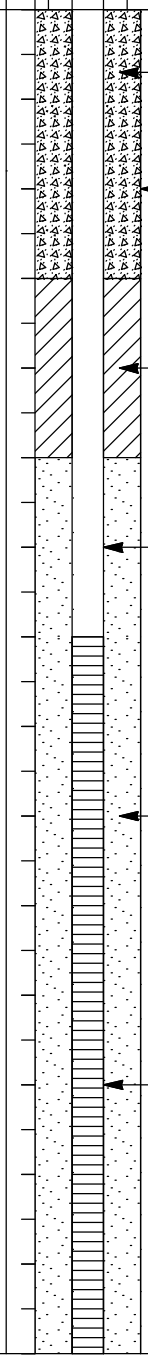
DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					LEAN CLAY with SAND (CL): cont.	
11			11 14 15		80% fines, 15% fine sand, 5% fine gravel, grayish brown (2.5Y 5/2), decreasing mottling	
12			7 14 14		dark gray (2.5Y 4/1), decrease in shell fragments	Schedule 40 PVC well screen, 0.010-inch slot
13					wet	
14			9 13 14			8" diameter borehole
15			12 15 20		moist, gray (2.5Y 5/1), very soft, shell fragments	Schedule 40 PVC end cap
16						
17			12 18 24			Bentonite chips
18			12 18 22			
19						
					Bottom of boring at 19.5 feet.	
20						
21						
22						

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-3**
BORING LOCATION: N 690236.8 E 1186168.7	TOP OF CASING ELEVATION AND DATUM: 134.78' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 9/20/10 / DATE FINISHED: 9/20/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 19.5 / SCREEN INTERVAL (ft.): 7.0 to 16.7
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: John Long
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 132.57'
		X	5 10 15		SILT (ML): very dark brown (7.5YR 2.5/2), moist, 100% fines, roots, medium plasticity
1					
		X			
2			10 15 28		LEAN CLAY with SAND (CL): light olive brown (2.5Y 5/3), moist, 85% fines, 15% fine to medium sand rusty mottling, high plasticity
3					
			14 28 31		dark grayish brown (2.5Y 4/2), moist, 80% fines, 15% fine to medium sand, 5% fine well rounded gravel
4					
5			20 22 27		light olive brown (2.5Y 5/3), decreasing water content
6					
			11 15 16		
7					
8			16 16 19		grayish brown (2.5Y 5/2), no mottling
9					
			14 15 19		dark grayish brown (2.5Y 4/2)
10					
11			9 10 11		moist, 85% fines, 15% fine to medium sand
12					
			7 10 11		moist, 80% fines, 15% fine to medium sand, 5% fine well rounded gravel
13					
14			7 10 12		shell fragments
15					

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-3 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
16			5 7 10		LEAN CLAY with SAND (CL): cont., wet, dark gray (N 4/), shell fragments	8" diameter borehole Schedule 40 PVC well screen, 0.010-inch slot
17			5 8 10		very soft, shell fragments	Schedule 40 PVC end cap 2/12 filter pack sand
18			5 14 18			Bentonite chips
19					Bottom of boring at 19.5 feet.	
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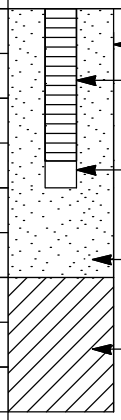
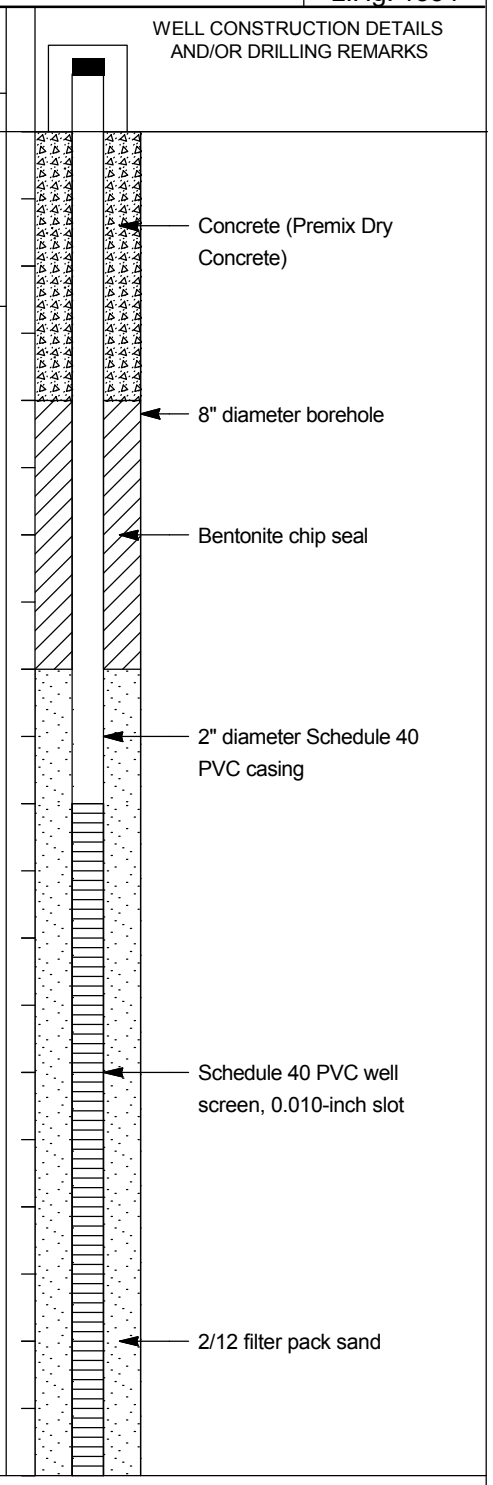


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington		**Log of Well No. PZ-4**	
BORING LOCATION: N 687725.1 E1186276.3		TOP OF CASING ELEVATION AND DATUM: 159.21' (NAVD 88)	
DRILLING CONTRACTOR: Cascade Drilling, Inc.		DATE STARTED: 9/23/10	DATE FINISHED: 9/23/10
DRILLING METHOD: Hollow-stem auger		TOTAL DEPTH (ft.): 19.5	SCREEN INTERVAL (ft.): 5.0 to 15.0
DRILLING EQUIPMENT: CME 75 - Track		DEPTH TO WATER (ft.): FIRST NA, COMPL. NA	CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]		LOGGED BY: John Long	
HAMMER WEIGHT: 140 lb	DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long	REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 157.34'
			18 20 20		SILT (ML): very dark brown (10YR 2/2), dry, 95% fines, 5% fine sand, medium plasticity
1					
			13 35 40		LEAN CLAY with SAND (CL): light olive brown (2.5Y 5/3), dry, 75% fines, 25% fine sand, high plasticity
2					
3					
			20 43 50		dry, 80% fines, 15% fine sand, 5% fine gravel, rusty mottling
4					
5			23 36 40		dry, 75% fines, 15% fine sand, 10% fine gravel, roots, rusty mottling
6					
			18 28 30		
7					
8			23 25 28		
					decreased mottling, increasing moisture content
9		S			
10					



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

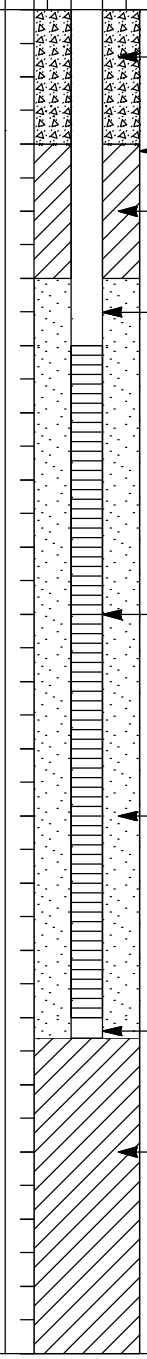
Log of Well No. PZ-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	6P091023-4-9				LEAN CLAY with SAND (CL): cont.	
11		S				8" diameter borehole
12			12 13 15		olive brown (2.5Y 4/3), wet, 75% fines, 15% fine sand, 10% fine to coarse gravel, shell fragments	2/12 filter pack sand
13						Schedule 40 PVC well screen, 0.010-inch slot
14			8 9 12		decreased mottling, shell fragments	
15						Schedule 40 PVC end cap
			7 8 8			
16					gray (2.5Y 5/1), moist, 80% fines, 15% fine sand, 5% fine gravel, very soft, high plasticity	
17			7 8 8		no mottling, shell fragments	Bentonite chips
18						
			6 7 8			
19						
					Bottom of boring at 19.5 feet.	
20						
21						
22						

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington		**Log of Well No. PZ-5**
BORING LOCATION: N 685822.8 E1183393.3		TOP OF CASING ELEVATION AND DATUM: 93.29' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.		DATE STARTED: 9/23/10 / DATE FINISHED: 9/23/10
DRILLING METHOD: Hollow-stem auger		TOTAL DEPTH (ft.): 51.5 / SCREEN INTERVAL (ft.): 5.0 to 15.0
DRILLING EQUIPMENT: CME 75 - Track		DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]		LOGGED BY: John Long
HAMMER WEIGHT: 140 lb	DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 90.81'
1	6P091023-5-7.5		10 12 12		SILT with SAND (ML): very dark brown (10YR 2/2), moist, 85% fines, 15% fine to medium sand, roots, medium plasticity
2	6P091023-5-7		45 17 18		LEAN CLAY with SAND (CL): light olive brown (2.5Y 5/3), moist, 75% fines, 25% fine to medium sand, rusty mottling, high plasticity
3					
4			24 34 36		moist, 80% fines, 15% fine sand, 5% fine gravel
5			24 36 40		75% fines, 20% fine sand, 15% fine to coarse gravel, rusty mottling
6					
7			23 23 25		75% fines, 15% fine sand, 10% fine gravel
8					
9		S			
10					
11			12 15 17		80% fines, 15% fine sand, 5% fine gravel, mottling, roots, increasing moisture content
12			9 12 13		
13					
14			9 12 13		
15					
16					wet, shell fragments, mottling, roots
17			8 9 11		no mottling
18			7 9 11		soft, shell fragments
19					gray (2.5Y 5/1), moist, very soft, shell fragments, high plasticity
20			7		



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-5 (cont'd)

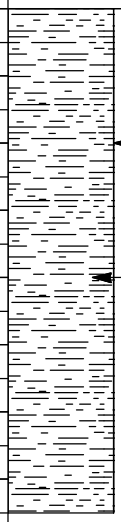
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	6P091023-5-20.5 6P091023-5-21	S	9 11		LEAN CLAY with SAND (CL): cont.	
21						
22						
23						
24						Bentonite chips
25			6 6 7		moist, 85% fines, 15% fine sand, trace gravel	
26						
27						
28						
29						
30			7 7 8		moist, 75% fines, 15% fine sand, 10% fine to coarse gravel	
31						
32						
33						8" diameter borehole
34						
35			8 8 11		70% fines, 15% fine sand, 15% fine to coarse gravel, decreasing moisture content	
36						
37						
38						
39						
40			8 8 9		increasing moisture content	Native backfill
41						
42						
43						
44						

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-5 (cont'd)

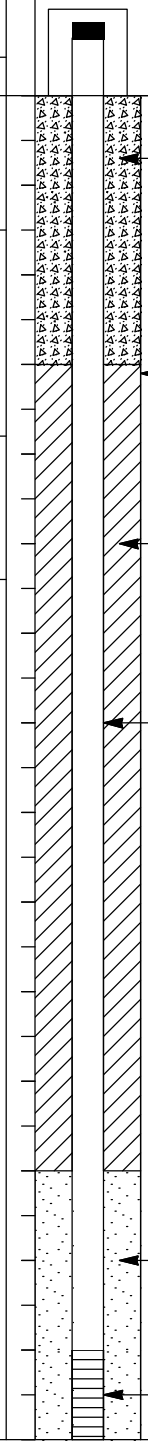
DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					LEAN CLAY with SAND (CL): cont., 75% fines, 15% fine sand, 10% fine gravel	
45						
46			8 8 9		SANDY LEAN CLAY (CL)	8" diameter borehole
47						
48						Native backfill
49						
50					80% fines, 15% fine sand, 5% fine gravel	
51						
52					Bottom of boring at 51.5 feet.	
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-6**
BORING LOCATION: N 684229.6 E1181223.9	TOP OF CASING ELEVATION AND DATUM: 59.82' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 9/20/10 / DATE FINISHED: 9/20/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 24.0 / SCREEN INTERVAL (ft.): 14.0 to 23.7
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: John Long
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 57.49'
1		X	6 8 9		SILT (ML): dark gray (2.5Y 4/1), moist, 100% fines, trace sand, roots, medium plasticity
2		X	35 40 50		POORLY GRADED SAND with GRAVEL (SP): dark yellowish brown (10YR 4/4), dry, 75% medium to coarse sand, 25% fine to coarse well rounded gravel
3		X	25 25 29		
4			16 25 28		LEAN CLAY with GRAVEL (CL): dark grayish brown (10YR 4/2), dry, 65% fines, 15% fine to medium sand, 20% fine to coarse gravel, rusty mottling, high plasticity
5			17 25 27		LEAN CLAY with SAND (CL): dark grayish brown (2.5Y 4/2), dry, 70% fines, 20% fine sand, 10% fine gravel, mottling, high plasticity
6					
7					
8			21 28 30		olive brown (2.5Y 4/3), dry, 75% fines, 15% fine sand, 10% fine gravel, high plasticity
9			19 23 25		80% fines, 15% fine sand, 5% fine gravel
10					
11			16 20 23		dark grayish brown (2.5Y 4/2), rusty mottling
12			16 18 22		
13					
14			31 42 45		increasing moisture content, rusty mottles
15					



WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-6 (cont'd)

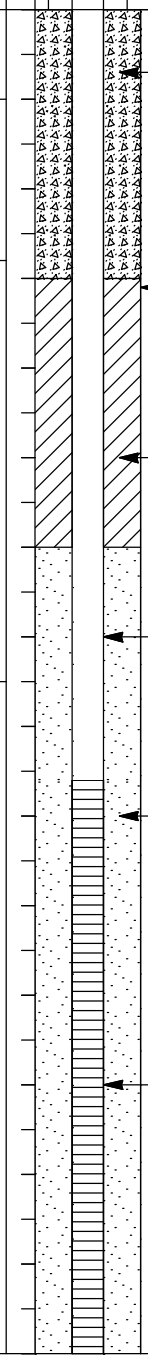
DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					LEAN CLAY with SAND (CL): cont.	
16			11 20 38		moist, 75% fines, 15% fine to coarse sand, 10% fine gravel	Schedule 40 PVC well screen, 0.010-inch slot
17			16 28 35			
18						8" diameter borehole
19			15 27 13		moist, gray (N 4/), 85% fines, 15% fine sand, shell fragments, soft, high plasticity	
20					very soft, shell fragments	
21						2/12 filter pack sand
22			10 15 18			
23					70% fines, 15% fine sand, 15% fine well rounded gravel, shell fragments, very soft, high plasticity	
24						Schedule 40 PVC end cap
					Bottom of boring at 24.0 feet.	
25						
26						
27						
28						
29						
30						
31						
32						
33						

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-7**
BORING LOCATION: N 685321.7 E 1179439.2	TOP OF CASING ELEVATION AND DATUM: 80.72' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 12/14/10 / DATE FINISHED: 12/14/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 18.9 / SCREEN INTERVAL (ft.): 8.8 to 18.6
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: Robert Wyckoff
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation: 78.56'
1			2 4 6		SILT with SAND (ML): black (2.5Y 2.5/1), moist, 80% fines, 20% fine sand, medium plasticity
					SILTY SAND (SM): dark yellowish brown (10YR 3/6), wet, 85% fine to coarse sand, 15% fines, trace gravel
2			2 3 5		75% fine to coarse sand, 15% fines, 10% fine gravel
3			4 50 for 4"		SANDY LEAN CLAY (CL): dark grayish brown (2.5Y 4/2), moist, 70% fines, 30% fine to medium sand, very hard, high plasticity
4					
5			30 50 for 5"		60% fines, 40% fine to medium sand
6			15 50 for 6"		POORLY GRADED SAND (SP)
7					POORLY GRADED SAND (SP)
8			27 50 for 6"		LEAN CLAY with SAND (CL): dark grayish brown (2.5Y 4/2), moist, 80% fines, 20% fine to medium sand, firm, high plasticity
9			20 30 37		
10					
11			17 19 20		
12			17 19 20		SANDY LEAN CLAY (CL)
13					increasing coarse gravel content
14			9 10 20		increasing fine sand content
15					

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-7 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
			6 7 8		LEAN CLAY with SAND (CL): cont., dark gray (N 4/)	Schedule 40 PVC well screen, 0.010-inch slot
16						
			12 15 22		shell fragments, wet	2/12 filter pack sand
17						
						8" diameter borehole
18						
						Schedule 40 PVC end cap
19					Bottom of boring at 18.6 feet.	
20						
21						
22						
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26						
27						
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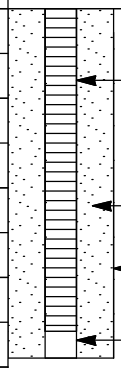
29						
30						
31						
32						
33						

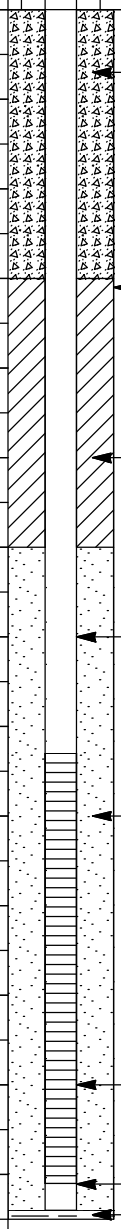


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-8**
BORING LOCATION: N 683190.8 E 1183752.0	TOP OF CASING ELEVATION AND DATUM: 29.58' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 12/15/10 / DATE FINISHED: 12/15/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 13.5 / SCREEN INTERVAL (ft.): 8.3 to 13.1
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: Robert Wyckoff
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 27.04'
1			5 6 7		SILTY SAND (SM): black (10YR 2/1), moist, 70% fine to medium sand, 30% non plastic fines
2			3 4 4		POORLY GRADED SAND (SP): strong brown (7.5YR 4/6), moist, 85% fine to coarse sand, 10% fine gravel, 5% non plastic fines
3			12 14 12		POORLY GRADED SAND with GRAVEL (SP): dark yellowish brown (10YR 4/6), moist, 80% fine to coarse sand, 15% fine gravel, 5% non plastic fines
4					
5			7 9 8		POORLY GRADED SAND with SILT and GRAVEL (SP-SM)
6					SANDY LEAN CLAY (CL): dark grayish brown (2.5Y 4/2), moist, 70% fines, 30% fine to medium sand, rusty mottles, hard, high plasticity
7			15 27 16		SANDY SILT (ML): olive brown (2.5Y 4/3), moist, 50% fines, 50% fine sand, very soft, non plastic
8			18 24 15		SANDY LEAN CLAY (CL): light olive brown (2.5Y 5/3), moist, 70% fines, 30% fine to medium sand, rusty mottles, very soft, high plasticity
9					
10			7 10 12		
11					increasing moisture content
12					bluish gray (10B 5/1)
13					
14					Bottom of boring at 13.5 feet.
15					

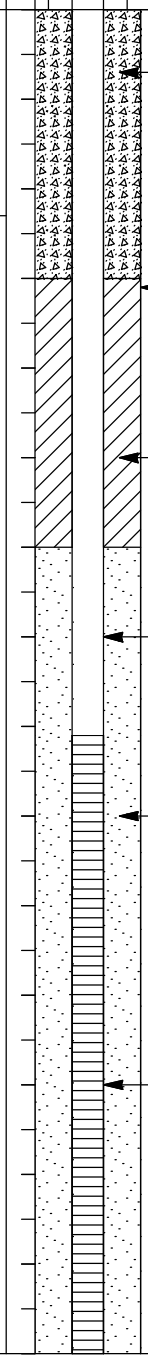
WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-9**
BORING LOCATION: N 685341.6 E1183614.3	TOP OF CASING ELEVATION AND DATUM: 89.86' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 12/15/10 / DATE FINISHED: 12/15/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 18.3 / SCREEN INTERVAL (ft.): 8.1 to 17.9
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: Robert Wyckoff
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 88.01'
			1 1 1		SILT with SAND (ML): very dark brown (10YR 2/2), wet, 75% fines, 25% fine sand, medium plasticity
1		X			
2			12 9 5		LEAN CLAY with SAND (CL): olive brown (2.5Y 4/4), moist, 75% fines, 25% fine to medium sand, rusty mottles, firm, high plasticity
3		X			SILTY SAND (SM)
4			22 50 for 6"		
5			9 50 for 6"		trace gravel
6		X			
7			5 21 23		trace coarse gravel
8			8 18 20		trace coarse gravel
9			8 13 14		
10					
11			4 9 12		trace gravel
12		X	10 12 15		increasing moisture content, soft
13					
14			7 8 9		SANDY LEAN CLAY (CL) 75% fines, 25% fine to medium sand
15					

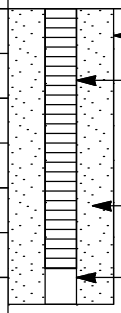


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-9 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
16			19 20 24		LEAN CLAY with SAND (CL): cont., moist, dark gray (N 4/), 80% fines, 20% fine to medium sand, rusty mottling, very soft wet	8" diameter borehole Schedule 40 PVC well screen, 0.010-inch slot
17			12 15 14		moist, very soft	2/12 filter pack sand
18						Schedule 40 PVC end cap
					Bottom of Boring at 18.3 feet.	
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

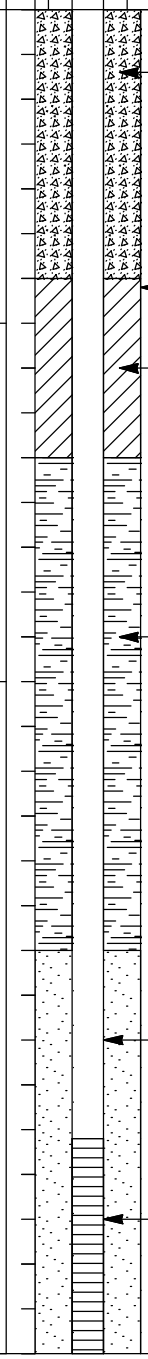


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-10**
BORING LOCATION: N 687204.9 E 1181030.0	TOP OF CASING ELEVATION AND DATUM: 108.77' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 12/13/10 / DATE FINISHED: 12/13/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 22.7 / SCREEN INTERVAL (ft.): 12.6 to 22.4
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: Robert Wyckoff
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: 106.52'
1			4 4 6		SILTY SAND (SM): dark reddish brown (5YR 2.5/2), moist, 80% fine to medium sand, 20% non plastic fines, grass roots
2			5 6 7		wet, olive brown (2.5Y 4/4), roots
3			20 40 60		SANDY LEAN CLAY (CL): olive brown (2.5Y 4/3), moist, 70% fines, 30% fine to coarse sand, trace gravel, rusty mottling, high plasticity
4					
5			23 33 48		65% fines, 30% fine to coarse sand, 5% fine gravel
6			20 40 50		POORLY GRADED SAND (SP)
7					
8			13 18 30		LEAN CLAY with SAND (CL): olive brown (2.5Y 4/3), moist, 75% fines, 25% fine to medium sand, trace gravel, mottled, firm, high plasticity
9			13 18 20		
10					
11			6 20 23		
12			8 22 24		
13					
14			10 15 32		
15					

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-10 (cont'd)

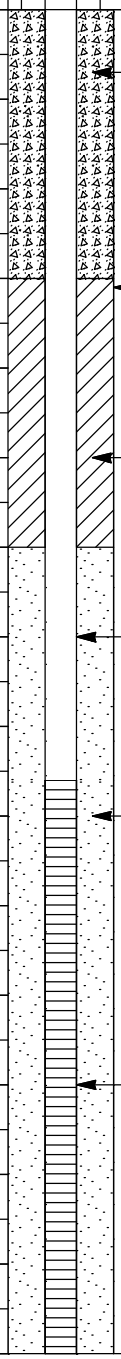
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
16			15 30 35		SANDY LEAN CLAY (CL): olive brown (2.5Y 4/3), moist, 65% fines, 30% fine to coarse sand, 5% fine gravel, high plasticity	2/12 filter pack sand
17			11 18 28			
18					POORLY GRADED SAND (SP)	
19			7 10 14		LEAN CLAY with SAND (CL): olive brown (2.5Y 4/3), moist, 80% fines, 20% fine to medium sand, trace gravel, high plasticity dark gray (N 4/), moist, firm, high plasticity	8" diameter borehole
20			10 15 50		increased mottling	
21			5 10 52		very soft	Schedule 40 PVC well screen, 0.010-inch slot
22						Schedule 40 PVC end cap
23					Bottom of boring at 22.7 feet.	
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						

OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-11**
BORING LOCATION: N 686636.8 E 189624.3	TOP OF CASING ELEVATION AND DATUM: 203.41' (NAVD 88)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 12/17/10 / DATE FINISHED: 12/17/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 18.8 / SCREEN INTERVAL (ft.): 8.6 to 18.4
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: Robert Wyckoff
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation: 202.04'
1			2 5 8		SILT with SAND (ML): very dark brown (10YR 2/2), moist, 85% fines, 15% fine sand, organics, roots, non-plastic
					75% fines, 25% fine sand, trace gravel
2			4 10 10		SANDY LEAN CLAY (CL): dark olive brown (2.5Y 3/3), moist, 70% fines, 30% fine to medium sand, roots, medium plasticity
3			20 50 for 5"		
4					POORLY GRADED SAND with SILT and GRAVEL (SP-SM): olive brown (2.5Y 4/4), moist, 75% fine to coarse sand, 15% fine to coarse gravel, 10% non-plastic fines
5			50 for 6"		
6			22 50 for 5"		SANDY LEAN CLAY (CL): olive brown (2.5Y 4/3), moist, 70% fines, 30% fine to medium sand, rusty mottles, very hard, high plasticity
7					
8			12 14 15		trace gravel
9			7 8 9		hard
10					blueish gray streaking
11			19 50 for 5"		
12			18 23 27		LEAN CLAY with SAND (CL): olive brown (2.5Y 4/3), 75% fines, 15% fine sand, 10% fine gravel, soft
13					
14			12 11 15		80% fines, 20% fine sand, firm, no mottling, no blueish gray streaking
15					

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

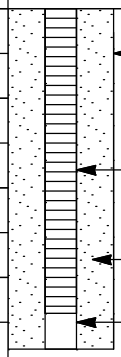


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-11 (cont'd)

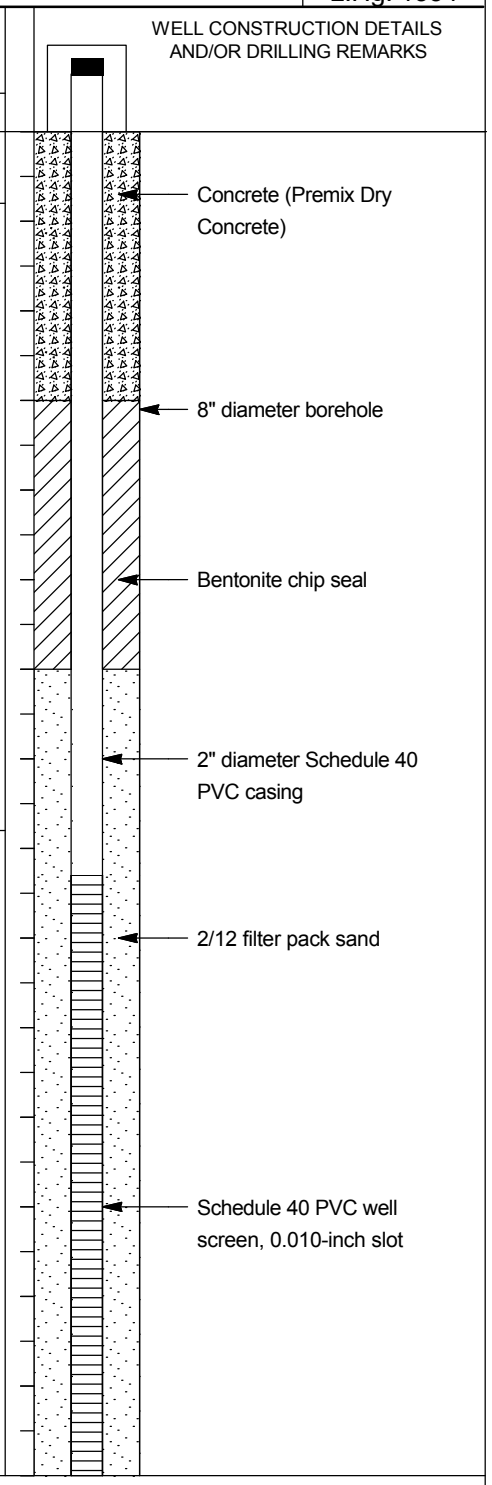
DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
			7 12 17		LEAN CLAY with SAND (CL): cont., light olive brown (2.5Y 5/3)	8" diameter borehole
16						
17			10 10 10		very soft	Schedule 40 PVC well screen, 0.010-inch slot
					dark greenish gray (5GY 4/1)	2/12 filter pack sand
18						Schedule 40 PVC end cap
19					Bottom of boring at 18.8 feet.	
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						



OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal Whatcom County, Washington	**Log of Well No. PZ-12**
BORING LOCATION: N 689119.1 E1184815.2	TOP OF CASING ELEVATION AND DATUM: 121.73' (NAVD)
DRILLING CONTRACTOR: Cascade Drilling, Inc.	DATE STARTED: 12/16/10 / DATE FINISHED: 12/16/10
DRILLING METHOD: Hollow-stem auger	TOTAL DEPTH (ft.): 18.4 / SCREEN INTERVAL (ft.): 8.3 to 18.1
DRILLING EQUIPMENT: CME 75 - Track	DEPTH TO WATER (ft.): FIRST NA, COMPL. NA / CASING: 2" Sched. 40 PVC
SAMPLING METHOD: Split-spoon drive sampler [18" x 1.5"]	LOGGED BY: Robert Wyckoff
HAMMER WEIGHT: 140 lb / DROP: 30 inches	RESPONSIBLE PROFESSIONAL: J. Long / REG. NO. L.Hg. 1354

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation: 119.74'
1			5 6 11		SILT with SAND (ML): very dark gray (2.5Y 3/1), moist, 85% fines, 15% fine sand, roots, organics, medium plasticity
2			12 10 8		SANDY LEAN CLAY (CL): dark grayish brown (2.5Y 4/2), moist, 70% fines, 30% fine to medium sand, soft, high plasticity
					trace gravel, decreasing roots
3			20 50 for 5"		
4					SILTY SAND (SM)
5			50 for 6"		
6			50 for 6"		
7					SILT WITH SAND (ML)
8			19 20 23		LEAN CLAY with SAND (CL): dark grayish brown (2.5Y 4/2), 80% fines, 20% fine sand, rusty mottles with blueish gray streaking, increasing moisture
9			5 10 15		
10					
11			12 18 22		trace coarse gravel
					SANDY LEAN CLAY (CL)
12			7 9 11		trace gravel, grayish brown (2.5Y 5/2)
13					
14			7 8 8		gray (2.5Y 5/1), shell fragments, decreased rusty mottling
15					SANDY LEAN CLAY (CL)

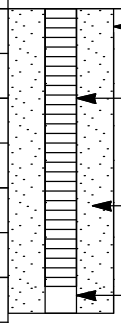


OAKWELLV_TOC (REV. 9/2007)

PROJECT: Gateway Pacific Terminal
Whatcom County, Washington

Log of Well No. PZ-12 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
			6 6 5		LEAN CLAY with SAND (CL): cont., dark blueish gray (5B 4/1), moist, 85% fines, 15% fine sand, trace gravel, very soft	8" diameter borehole
16						Schedule 40 PVC well screen, 0.010-inch slot
					75% fines, 15% fine sand, 10% fine gravel	
17						2/12 filter pack sand
18						Schedule 40 PVC end cap
					Bottom of boring at 18.4 feet.	
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						



OAKWELLV_TOC (REV. 9/2007)

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APPENDIX B

Well Reports

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The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 39-1E-19C

Notice of Intent No. RE05009

Construction/Decommission

391118

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals, Inc.

Site Address: Gulf Rd

City: Ferndale County: 37-Whatcom (EWM)

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

Consulting Firm: AMEC Geomatrix-Seattle

Unique Ecology Well ID Tag No.: BCT 328

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print): Scott Krueger

Driller/Trainee Signature: [signature]

Driller/Trainee License No.: 2073

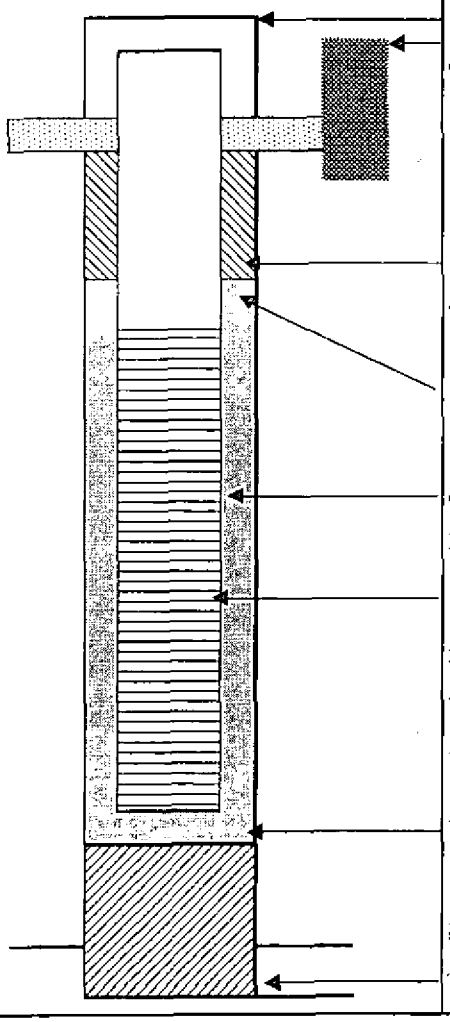
If trainee, licensed driller's Signature and License No. _____

Cased or Uncased Diameter: 8 Static Level: N/A

Work/Decommission Start Date: 9-21-10

Work/Decommission End Date: " "

Construction/Design



Well Data W10-517

Locking Cap	
Protective Post	
Concrete Surface Seal Depth	2 FT
Blank Casing (dia x dep)	2 10
Material	pvc
Backfill	4 FT
Type	Bent chips
Seal	
Material	
Gravel Pack	12 FT
Material	2/12
Screen (dia x dep)	2 10
Slot Size	1010
Material	pvc
Well Depth	18. FT
Backfill	Bent chips
Material	
Total Hole Depth	19.5 FT

Formation Description

0 - 15 FT brown Silty Clay

015 - 19.5 FT gray Silty Clay

0 - FT

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OCT 7 2010

WATER RESOURCES PROGRAM NWRO

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 39-1E-19C

Notice of Intent No. RE05009

Construction/Decommission 391117

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals, Inc.

Site Address: Gulf Rd

Consulting Firm: AMEC Geomatrix-Seattle

City: Ferndale County: 37-Whatcom (EWM)

Unique Ecology Well ID Tag No.: BCT 327

Location: 1/4 NE 1/4 NW Sec 19, Twn 39N R 1E or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

[X] Driller [ ] Engineer [ ] Trainee Name (Print): Scott Krueger

Driller/Trainee Signature: Scott K

Driller/Trainee License No.: 2073

If trainee, licensed driller's Signature and License No. _____

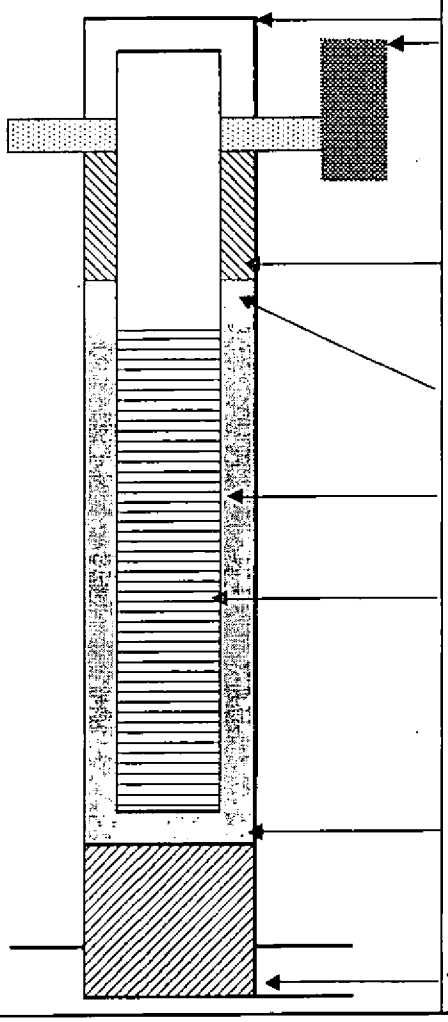
Tax Parcel No. _____

Cased or Uncased Diameter: 8 Static Level: 5

Work/Decommission Start Date: 9-21-10

Work/Decommission End Date: 11. 11

Construction/Design



Well Data W10-517

Locking Cap	
Protective Post	
Concrete Surface Seal Depth	2 FT
Blank Casing (dia x dep)	2 8
Material	pvc
Backfill	2 FT
Type	Bent chips
Seal	
Material	
Gravel Pack	11 FT
Material	2/12
Screen (dia x dep)	2 10
Slot Size	.010
Material	pvc
Well Depth	15 FT
Backfill	
Material	Bent chips
Total Hole Depth	19.5 FT

Formation Description

0 - 15 FT brown silty clay

015 - 19.5 FT grey silty clay

0 - FT

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Scale 1" = _____ Page _____ of _____

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RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 39-1E-19C

Notice of Intent No. RE05009

Construction/Decommission 391116 MW-3

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals, Inc.

Site Address: Gulf Rd

City: Ferndale County: 37-Whatcom (EWM)

Consulting Firm: AMEC Geomatrix-Seattle

Unique Ecology Well ID Tag No.: BCT 326

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Tax Parcel No. _____

[X] Driller [ ] Engineer [ ] Trainee Name (Print): Scott Krueger

Driller/Trainee Signature: Scott K

Driller/Trainee License No.: 2073

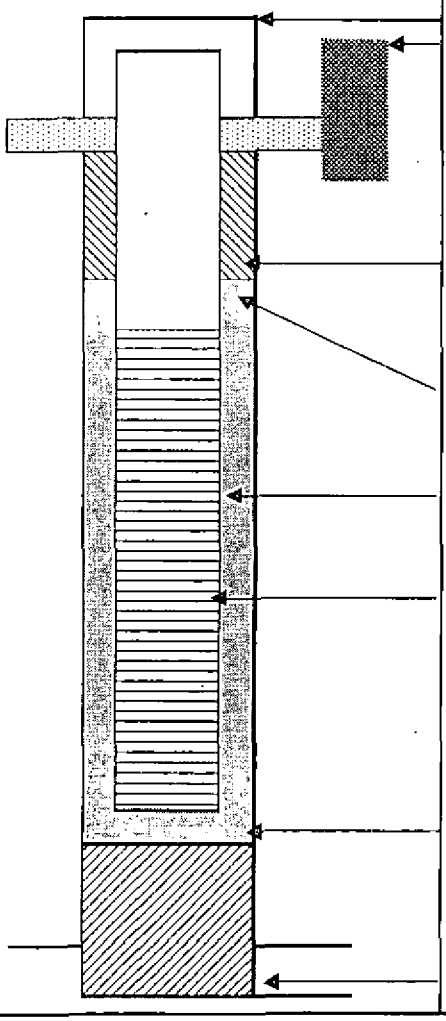
Cased or Uncased Diameter: 8 Static Level: 3

Work/Decommission Start Date: 9-20-10

Work/Decommission End Date: " "

If trainee, licensed driller's Signature and License No. _____

Construction/Design



Well Data W10-517

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2 10	
Material		
Backfill	2	FT
Type	Bent chips	
Seal		
Material		
Gravel Pack	12	FT
Material	2/12	
Screen (dia x dep)	2 10	
Slot Size	.010	
Material	PVC	
Well Depth	17	FT
Backfill	Bent chips	
Material		
Total Hole Depth	19.5	FT

Formation Description

0 - 15	FT
brown silty clay	
0/7 - 19.5	FT
gray silty clay	
0 -	FT

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OCT 12 2010

WATER RESOURCES PROGRAM NWRO

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT Notice of Intent No. 39-1E-19C RE05009

Construction/Decommission 391119

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals, Inc.

Site Address: Gulf Rd

City: Ferndale County: 37-Whatcom (EWM)

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

Consulting Firm: AMEC Geomatrix-Seattle

Unique Ecology Well ID Tag No.: BCT. 329

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print): Scott Krueger

Driller/Trainee Signature: [signature]

Driller/Trainee License No.: 2073

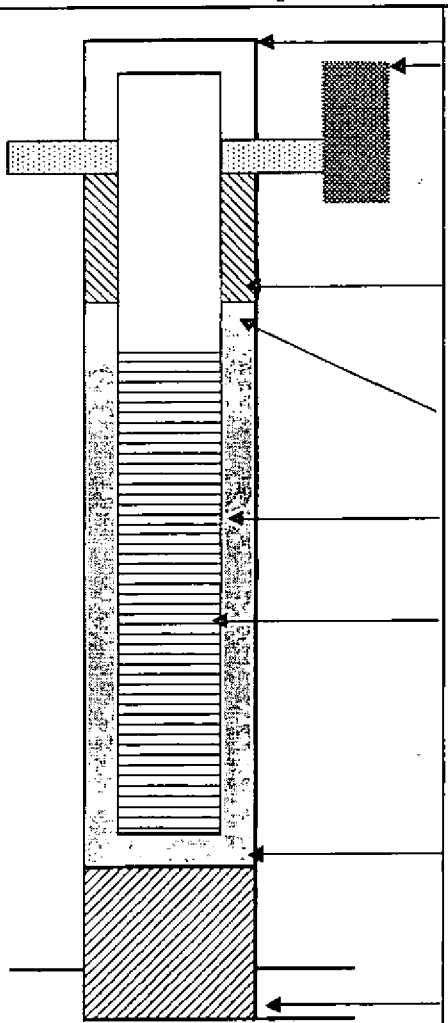
If trainee, licensed driller's Signature and License No. _____

Cased or Uncased Diameter _____ Static Level 9

Work/Decommission Start Date: 9-23-10

Work/Decommission End Date: " "

Construction/Design



Well Data W10-517

Locking Cap	
Protective Post	
Concrete Surface Seal Depth	2 FT
Blank Casing (dia x dep)	2 8
Material	pvc
Backfill	2 FT
Type	Bent chips
Seal	
Material	
Gravel Pack	11 FT
Material	2/12
Screen (dia x dep)	2 10
Slot Size	1010
Material	pvc
Well Depth	15 ~~19.5~~ FT
Backfill	
Material	Bent chips
Total Hole Depth	19.5 FT

Formation Description

0 - 15 FT brown silty clay

0 15 - 19.5 FT gray silty clay

0 - FT

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OCT 8 2010

WATER RESOURCES PROGRAM NWRO

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev. 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT Notice of Intent No. RE05009

39-1E-19C

Construction/Decommission 391120

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals, Inc.

Site Address: Guif Rd

City: Ferndale County: 37-Whatcom (EWM)

Location: 1/4 NE 1/4 NW Sec 19, Twn 39N R 1E or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

Consulting Firm: AMEC Geomatrix-Seattle

Unique Ecology Well ID Tag No. BCT 330

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) Scott Krueger

Driller/Trainee Signature: [signature]

Driller/Trainee License No. 2073

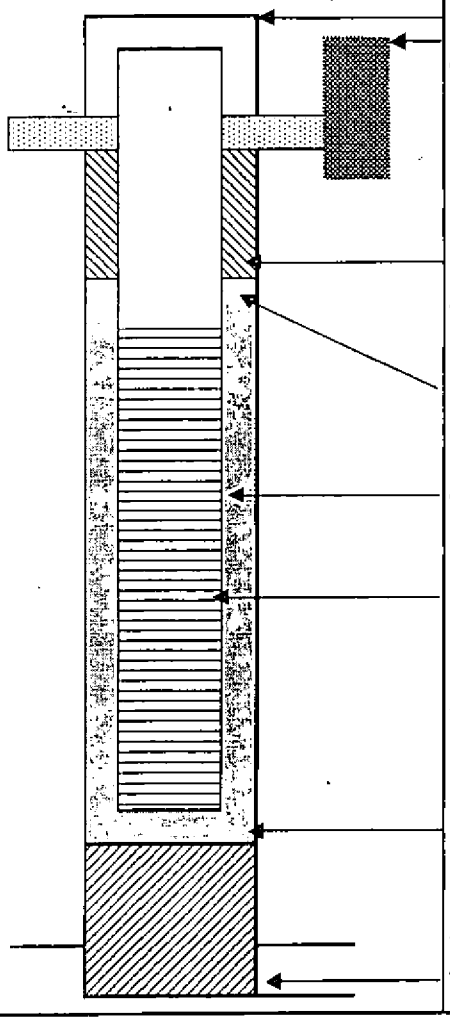
If trainee, licensed driller's Signature and License No. _____

Cased or Uncased Diameter: 8 Static Level: 4

Work/Decommission Start Date: 9-23-10

Work/Decommission End Date: " "

Construction/Design



Well Data W10-517

Locking Cap	
Protective Post	
Concrete Surface Seal Depth	2 FT
Blank Casing (dia x dep)	2 8
Material	pvc
Backfill	2 FT
Type	Bent chips
Seal	
Material	
Gravel Pack	12 FT
Material	2/12
Screen (dia x dep)	2 10
Slot Size	.010
Material	pvc
Well Depth	15 FT
Backfill	Bent chips
Material	
Total Hole Depth	50 FT

Formation Description

0 - 15 FT brown Silty clay

015 - 50 FT gray Silty Clay

0 - FT

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Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

WATER RESOURCES PROGRAM NWRO

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 39-1E-19C

Notice of Intent No. RE05009

Construction/Decommission 39/115 MW-6

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner: Pacific International Terminals, Inc.

Site Address: Gulf Rd

City: Ferndale County: 37-Whatcom (EWM)

Consulting Firm: AMEC Geomatrix-Seattle

Unique Ecology Well ID Tag No.: BCT 325

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print): Scott Krueger

Driller/Trainee Signature: [signature]

Driller/Trainee License No.: 2073

If trainee, licensed driller's Signature and License No. _____

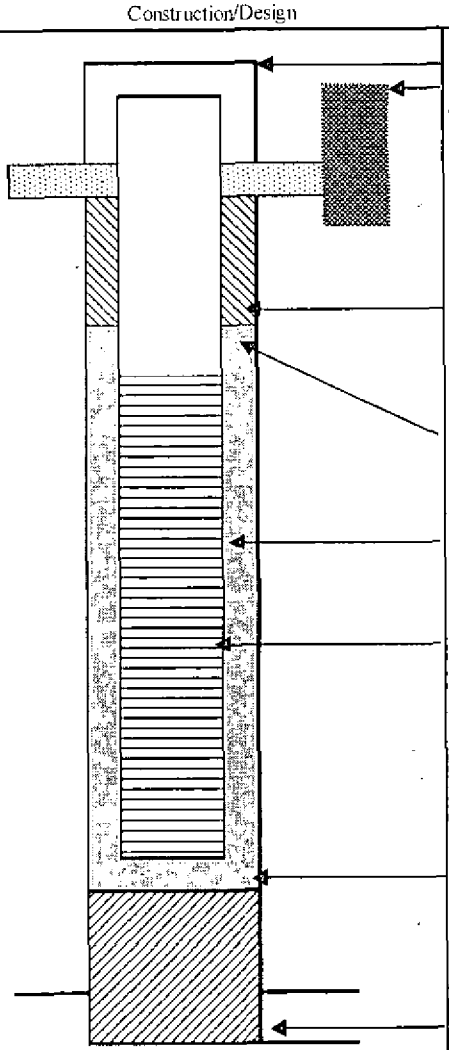
Tax Parcel No. _____

Cased or Uncased Diameter: 8 Static Level: 9

Work/Decommission Start Date: 9/20/10

Work/Decommission End Date: " "

Construction/Design



Well Data W10-517

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2 16'	
Material	pvc	
Backfill	9	FT
Type	Bent chips	
Seal		
Material		
Gravel Pack	12	FT
Material	2/12	
Screen (dia x dep)	2 10	
Slot Size	1010	
Material	pvc	
Well Depth	24	FT
Backfill		
Material		
Total Hole Depth		FT

Formation Description

0 - 19 FT: brown silty clay

0 19 - 24 FT: gray silty clay

0 - FT

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OCT 13 2010

WATER RESOURCES PROGRAM NWRO

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev 2/01)

39-1E-19C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE05288

Construction/Decommission 464027

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals

Site Address: Lonseth Rd. & Gulf Rd. area

City: Ferndale County: 37-Whatcom

Consulting Firm: AMEC-Seattle

Unique Ecology Well ID Tag No.: BCM 815

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E EWM or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print): Curtis Askew

Driller/Trainee Signature: _____

Driller/Trainee License No.: 2867

Tax Parcel No.: _____

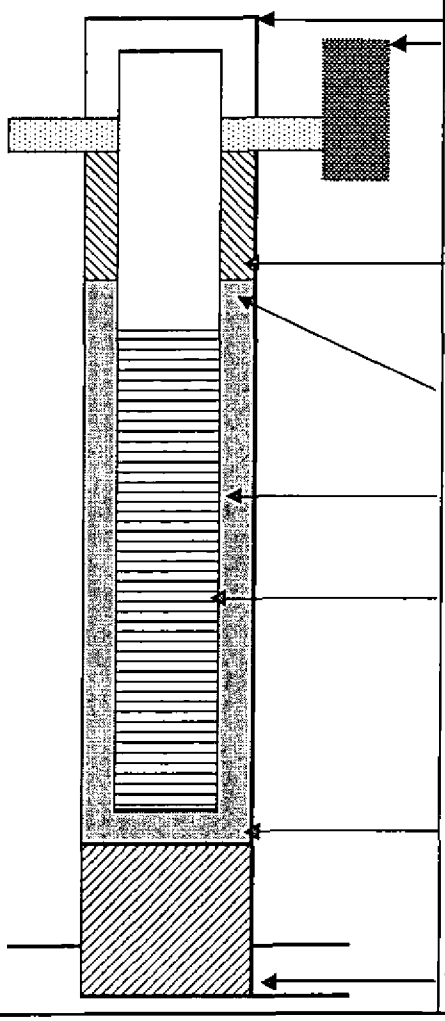
Cased or Uncased Diameter: 8 1/4" Static Level: 1'

Work/Decommission Start Date: 12-13-10

Work/Decommission End Date: 12-17-10

If trainee, licensed driller's signature and License No.: _____

Construction/Design



Well Data W10-692

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2" x 8'	
Material	PVC	
Backfill		FT
Type		
Seal	3'	
Material	Bent. Chips	
Gravel Pack	12	FT
Material	2-12 sand	
Screen (dia x dep)	2" x 10'	
Slot Size	.01	
Material	PVC	
Well Depth	18	FT
Backfill		
Material		
Total Hole Depth	18	FT

Formation Description

0 - 6'	FT
Brown silty w/ sand	
06 - 18	FT
clay	
0 -	FT

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev 5/01)

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The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

39-1E-19C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. RE05288

Construction/Decommission 404029

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well
[X] Resource Protection
[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals
Site Address: Lonseth Rd. & Gulf Rd. area
City: Ferndale County: 37-Whatcom
Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E (EWM or WWM)
Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____
Tax Parcel No. _____

Consulting Firm: AMEC-Seattle
Unique Ecology Well ID Tag No. 13CM 818

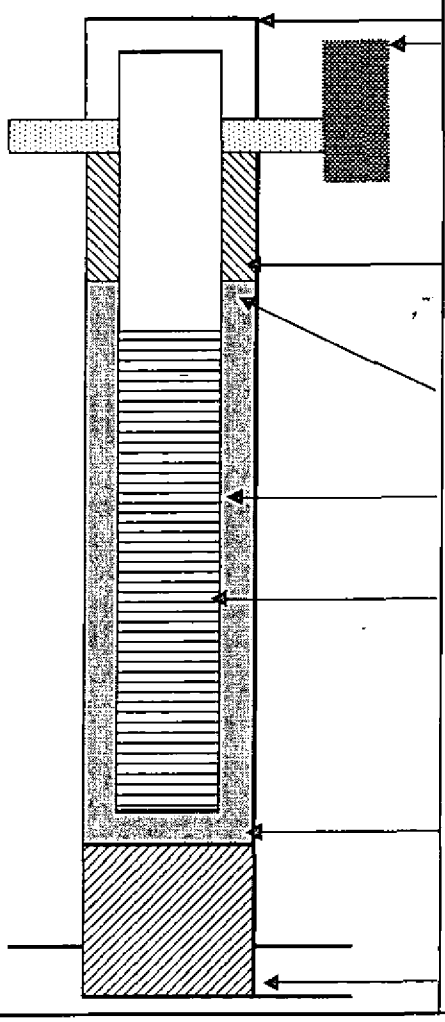
WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) Curtis Askew
Driller/Trainee Signature _____
Driller/Trainee License No. 2867

Trainee, licensed driller's signature and License No. _____

Cased or Uncased Diameter: 8 1/4" Static Level: 1'
Work/Decommission Start Date: 12-13-10
Work/Decommission End Date: 12-17-10

Construction/Design



Well Data W10-692

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2" x 6	
Material	PVC	
Backfill		FT
Type		
Seal	1'	
Material	Bent Chip	
Gravel Pack	7'	FT
Material	2-12 sand	
Screen (dia x dep)	2" x 5'	
Slot Size	.01	
Material	PVC	
Well Depth	13	FT
Backfill		
Material		
Total Hole Depth	13	FT

Formation Description

0 - 13	silty clay	FT
0 -		FT
0 -		FT

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Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev. 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

39-1E-19C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE05288

Construction/Decommission 404028

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals

Site Address: Lonseth Rd. & Gulf Rd. area

City: Ferndale County: 37-Whatcom

Consulting Firm: AMEC-Seattle

Unique Ecology Well ID Tag No.: BCM 817

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E (EWM) or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print): Curtis Askew

Driller/Trainee Signature: _____

Driller/Trainee License No.: 2867

Tax Parcel No.: _____

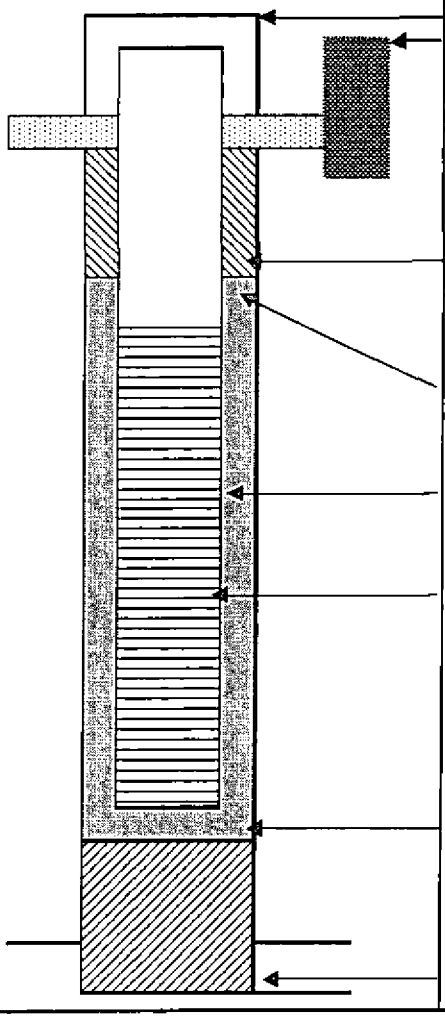
Cased or Uncased Diameter: 8 1/4" Static Level: 1'

Work/Decommission Start Date: 12-13-10

Trainee, licensed driller's signature and License No.: _____

Work/Decommission End Date: 12-17-10

Construction/Design



Well Data W10-692

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2"x8'	
Material	PVC	
Backfill		FT
Type		
Seal	3'	
Material	Bent. Chip	
Gravel Pack	12	FT
Material	2-12 sand	
Screen (dia x dep)	2"x10'	
Slot Size	.01	
Material	PVC	
Well Depth	18	FT
Backfill		
Material		
Total Hole Depth	18	FT

Formation Description

0 - 6	FT
Brown ~~sandy~~ silty w/ sands	
6 - 18	FT
clay, brown	
0 -	FT

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev. 2/01)

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The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

39-1E-19C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. RE05288

Construction/Decommission

404026

[X] Construction
[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well
[X] Resource Protection
[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals
Site Address: Lonseth Rd. & Gulf Rd. area
City: Ferndale County: 37-Whatcom (EWM)

Consulting Firm: AMEC-Seattle

Unique Ecology Well ID Tag No.: BCM914

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

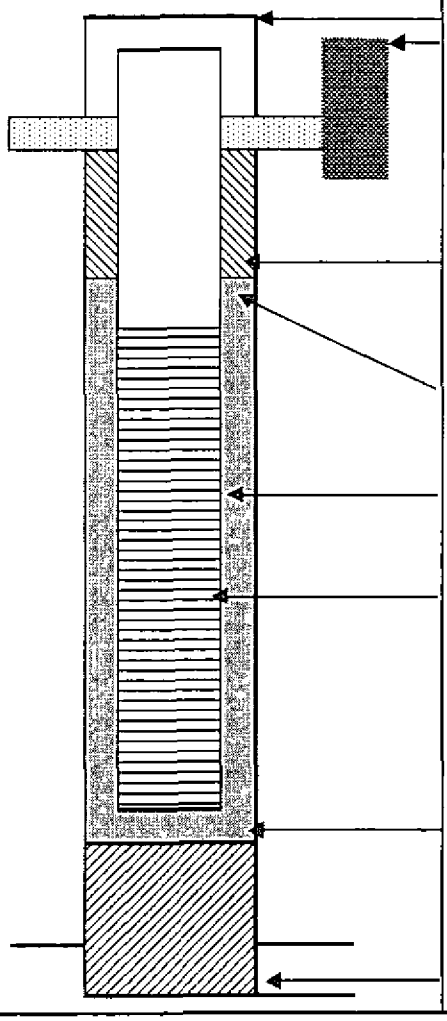
[X] Driller [ ] Engineer [ ] Trainee Name (Print) Frank Scott
Driller/Trainee Signature: [signature]
Driller/Trainee License No.: 25419

If trainee, licensed driller's Signature and License No. _____

Cased or Uncased Diameter: 8" Static Level: 1.5'

Work/Decommission Start Date: 12-13-10
Work/Decommission End Date: 12-13-10

Construction/Design



Well Data W10-692

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2" x 13'	
Material	PVC	
Backfill	7	FT
Type	Bent-chips	
Seal		
Material		
Gravel Pack	12.5	FT
Material	2/12 Sand	
Screen (dia x dep)	2" x 10'	
Slot Size	.010	
Material	PVC	
Well Depth	23	FT
Backfill		
Material		
Total Hole Depth		FT

Formation Description

0 - 3.5	FT
Dark Brown Silty Sand	
3.5 - 23	FT
Lt. Brown Silty Clay	
0 -	FT

RECEIVED
FEB 02 2011
WATER RESOURCES - NWRO

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev 2/05)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

39-1E-19C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE05288

Construction/Decommission 404031

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals

Site Address: Lonseth Rd. & Gulf Rd. area

City: Ferndale County: 37-Whatcom

Consulting Firm: AMEC-Seattle

Unique Ecology Well ID Tag No.: BCM 819

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E (EWM) or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[ ] Driller [ ] Engineer [ ] Trainee Name (Print): Curtis Askew

Driller/Trainee Signature: _____

Driller/Trainee License No.: 2867

Trainee, licensed driller's signature and License No.: _____

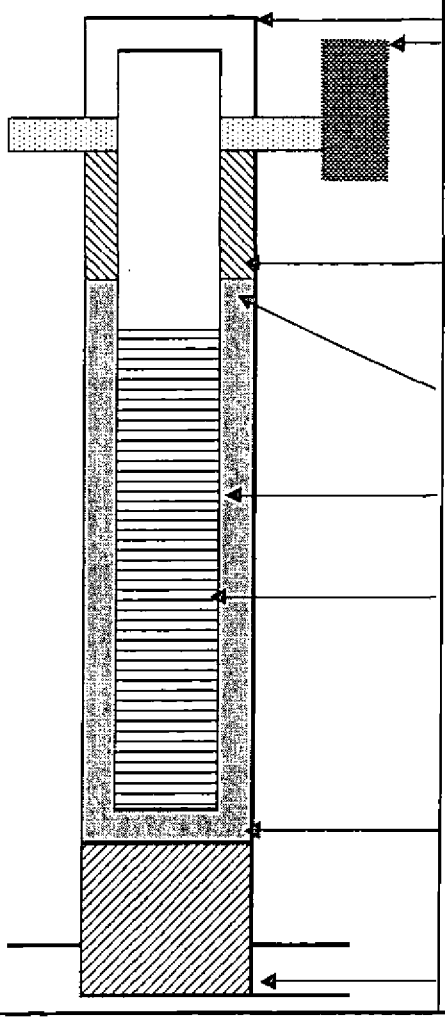
Tax Parcel No.: _____

Cased or Uncased Diameter: 8 1/4" Static Level: 1'

Work/Decommission Start Date: 12-13-10

Work/Decommission End Date: 12-17-10

Construction/Design



Well Data W10-692

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	2" x 8'	
Material	PVC	
Backfill		FT
Type		
Seal	3'	
Material	Bent. Chip	
Gravel Pack	12	FT
Material	2-12 sand	
Screen (dia x dep)	2" x 10'	
Slot Size	.01	
Material	PVC	
Well Depth	18	FT
Backfill		
Material		
Total Hole Depth	18	FT

Formation Description

0 - 18	FT
Brown silts w/ fine sands	
0 -	FT
0 -	FT

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev 2/08)

RECEIVED FEB 02 2011 WATER RESOURCES - NWRO

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

39-1E-19C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. RE05288

404030

Construction/Decommission

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Pacific International Terminals

Site Address: Lonseth Rd. & Gulf Rd. area

City: Ferndale County: 37-Whatcom

Consulting Firm: AMEC-Seattle

Unique Ecology Well ID Tag No.: BCM 818

Location: 1/4 NE 1/4 NW Sec 19 Twn 39N R 1E (EWM) or WWM

Lat/Long (s,t,r still Required): Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[ ] Driller [ ] Engineer [ ] Trainee Name (Print): Curtis Askew

Driller/Trainee Signature: _____

Driller/Trainee License No.: 2867

Trainee, licensed driller's signature and License No.: _____

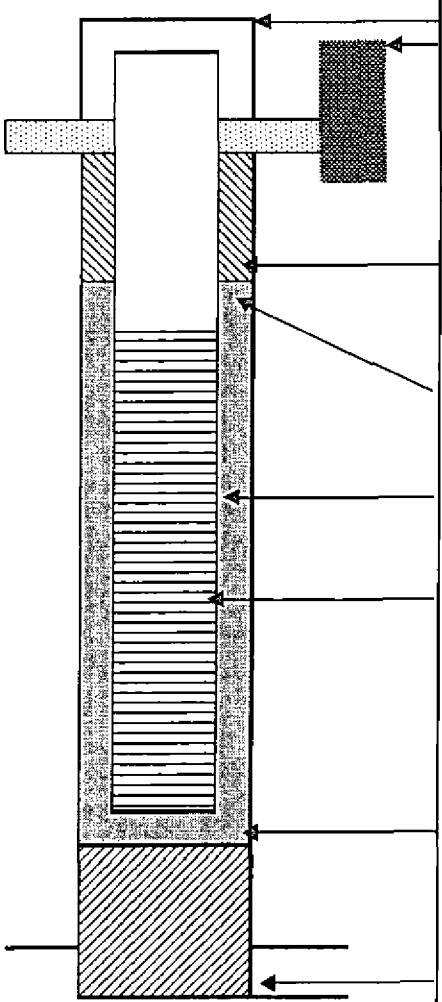
Tax Parcel No.: _____

Cased or Uncased Diameter: 8 1/4" Static Level: 1'

Work/Decommission Start Date: 12-13-10

Work/Decommission End Date: 12-17-10

Construction/Design



Well Data W10-692

Locking Cap		
Protective Post		
Concrete Surface Seal Depth	31	FT
Blank Casing (dia x dep)	2" x 8'	
Material	PVC	
Backfill		FT
Type		
Seal	3'	
Material	Bent. Chip	
Gravel Pack	12	FT
Material	8-12 sand	
Screen (dia x dep)	2" x 10'	
Slot Size	.01	
Material	PVC	
Well Depth	18	FT
Backfill		
Material		
Total Hole Depth	18	FT

Formation Description

0 - 4 FT	sandy brown silt
0 4 - 15 FT	Brown silt/clay
0 15 - 18 FT	Grayish blue clay

Scale 1" = _____ Page _____ of _____

ECY 050-12 (Rev. 2)

RECEIVED FEB 02 2011 WATER RESOURCES - NWRO

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

APPENDIX C

Laboratory Reports for Water Quality Analyses

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Memo

To:	Robert Wyckoff	Project:	091515338C
From:	Crystal Neirby	cc:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	June 21, 2011		

Subject: Pacific International Terminals, Inc. Whatcom County, Washington Groundwater and Surface Water Sampling Summary Data Quality Review Sample Delivery Groups (SDGs): SH35, SH52, SR71, SR88, and SS17

This memorandum presents a summary data quality review for analyses of 24 primary groundwater samples, one groundwater field duplicate, six primary surface water samples, and three trip blanks collected on February 2 and 3 and April 14 and 15, 2011. The samples were submitted to Analytical Resources (ARI), a Washington State Department of Ecology certified laboratory, located in Tukwila, Washington.

The samples were selectively analyzed for the following:

- Semivolatile organic compounds (SVOCs) by U.S. Environmental Protection Agency (EPA) Method 8270D;
- Total petroleum hydrocarbons (TPH) as gasoline by Ecology Method NWTPH-Gx;
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8021B;
- TPH hydrocarbon identification by Ecology Method NWTPH-HCID;
- Alkalinity by Standard Methods SM2320;
- Conductivity by EPA Method 120.1;
- Total dissolved solids (TDS) by EPA Method 160.1;
- Total suspended solids (TSS) by EPA Method 160.2;
- Salinity by Standard Methods SM2320B;
- Anions (chloride, fluoride, nitrate, sulfate, and orthophosphorus phosphate) by EPA Method 300.0;
- Total metals (calcium, magnesium, potassium, and sodium) by EPA Method 6010B; and
- Ammonia by EPA Method 350.1.

The sample IDs, sample collection date, laboratory sample ID, and the analyses conducted on the samples are listed in the table below.

AMEC Environment & Infrastructure, Inc.
11810 North Creek Parkway N
Bothell, Washington 98011
(425) 368-1000 Phone
(425) 368-1001 Facsimile
www.amec.com

Sample ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
PZ-11-0211	2/2/2011	SH35A	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-09-0211	2/2/2011	SH35B	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-08-0211	2/2/2011	SH35C	alkalinity, anions, ammonia, TDS, TSS, total metals
SW-03-0211	2/2/2011	SH35D	alkalinity, anions, ammonia, TDS, TSS, total metals, conductivity, salinity
PZ-07-0211	2/2/2011	SH35E	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-06-0211	2/2/2011	SH35F	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-05-0211	2/2/2011	SH35G	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-03-0211	2/3/2011	SH52A	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-12-0211	2/3/2011	SH52B	alkalinity, anions, ammonia, TDS, TSS, total metals
SW-01-0211	2/3/2011	SH52C	alkalinity, anions, ammonia, TDS, TSS, total metals, conductivity, salinity
PZ-02-0211	2/3/2011	SH52D	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-01-0211	2/3/2011	SH52E	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-10-0211	2/3/2011	SH52F	alkalinity, anions, ammonia, TDS, TSS, total metals
PZ-04-0211	2/3/2011	SH52G	alkalinity, anions, ammonia, TDS, TSS, total metals
SW-02-0211	2/3/2011	SH52H	alkalinity, anions, ammonia, TDS, TSS, total metals, conductivity, salinity
PZ-03-0411	4/13/2011	SR71A	all
PZ-12-0411	4/13/2011	SR71B	all
PZ-02-0411	4/13/2011	SR71C	all
SW-01-0411	4/13/2011	SR71D	all
PZ-01-0411	4/13/2011	SR71E	all
PZ-01-D-0411	4/13/2011	SR71F	all
Trip Blank	4/13/2011	SR71G	TPH-Gas/BTEX
PZ-11-0411	4/14/2011	SR88A	all
PZ-04-0411	4/14/2011	SR88B	all
PZ-07-0411	4/14/2011	SR88C	all
PZ-06-0411	4/14/2011	SR88D	all
Trip Blank	4/14/2011	SR88E	TPH-Gas/BTEX
SW-02-0411	4/15/2011	SS17A	all
PZ-10-0411	4/15/2011	SS17B	all
SW-03-0411	4/15/2011	SS17C	all
PZ-08-0411	4/15/2011	SS17D	all

Sample ID	Sample Collection Date	Laboratory Sample ID	Requested Analyses
PZ-09-0411	4/15/2011	SS17E	all
PZ-05-0411	4/15/2011	SS17F	all
Trip Blank	4/15/2011	SS17G	TPH-Gas/BTEX

Upon receipt by the laboratory, the sample jar information was compared to the chain-of-custody forms. The temperatures of the coolers were recorded as part of the check-in procedure, and were less than the maximum acceptable temperature of 6°C.

The following was noted by the laboratory upon sample receipt:

- SDGs SR88 and SS17: Small bubbles (approximately 2 millimeters in size) were observed in the trip blanks associated with these SDGs. The laboratory proceeded with analysis using unaffected vials where possible, and sample results are not affected.

The analytical results for these samples were reviewed in accordance with the requirements specified in EPA National Functional Guidelines (EPA, 2010, 2008), the analytical methods referenced by the laboratory, AMEC data review procedures, and the laboratory quality control limits. The EPA guidelines referenced above were written specifically for the Contract Laboratory Program and have been modified for the purposes of this data quality review where they differ from EPA SW-846 method requirements.

The certified laboratory reports were reviewed to assess the following: chain-of-custody compliance; holding time compliance; presence or absence of laboratory contamination as demonstrated by method and trip blanks; standard reference material (SRM), laboratory control samples (LCS), and matrix spike (MS) samples; surrogate recoveries; analytical precision as the relative percent difference between replicate sample results (i.e., laboratory and field duplicates) or MS and matrix spike duplicates (MSD). This data quality review did not include validation of the raw analytical data.

Samples were analyzed for the methods identified in the introduction to this report and were evaluated for the following criteria.

1. Holding Times – Acceptable
2. Blanks – Acceptable
3. SRM – Acceptable
4. LCS – Acceptable except as noted:

SDG SS17

SVOCs by EPA 8270D: The laboratory control sample duplicate (LCSD) recovery for 2,4-dimethylphenol was 19.2 percent, less than the control limits of 29 to 100 percent. The associated LCS recovery was within the control limits; however, the LCS/LCSD relative percent difference was 64.1 percent, greater than the control limit of 30 percent. The low recovery equates to a low bias in the samples, and 2,4-dimethylphenol was not detected in the associated samples. Therefore, the results are qualified as estimated and flagged with a "UJ."

BTEX by EPA 8021B: The LCS recovery for benzene was 123 percent, greater than the control limits of 73 to 120 percent. The associated LCSD recovery was within the control limits. The high recovery equates to a high bias in the samples and benzene was not detected in the associated samples. Therefore, the benzene results are not affected and are not qualified.

5. MS/MSD – Acceptable

   MS/MSD samples were not analyzed with project samples for every analysis. For analyses in which a project specific MS/MSD was not reported, sample results were evaluated based on the laboratory control sample results.

6. Surrogates – Acceptable

7. Reporting Limits and Laboratory Flags – Acceptable:

SDG SR71

SVOCs by EPA 8270D: The laboratory indicated in the case narrative, and with a "Q" flag on the LCS/LCSD results, that the recoveries for 3-nitroaniline and 4-nitroaniline were less than the control limits in the continuing calibration (CCAL) associated with samples analyzed on April 20, 2011. The recovery for 2,2'-oxybis (1-chlorophenol) was greater than the control limits in the same CCAL. 3-Nitroaniline and 4-nitroaniline were not detected in the associated samples; therefore, the results are qualified as estimated and flagged with a "UJ" due to the possible low analytical bias. The high recoveries equate to a high bias in the samples, and 2,2'-oxybis (1-chlorophenol) was not detected in the samples. Therefore, sample results are not affected and are not qualified.

SDG SS17

SVOCs by EPA 8270D: The laboratory indicated in the case narrative, and with a "Q" flag on the LCS/LCSD results, that the recoveries for 4-chloroaniline and 2,4-dinitrophenol were less than the control limits in the CCAL associated with samples analyzed on April 27, 2011. The recovery for 2,2'-oxybis (1-chlorophenol) was greater than the control limits in the same CCAL. 4-Chloroaniline and 2,4-dinitrophenol were not detected in the associated samples; therefore, the results are qualified as estimated and flagged with a "UJ" due to the possible low analytical bias. The high recoveries equate to a high bias in the samples, and 2,2'-oxybis (1-chlorophenol) was not detected in the samples. Therefore, sample results are not affected and are not qualified.

OVERALL ASSESSMENT OF DATA

The ARI SDG Numbers SH35, SH52, SR71, SR88, and SS17 are 100 percent complete. The data usability is based on EPA's guidance documents. Few problems were identified and analytical performance was generally within specified limits. The data are acceptable and meet the project's data quality objectives. Sample identifications and qualified results are summarized in the table below.

Sample ID	Qualified Analyte	Qualified Result	Units	Qualifier Reason
PZ-11-0211	none			
PZ-09-0211	none			
PZ-08-0211	none			
SW-03-0211	none			
PZ-07-0211	none			
PZ-06-0211	none			
PZ-05-0211	none			
PZ-03-0211	none			
PZ-12-0211	none			
SW-01-0211	none			
PZ-02-0211	none			
PZ-01-0211	none			
PZ-10-0211	none			
PZ-04-0211	none			
SW-02-0211	none			
PZ-03-0411	3-nitroaniline	5.0 UJ	µg/L	CCAL Recovery
	4-nitroaniline	5.0 UJ		
PZ-12-0411	3-nitroaniline	5.0 UJ	µg/L	CCAL Recovery
	4-nitroaniline	5.0 UJ		
PZ-02-0411	3-nitroaniline	5.0 UJ	µg/L	CCAL Recovery
	4-nitroaniline	5.0 UJ		
SW-01-0411	3-nitroaniline	5.0 UJ	µg/L	CCAL Recovery
	4-nitroaniline	5.0 UJ		
PZ-01-0411	3-nitroaniline	5.0 UJ	µg/L	CCAL Recovery
	4-nitroaniline	5.0 UJ		
PZ-01-D-0411	3-nitroaniline	5.0 UJ	µg/L	CCAL Recovery
	4-nitroaniline	5.0 UJ		
Trip Blank	none			
PZ-11-0411	none			

Sample ID	Qualified Analyte	Qualified Result	Units	Qualifier Reason
PZ-04-0411	none			
PZ-07-0411	none			
PZ-06-0411	none			
Trip Blank	none			
SW-02-0411	2,4-dimethylphenol	1.0 UJ	µg/L	LCS/LCSD Recovery
	4-chloroaniline	5.0 UJ		CCAL Recovery
	2,4-dinitrophenol	10 UJ		
PZ-10-0411	2,4-dimethylphenol	1.0 UJ	µg/L	LCS/LCSD Recovery
	4-chloroaniline	5.0 UJ		CCAL Recovery
	2,4-dinitrophenol	10 UJ		
SW-03-0411	2,4-dimethylphenol	1.0 UJ	µg/L	LCS/LCSD Recovery
	4-chloroaniline	5.0 UJ		CCAL Recovery
	2,4-dinitrophenol	10 UJ		
PZ-08-0411	2,4-dimethylphenol	1.0 UJ	µg/L	LCS/LCSD Recovery
	4-chloroaniline	5.0 UJ		CCAL Recovery
	2,4-dinitrophenol	10 UJ		
PZ-09-0411	2,4-dimethylphenol	1.0 UJ	µg/L	LCS/LCSD Recovery
	4-chloroaniline	5.0 UJ		CCAL Recovery
	2,4-dinitrophenol	10 UJ		
PZ-05-0411	2,4-dimethylphenol	1.0 UJ	µg/L	LCS/LCSD Recovery
	4-chloroaniline	5.0 UJ		CCAL Recovery
	2,4-dinitrophenol	10 UJ		
Trip Blank	none			

Abbreviations
CCAL = continuing calibration
LCS/D = laboratory control sample\duplicate
µg/L = micrograms per liter

REFERENCES

EPA (US Environmental Protection Agency), 2010, US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review: EPA 540-R-10-011, January.

EPA, 2008, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-08-001, June.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

February 18, 2011

Nick Bacher
AMEC
600 University Street, Suite 1020
Seattle, WA 98101

Client Project: Gateway Pacific Terminal (GPT) 0-915-15338-C
ARI ID: SH35

Dear Mr. Bacher:

Please find enclosed the original chain of custody (COC) records and the final results for the samples from the project referenced above. Seven water samples were received in good condition on February 3, 2011. Select samples were analyzed for alkalinity, salinity, fluoride, chloride, nitrate, ortho-phosphorous, ammonia, total dissolved solids, total suspended solids, and total metals parameters, as requested on the COC. Sulfate was not originally requested, but was added, per client request, on February 17, 2011.

There were no irregularities with these analyses.

A copy of these reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,
ANALYTICAL RESOURCES, INC.

Eric Branson
Project Manager
-for-
Kelly Bottem
Client Services Manager
206.695.6211
kellyb@arilabs.com
www.arilabs.com

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

CHAIN-OF-CUSTODY RECORD

PROJECT NAME: Gateway Pacific Terminal (GPT)			DATE: 2/2/11 — PAGE 1 OF 1
PROJECT NUMBER: 0-915-15338-C	LABORATORY NAME: ARI	CLIENT INFORMATION: N/A	REPORTING REQUIREMENTS: Standard
RESULTS TO: Niklas Bacher	LABORATORY ADDRESS: Tukwila, WA		
TURNAROUND TIME: Standard	LABORATORY CONTACT: Kelly Bottem		GEOTRACKER REQUIRED: YES / NO (NO circled)
SAMPLE SHIPMENT METHOD: FEDEX	LABORATORY PHONE NUMBER: 206-695-6200		SITE SPECIFIC GLOBAL ID NO: N/A

SAMPLERS (SIGNATURE):

DATE	TIME	SAMPLE NUMBER	Alkalinity/Salinity	Fl/Cl/NO3/SRP	Ammonia	TDS	TSS	Total Metals	CONTAINER TYPE AND SIZE	Soil (S), Water (W), Vapor (V), or Other (O)	Filtered	Preservative Type	Cooled	MS/MSD	No. of Containers	ADDITIONAL COMMENTS
2/2/11	1000	PZ-11-0211	X	X	X	X	X	X	Various	W	N	H_2SO_4 HNO_3	Y	N	6	
2/2/11	1105	PZ-09-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/2/11	1155	PZ-08-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/2/11	1240	SW-03-0211	x*	X	X	X	X	X	Various	W	N		Y	N	6	
2/2/11	1345	PZ-07-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/2/11	1445	PZ-06-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/2/11	1540	PZ-05-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	

2/2/11

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
SIGNATURE			SIGNATURE FEDEX		
PRINTED NAME: Trevor Louviere	2/2/11	1642	PRINTED NAME: 8741 5769 4451		
COMPANY: AMEC Geomatrix			COMPANY		
SIGNATURE			SIGNATURE: Jennifer Millsap	2/3/11	1030
PRINTED NAME			PRINTED NAME		
COMPANY			COMPANY: ARI		
SIGNATURE			SIGNATURE		
PRINTED NAME			PRINTED NAME		
COMPANY			COMPANY		

TOTAL NUMBER OF CONTAINERS: 42

SAMPLING COMMENTS: x* Salinity is only tested for in the SW-03-0211 sample

One Union Square, 600 University Street, Suite 1020
Seattle, Washington 98101-4107
Tel 206.342.1760 Fax 206.342.1761

amec

SH35 : 00002

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: AMEC

Project Name: Gateway Pacific Terminal

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: SH35

Tracking No: 8741 5769 4451 NA
~~8741~~

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry): 3.9 4.6 ___ ___ ___

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90941619

Cooler Accepted by: JM Date: 2/3/11 Time: 1030

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	YES	NO
Were all bottles sealed in individual plastic bags?		YES	NO
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA	_____	

Was Sample Split by ARI : NA YES Date/Time: _____ Equipment: _____ Split by: _____

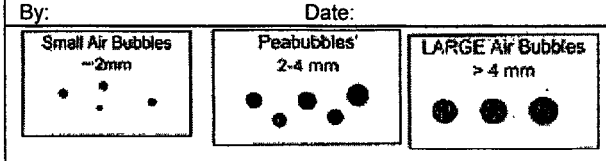
Samples Logged by: JM Date: 2/3/11 Time: 1230

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

FedEx Express US Airbill

FedEx Tracking Number 8741 5769 4451

0200 Form ID No

FedEx Retrieval Cop

1 From

Date 2/2/11 Sender's FedEx Account Number 476501806

Sender's Name N. Bacher Phone 206 351-0951

Company AMEZ Geomatrix

Address 600 University Street Suite 1020 Dept./Floor/Suite/Room

City Seattle State WA ZIP 98101

2 Your Internal Billing Reference GPT

3 To

Recipient's Name Sample Receiving Phone 206 695-6200

Company ARI

Address 4611 South 134th Place Suite 100 Dept./Floor/Suite/Room

We cannot deliver to P.O. boxes or P.O. ZIP codes

Address

Use this line for the HOLD location address or for continuation of your shipping address

City Tukwila State WA ZIP 98168

HOLD Weekday 01 ☐ FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday 31 ☐ FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

8741 5769 4451

4a Express Package Service * To most locations. *Packages up to 150 lb*

01 ☒ FedEx Priority Overnight — Next business morning * Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.

05 ☐ FedEx Standard Overnight — Next business afternoon * Saturday Delivery NOT available

06 ☐ FedEx First Overnight — Earliest next business morning delivery to select locations *

03 ☐ FedEx 2Day — Second business day * Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected

20 ☐ FedEx Express Saver — Third business day * Saturday Delivery NOT available

4b Express Freight Service ** To most locations. *Packages over 150 lb*

70 ☐ FedEx 1Day Freight — Next business day ** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected

FedEx 1Day Freight Booking No

80 ☐ FedEx 2Day Freight — Second business day ** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected

83 ☐ FedEx 3Day Freight — Third business day ** Saturday Delivery NOT available

5 Packaging * Declared value limit $500.

06 ☐ FedEx Envelope*

02 ☐ FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.

03 ☐ FedEx Box

04 ☐ FedEx Tube

01 ☒ Othe

6 Special Handling and Delivery Signature Options

03 ☐ **SATURDAY DELIVERY**

☐ No Signature Required — Package may be left without obtaining a signature for delivery

10 ☐ Direct Signature — Someone at recipient's address may sign for delivery *Fee applies*

34 ☒ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only *Fee appli*

Does this shipment contain dangerous goods?

One box must be checked.

☒ No

04 ☐ Yes — As per attached Shipper's Declaration

☐ Yes — Shipper's Declaration not required

06 ☐ Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

☐ Cargo Aircraft Only

7 Payment *Bill to:*

Obtain recip Acct. No ☐

01 ☒ Sender — Acct. No. in Section 1 will be billed.

Enter FedEx Acct. No or Credit Card No. below

2 ☐ Recipient 3 ☐ Third Party 4 ☐ Credit Card 5 ☐ Cash/Che

[redacted]

Total Packages 2 Total Weight 97 lbs

[redacted]

Credit Card Auth.

†Our liability is limited to $100 unless you declare a higher value. See the current FedEx Service Guide for details

606

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SH35 : 00004

PRESERVATION VERIFICATION 02/03/11

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **SH35**

Inquiry Number: NONE
Analysis Requested: 02/03/11
Contact: Bacher, Nik
Client: Amec Geomatrix
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

PC: Kelly
VTSR: 02/03/11

Project #: 0-915-15338-C
Project: Gateway Pacific Terminal (GPT)
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
11-2297 **SH35A**	PZ-11-0211			pass			TOT pass															
11-2298 **SH35B**	PZ-09-0211						TOT															
11-2299 **SH35C**	PZ-08-0211						TOT															
11-2300 **SH35D**	SW-03-0211						TOT															
11-2301 **SH35E**	PZ-07-0211						TOT															
11-2302 **SH35F**	PZ-06-0211						TOT															
11-2303 **SH35G**	PZ-05-0211						TOT															

SH35 00005

Checked By JM Date 2/3/11

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: SH35
Client: Amec Geomatrix
Project Event: 0-915-15338-C
Project Name: Gateway Pacific Terminal (GPT)

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	PZ-11-0211	SH35A	11-2297	Water	02/02/11 10:00	02/03/11 10:30
2.	PZ-09-0211	SH35B	11-2298	Water	02/02/11 11:05	02/03/11 10:30
3.	PZ-08-0211	SH35C	11-2299	Water	02/02/11 11:55	02/03/11 10:30
4.	SW-03-0211	SH35D	11-2300	Water	02/02/11 12:40	02/03/11 10:30
5.	PZ-07-0211	SH35E	11-2301	Water	02/02/11 13:45	02/03/11 10:30
6.	PZ-06-0211	SH35F	11-2302	Water	02/02/11 14:45	02/03/11 10:30
7.	PZ-05-0211	SH35G	11-2303	Water	02/02/11 15:40	02/03/11 10:30

Printed 02/03/11

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-11-0211
SAMPLE

Lab Sample ID: SH35A
LIMS ID: 11-2297
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**11.6**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**8.70**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**2.3**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**73.2**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-09-0211
SAMPLE

Lab Sample ID: SH35B
LIMS ID: 11-2298
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**52.6**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**33.2**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**4.0**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**56.5**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-08-0211
SAMPLE

Lab Sample ID: SH35C
LIMS ID: 11-2299
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**19.9**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**11.4**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**3.6**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**34.6**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: SW-03-0211
SAMPLE

Lab Sample ID: SH35D
LIMS ID: 11-2300
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**11.4**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**15.7**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**6.1**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**139**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-07-0211
SAMPLE

Lab Sample ID: SH35E
LIMS ID: 11-2301
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**40.3**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**29.2**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**6.5**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**93.6**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-06-0211
SAMPLE

Lab Sample ID: SH35F
LIMS ID: 11-2302
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**27.1**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**17.2**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**3.3**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**34.4**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-05-0211
SAMPLE

Lab Sample ID: SH35G
LIMS ID: 11-2303
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	**7440-70-2**	**Calcium**	0.05	**32.1**	
3010A	02/04/11	6010B	02/09/11	**7439-95-4**	**Magnesium**	0.05	**21.1**	
3010A	02/04/11	6010B	02/09/11	**7440-09-7**	**Potassium**	0.5	**3.4**	
3010A	02/04/11	6010B	02/09/11	**7440-23-5**	**Sodium**	0.5	**36.4**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: LAB CONTROL

Lab Sample ID: SH35LCS
LIMS ID: 11-2297
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Calcium	6010B	10.0	10.0	100%	
Magnesium	6010B	10.5	10.0	105%	
Potassium	6010B	10.1	10.0	101%	
Sodium	6010B	10.1	10.0	101%	

Reported in mg/L

N-Control limit not met
Control Limits: 80-120%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: METHOD BLANK

Lab Sample ID: SH35MB
LIMS ID: 11-2297
Matrix: Water
Data Release Authorized:
Reported: 02/10/11

QC Report No: SH35-Amec Geomatrix
Project: Gateway Pacific Terminal (GPT)
0-915-15338-C
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/09/11	7440-70-2	Calcium	0.05	0.05	U
3010A	02/04/11	6010B	02/09/11	7439-95-4	Magnesium	0.05	0.05	U
3010A	02/04/11	6010B	02/09/11	7440-09-7	Potassium	0.5	0.5	U
3010A	02/04/11	6010B	02/09/11	7440-23-5	Sodium	0.5	0.5	U

U-Analyte undetected at given RL
RL-Reporting Limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: PZ-11-0211
ARI ID: 11-2297 SH35A

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	110
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	110
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	258
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	1.4
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	5.0	66.3
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	0.6
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.044
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	5.0	22.8

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: PZ-09-0211
ARI ID: 11-2298 SH35B

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	311
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	311
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	10.0	418
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	6.0
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	2.0	53.2
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	0.5
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.047
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	2.0	25.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: PZ-08-0211
ARI ID: 11-2299 SH35C

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	121
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	121
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	214
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	1.2
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	1.0	22.0
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	2.4
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.063
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	1.0	17.9

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: SW-03-0211
ARI ID: 11-2300 SH35D

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	29.1
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	29.1
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	02/04/11 020411#1	EPA 120.1	umhos/cm	1.00	892
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	10.0	489
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	2.1	< 2.1 U
Salinity	02/04/11 020411#1	SM 2520.B	ppt	0.10	0.40
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	10.0	224
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	4.2
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.055
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	10.0	33.7

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: PZ-07-0211
ARI ID: 11-2301 SH35E

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	242
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	242
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	10.0	458
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	8.4
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	5.0	99.7
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	0.2
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.089
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	5.0	31.9

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: PZ-06-0211
ARI ID: 11-2302 SH35F

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	177
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	177
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	252
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.5	27.9
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	0.5	17.3
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.028
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	0.5	11.8

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Client ID: PZ-05-0211
ARI ID: 11-2303 SH35G

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	233
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	233
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	270
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	5.7
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	0.5	10.6
Fluoride	02/03/11 020311#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/03/11 020311#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Ortho-Phosphorous	02/03/11 020311#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/03/11 020311#1	EPA 350.1M	mg-N/L	0.010	0.036
Sulfate	02/04/11 020411#1	EPA 300.0	mg/L	0.5	8.9

RL Analytical reporting limit
U Undetected at reported detection limit

MS/MSD RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: SH35A Client ID: PZ-11-0211							
Fluoride	EPA 300.0	02/03/11	mg/L	0.2	2.3	2.0	105.0%
N-Nitrate	EPA 300.0	02/03/11	mg-N/L	0.6	2.7	2.0	105.0%
Ortho-Phosphorous	EPA 300.0	02/03/11	mg-P/L	< 0.1	1.8	2.0	90.0%
N-Ammonia	EPA 350.1M	02/03/11	mg-N/L	0.044	0.492	0.500	89.6%

REPLICATE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: 02/02/11
Date Received: 02/03/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: SH35A Client ID: PZ-11-0211						
Alkalinity	SM 2320	02/08/11	mg/L CaCO3	110	110	0.0%
Carbonate	SM 2320	02/08/11	mg/L CaCO3	< 1.0	< 1.0	NA
Bicarbonate	SM 2320	02/08/11	mg/L CaCO3	110	110	0.0%
Hydroxide	SM 2320	02/08/11	mg/L CaCO3	< 1.0	< 1.0	NA
Total Dissolved Solids	EPA 160.1	02/04/11	mg/L	258	265	2.7%
Chloride	EPA 300.0	02/04/11	mg/L	66.3	66.1	0.3%
Fluoride	EPA 300.0	02/03/11	mg/L	0.2	0.2	0.0%
N-Nitrate	EPA 300.0	02/03/11	mg-N/L	0.6	0.6	0.0%
Ortho-Phosphorous	EPA 300.0	02/03/11	mg-P/L	< 0.1	< 0.1	NA
N-Ammonia	EPA 350.1M	02/03/11	mg-N/L	0.044	0.043	2.3%
Sulfate	EPA 300.0	02/04/11	mg/L	22.8	23.8	4.3%
ARI ID: SH35B Client ID: PZ-09-0211						
Alkalinity	SM 2320	02/08/11	mg/L CaCO3	311	309	0.6%
Carbonate	SM 2320	02/08/11	mg/L CaCO3	< 1.0	< 1.0	NA
Bicarbonate	SM 2320	02/08/11	mg/L CaCO3	311	309	0.6%
Hydroxide	SM 2320	02/08/11	mg/L CaCO3	< 1.0	< 1.0	NA
ARI ID: SH35D Client ID: SW-03-0211						
Conductivity	EPA 120.1	02/04/11	umhos/cm	892	890	0.2%
Total Suspended Solids	EPA 160.2	02/04/11	mg/L	< 2.1	< 2.1	NA
Salinity	SM 2520.B	02/04/11	ppt	0.40	0.40	0.0%

LAB CONTROL RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	02/04/11	mg/L	486	500	97.2%
Total Suspended Solids EPA 160.2	ICVL	02/04/11	mg/L	49.5	50.0	99.0%
Salinity SM 2520.B	ICVL	02/04/11	ppt	42,900	47,600	90.1%

METHOD BLANK RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Conductivity	EPA 120.1	02/04/11	umhos/cm	< 1.00 U	
Total Dissolved Solids	EPA 160.1	02/04/11	mg/L	< 5.0 U	
Total Suspended Solids	EPA 160.2	02/04/11	mg/L	< 1.0 U	
Salinity	SM 2520.B	02/04/11	ppt	< 0.10 U	
Chloride	EPA 300.0	02/04/11	mg/L	< 0.1 U	
Fluoride	EPA 300.0	02/03/11	mg/L	< 0.1 U	
N-Nitrate	EPA 300.0	02/03/11	mg-N/L	< 0.1 U	
Ortho-Phosphorous	EPA 300.0	02/03/11	mg-P/L	< 0.1 U	
N-Ammonia	EPA 350.1M	02/03/11	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	02/04/11	mg/L	< 0.1 U	

STANDARD REFERENCE RESULTS-CONVENTIONALS
SH35-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized
Reported: 02/18/11

Project: Gateway Pacific Terminal (GP
Event: 0-915-15338-C
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Alkalinity	SM 2320	02/08/11	mg/L CaCO3	101	102	99.0%
ERA #P181506		02/08/11		106	102	103.9%
Conductivity	EPA 120.1	02/04/11	umhos/cm	973	1,000	97.3%
Ricca #3193						
Chloride	EPA 300.0	02/04/11	mg/L	3.0	3.0	100.0%
ERA #230109						
Fluoride	EPA 300.0	02/03/11	mg/L	3.0	3.0	100.0%
ERA #02098						
N-Nitrate	EPA 300.0	02/03/11	mg-N/L	3.0	3.0	100.0%
ERA #09127						
Ortho-Phosphorous	EPA 300.0	02/03/11	mg-P/L	2.9	3.0	96.7%
EAR #210109						
N-Ammonia	EPA 350.1M	02/03/11	mg-N/L	0.510	0.500	102.0%
ERA #15125						
Sulfate	EPA 300.0	02/04/11	mg/L	2.9	3.0	96.7%
ERA #220109						

Analytical Resources, Incorporated
Analytical Chemists and Consultants

February 22, 2011

Nick Bacher
AMEC
600 University Street, Suite 1020
Seattle, WA 98101

Client Project: Gateway Pacific Terminal (GPT) 0-915-15338-C
ARI ID: SH52

Dear Mr. Bacher:

Please find enclosed the original chain of custody (COC) records and the final results for the samples from the project referenced above. Eight water samples were received in good condition on February 3, 2011. Select samples were analyzed for alkalinity, salinity, fluoride, chloride, nitrate, ortho-phosphorous, ammonia, total dissolved solids, total suspended solids, and total metals parameters, as requested on the COC. Sulfate was not originally requested, but was added, per client request, on February 17, 2011.

There were no irregularities with these analyses.

A copy of these reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,
ANALYTICAL RESOURCES, INC.

Eric Branson
Project Manager
-for-
Kelly Bottem
Client Services Manager
206.695.6211
kellyb@arilabs.com
www.arilabs.com

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Cooler 2: 1.4°C Cooler 1: 3.9°C SH52-

CHAIN-OF-CUSTODY RECORD

PROJECT NAME: Gateway Pacific Terminal			DATE: 2/3/11 PAGE 1 OF 1
PROJECT NUMBER 0-915-15338-C	LABORATORY NAME ARI	CLIENT INFORMATION N/A	REPORTING REQUIREMENTS Standard
RESULTS TO Niklas Bacher	LABORATORY ADDRESS		
TURNAROUND TIME Standard	Tukwila, WA		
SAMPLE SHIPMENT METHOD	LABORATORY CONTACT Kelly Bottem		GEOTRACKER REQUIRED YES (NO)
	LABORATORY PHONE NUMBER 206-695-6200		SITE SPECIFIC GLOBAL ID NO N/A

SAMPLERS (SIGNATURE):

ANALYSES

DATE	TIME	SAMPLE NUMBER	Alkalinity/Salinity	Fl/Cl/NO3/SRP	Ammonia	TDS	TSS	Total Metals	CONTAINER TYPE AND SIZE	Soil (S), Water (W), Vapor (V), or Other (O)	Filtered	Preservative Type	Cooled	MS/MSD	No of Containers	ADDITIONAL COMMENTS
2/3/11	0835	PZ-03-0211	X	X	X	X	X	X	Various	W	N	H_2SO_4 + HNO_3	Y	N	6	
2/3/11	0930	PZ-12-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/3/11	1020	SW-01-0211	X*	X	X	X	X	X	Various	W	N		Y	N	6	
2/3/11	1050	PZ-02-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/3/11	1210	PZ-01-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/3/11	1310	PZ-10-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/3/11	1410	PZ-04-0211	X	X	X	X	X	X	Various	W	N		Y	N	6	
2/3/11	1510	SW-02-0211	X*	X	X	X	X	X	Various	W	N		Y	N	6	

RELINQUISHED BY:	DATE	TIME	RECEIVED BY: TH	DATE	TIME
SIGNATURE	2/3/11	1821	SIGNATURE	2/3/11	18:24
PRINTED NAME Trevor Louviere			PRINTED NAME		
COMPANY AMEC Geomatrix			COMPANY		
SIGNATURE			SIGNATURE		
PRINTED NAME			PRINTED NAME		
COMPANY			COMPANY		
SIGNATURE			SIGNATURE		
PRINTED NAME			PRINTED NAME		
COMPANY			COMPANY		

TOTAL NUMBER OF CONTAINERS 48

SAMPLING COMMENTS. X* Salinity is only tested for in SW-01-0211 and SW-02-0211

One Union Square, 600 University Street, Suite 1020
Seattle, Washington 98101-4107
Tel 206.342.1760 Fax 206.342.1761

amec

SH52:00002

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: AMEC

Project Name: Gateway Pacific Terminal

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: SH52

Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 1.4 3.9 ___ ___

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90941619

Cooler Accepted by: TH Date: 2/3/11 Time: 1824

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? ..... YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)?	NA	YES	NO
Were all bottles sealed in individual plastic bags?		YES	NO
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA		

Was Sample Split by ARI : NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: MCM Date: 2/4/11 Time: 0715

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Small Air Bubbles <2mm	Peabubbles' 2-4 mm	LARGE Air Bubbles > 4 mm

Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

PRESERVATION VERIFICATION 02/04/11
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **SH52**

PC: Kelly
VTSR: 02/03/11

Inquiry Number: NONE
Analysis Requested: 02/04/11
Contact: Bacher, Nik
Client: Amec Geomatrix
Logged by: MM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0-915-15338-C
Project: Gateway Pacific Terminal
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
11-2358 **SH52A**	PZ-03-0211			PASS			TOT PASS															
11-2359 **SH52B**	PZ-12-0211						TOT															
11-2360 **SH52C**	SW-01-0211						TOT															
11-2361 **SH52D**	PZ-02-0211						TOT															
11-2362 **SH52E**	PZ-01-0211						TOT															
11-2363 **SH52F**	PZ-10-0211						TOT															
11-2364 **SH52G**	PZ-04-0211						TOT															
11-2365 **SH52H**	SW-02-0211						TOT															

2-4-11

Checked By _____ Date 2/4/11

SH52 : 00004

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: SH52
Client: Amec Geomatrix
Project Event: 0-915-15338-C
Project Name: Gateway Pacific Terminal

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	PZ-03-0211	SH52A	11-2358	Water	02/03/11 08:35	02/03/11 18:24
2.	PZ-12-0211	SH52B	11-2359	Water	02/03/11 09:30	02/03/11 18:24
3.	SW-01-0211	SH52C	11-2360	Water	02/03/11 10:20	02/03/11 18:24
4.	PZ-02-0211	SH52D	11-2361	Water	02/03/11 10:50	02/03/11 18:24
5.	PZ-01-0211	SH52E	11-2362	Water	02/03/11 12:10	02/03/11 18:24
6.	PZ-10-0211	SH52F	11-2363	Water	02/03/11 13:10	02/03/11 18:24
7.	PZ-04-0211	SH52G	11-2364	Water	02/03/11 14:10	02/03/11 18:24
8.	SW-02-0211	SH52H	11-2365	Water	02/03/11 15:10	02/03/11 18:24

Printed 02/04/11

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-03-0211
SAMPLE

Lab Sample ID: SH52A
LIMS ID: 11-2358
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**50.4**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**34.6**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**5.0**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**44.5**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-12-0211
SAMPLE

Lab Sample ID: SH52B
LIMS ID: 11-2359
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**55.8**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**40.2**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**4.9**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**75.4**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: SW-01-0211
SAMPLE

Lab Sample ID: SH52C
LIMS ID: 11-2360
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**8.68**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**3.95**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**0.8**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**4.5**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-02-0211
SAMPLE

Lab Sample ID: SH52D
LIMS ID: 11-2361
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**65.8**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**36.8**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**3.9**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**47.2**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-01-0211
SAMPLE

Lab Sample ID: SH52E
LIMS ID: 11-2362
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**132**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**64.3**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**6.7**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**129**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-10-0211
SAMPLE

Lab Sample ID: SH52F
LIMS ID: 11-2363
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**20.3**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**11.2**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**1.8**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**16.6**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-04-0211
SAMPLE

Lab Sample ID: SH52G
LIMS ID: 11-2364
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**87.4**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**60.7**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**7.1**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**103**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: SW-02-0211
SAMPLE

Lab Sample ID: SH52H
LIMS ID: 11-2365
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	**7440-70-2**	**Calcium**	0.05	**8.79**	
3010A	02/04/11	6010B	02/10/11	**7439-95-4**	**Magnesium**	0.05	**3.96**	
3010A	02/04/11	6010B	02/10/11	**7440-09-7**	**Potassium**	0.5	**1.0**	
3010A	02/04/11	6010B	02/10/11	**7440-23-5**	**Sodium**	0.5	**5.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: LAB CONTROL

Lab Sample ID: SH52LCS
LIMS ID: 11-2358
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Calcium	6010B	9.80	10.0	98.0%	
Magnesium	6010B	10.1	10.0	101%	
Potassium	6010B	10.0	10.0	100%	
Sodium	6010B	10.2	10.0	102%	

Reported in mg/L

N-Control limit not met
Control Limits: 80-120%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: METHOD BLANK

Lab Sample ID: SH52MB
LIMS ID: 11-2358
Matrix: Water
Data Release Authorized:
Reported: 02/11/11

QC Report No: SH52-Amec Geomatrix
Project: Gateway Pacific Terminal
0-915-15338-C
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/04/11	6010B	02/10/11	7440-70-2	Calcium	0.05	0.05	U
3010A	02/04/11	6010B	02/10/11	7439-95-4	Magnesium	0.05	0.05	U
3010A	02/04/11	6010B	02/10/11	7440-09-7	Potassium	0.5	0.5	U
3010A	02/04/11	6010B	02/10/11	7440-23-5	Sodium	0.5	0.5	U

U-Analyte undetected at given RL
RL-Reporting Limit

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: PZ-03-0211
ARI ID: 11-2358 SH52A

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	308
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	308
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	10.0	386
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	2.8
Chloride	02/06/11 020611#1	EPA 300.0	mg/L	1.0	34.4
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	0.5
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	0.011
Sulfate	02/05/11 020511#1	EPA 300.0	mg/L	1.0	29.1

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: PZ-12-0211
ARI ID: 11-2359 SH52B

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	406
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	406
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	10.0	474
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	1.1
Chloride	02/06/11 020611#1	EPA 300.0	mg/L	1.0	37.8
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	0.1
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	0.024
Sulfate	02/05/11 020511#1	EPA 300.0	mg/L	1.0	25.0

RL Analytical reporting limit
U Undetected at reported detection limit

SH52:00017R

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: SW-01-0211
ARI ID: 11-2360 SH52C

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	32.3
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	32.3
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	02/04/11 020411#1	EPA 120.1	umhos/cm	1.00	95.9
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	88.0
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	5.3
Salinity	02/04/11 020411#1	SM 2520.B	ppt	0.10	< 0.10 U
Chloride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	4.5
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	0.2
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	0.042
Sulfate	02/17/11 021711#1	EPA 300.0	mg/L	0.2	6.6

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: PZ-02-0211
ARI ID: 11-2361 SH52D

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	322
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	322
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	10.0	432
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	1.8
Chloride	02/08/11 020811#1	EPA 300.0	mg/L	2.0	49.0
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	< 0.010 U
Sulfate	02/08/11 020811#1	EPA 300.0	mg/L	2.0	47.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: PZ-01-0211
ARI ID: 11-2362 SH52E

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	482
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	482
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	13.3	929
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.0	1.9
Chloride	02/06/11 020611#1	EPA 300.0	mg/L	10.0	265
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	0.4
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	0.013
Sulfate	02/05/11 020511#1	EPA 300.0	mg/L	10.0	45.6

RL Analytical reporting limit
U Undetected at reported detection limit

SH52 : 00020 R

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: PZ-10-0211
ARI ID: 11-2363 SH52F

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	104
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	104
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	156
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	1.6
Chloride	02/06/11 020611#1	EPA 300.0	mg/L	0.5	12.0
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	0.2
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	0.019
Sulfate	02/05/11 020511#1	EPA 300.0	mg/L	0.5	15.4

RL Analytical reporting limit
U Undetected at reported detection limit

SH52:00021R

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: PZ-04-0211
ARI ID: 11-2364 SH52G

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	516
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	516
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	13.3	721
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.1	2.4
Chloride	02/06/11 020611#1	EPA 300.0	mg/L	5.0	104
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	1.5
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	< 0.010 U
Sulfate	02/05/11 020511#1	EPA 300.0	mg/L	5.0	49.7

RL Analytical reporting limit
U Undetected at reported detection limit

SH52 : 00022 R

SAMPLE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Client ID: SW-02-0211
ARI ID: 11-2365 SH52H

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	02/08/11 020811#1	SM 2320	mg/L CaCO3	1.0	27.2
Carbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	02/08/11	SM 2320	mg/L CaCO3	1.0	27.2
Hydroxide	02/08/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	02/04/11 020411#1	EPA 120.1	umhos/cm	1.00	94.0
Total Dissolved Solids	02/04/11 020411#1	EPA 160.1	mg/L	5.0	105
Total Suspended Solids	02/04/11 020411#1	EPA 160.2	mg/L	1.5	48.2
Salinity	02/04/11 020411#1	SM 2520.B	ppt	0.10	< 0.10 U
Chloride	02/06/11 020611#1	EPA 300.0	mg/L	0.2	5.1
Fluoride	02/04/11 020411#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	02/04/11 020411#1	EPA 300.0	mg-N/L	0.1	0.7
Ortho-Phosphorous	02/04/11 020411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	02/10/11 021011#1	EPA 350.1M	mg-N/L	0.010	0.069
Sulfate	02/05/11 020511#1	EPA 300.0	mg/L	0.2	7.5

RL Analytical reporting limit
U Undetected at reported detection limit

SH52 : 00023 R

MS/MSD RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: SH52A Client ID: PZ-03-0211							
Chloride	EPA 300.0	02/06/11	mg/L	34.4	51.1	20.0	83.5%
Fluoride	EPA 300.0	02/04/11	mg/L	0.2	2.2	2.0	100.0%
N-Nitrate	EPA 300.0	02/04/11	mg-N/L	0.5	2.5	2.0	100.0%
Ortho-Phosphorous	EPA 300.0	02/04/11	mg-P/L	< 0.1	1.6	2.0	80.0%
N-Ammonia	EPA 350.1M	02/10/11	mg-N/L	0.011	0.446	0.500	87.0%
Sulfate	EPA 300.0	02/05/11	mg/L	29.1	46.8	20.0	88.5%

REPLICATE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: 02/03/11
Date Received: 02/03/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: SH52A Client ID: PZ-03-0211						
Alkalinity	SM 2320	02/08/11	mg/L CaCO3	308	309	0.3%
Carbonate	SM 2320	02/08/11	mg/L CaCO3	< 1.0	< 1.0	NA
Bicarbonate	SM 2320	02/08/11	mg/L CaCO3	308	309	0.3%
Hydroxide	SM 2320	02/08/11	mg/L CaCO3	< 1.0	< 1.0	NA
Chloride	EPA 300.0	02/06/11	mg/L	34.4	34.4	0.0%
Fluoride	EPA 300.0	02/04/11	mg/L	0.2	0.2	0.0%
N-Nitrate	EPA 300.0	02/04/11	mg-N/L	0.5	0.5	0.0%
Ortho-Phosphorous	EPA 300.0	02/04/11	mg-P/L	< 0.1	< 0.1	NA
N-Ammonia	EPA 350.1M	02/10/11	mg-N/L	0.011	< 0.010	NA
Sulfate	EPA 300.0	02/05/11	mg/L	29.1	28.9	0.7%
ARI ID: SH52C Client ID: SW-01-0211						
Conductivity	EPA 120.1	02/04/11	umhos/cm	95.9	95.7	0.2%
Salinity	SM 2520.B	02/04/11	ppt	< 0.10	< 0.10	NA

SH52 : 00025 R

LAB CONTROL RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	02/04/11	mg/L	486	500	97.2%
Total Suspended Solids EPA 160.2	ICVL	02/04/11	mg/L	49.5	50.0	99.0%
Salinity SM 2520.B	ICVL	02/04/11	ppt	42,900	47,600	90.1%

METHOD BLANK RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Conductivity	EPA 120.1	02/04/11	umhos/cm	< 1.00 U	
Total Dissolved Solids	EPA 160.1	02/04/11	mg/L	< 5.0 U	
Total Suspended Solids	EPA 160.2	02/04/11	mg/L	< 1.0 U	
Salinity	SM 2520.B	02/04/11	ppt	< 0.10 U	
Chloride	EPA 300.0	02/04/11	mg/L	< 0.1 U	
		02/06/11		< 0.1 U	
		02/08/11		< 0.1 U	
Fluoride	EPA 300.0	02/04/11	mg/L	< 0.1 U	
N-Nitrate	EPA 300.0	02/04/11	mg-N/L	< 0.1 U	
Ortho-Phosphorous	EPA 300.0	02/04/11	mg-P/L	< 0.1 U	
N-Ammonia	EPA 350.1M	02/10/11	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	02/05/11	mg/L	< 0.1 U	
		02/08/11		< 0.1 U	
		02/17/11		< 0.1 U	

SH52 00027 R

STANDARD REFERENCE RESULTS-CONVENTIONALS
SH52-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized
Reported: 02/22/11

Project: Gateway Pacific Terminal
Event: 0-915-15338-C
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Alkalinity	SM 2320	02/08/11	mg/L CaCO3	101	102	99.0%
ERA #P114506		02/08/11		106	102	103.9%
Conductivity	EPA 120.1	02/04/11	umhos/cm	973	1,000	97.3%
Ricca #3193						
Chloride	EPA 300.0	02/04/11	mg/L	3.0	3.0	100.0%
ERA #230109		02/06/11		3.0	3.0	100.0%
		02/08/11		3.0	3.0	100.0%
Fluoride	EPA 300.0	02/04/11	mg/L	3.0	3.0	100.0%
ERA #02098						
N-Nitrate	EPA 300.0	02/04/11	mg-N/L	3.0	3.0	100.0%
ERA #09127						
Ortho-Phosphorous	EPA 300.0	02/04/11	mg-P/L	2.9	3.0	96.7%
EAR #210109						
N-Ammonia	EPA 350.1M	02/10/11	mg-N/L	0.520	0.500	104.0%
ERA #15125						
Sulfate	EPA 300.0	02/05/11	mg/L	2.9	3.0	96.7%
ERA #220109		02/08/11		3.0	3.0	100.0%
		02/17/11		3.0	3.0	100.0%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

May 3, 2011

Niklas Bacher
AMEC
600 University Street, Suite 1020
Seattle, WA 98101

Client Project: Gateway Pacific Terminal (GPT)
ARI ID: SR71

Dear Mr. Bacher:

Please find enclosed the original chain of custody (COC) records and the final results for the samples from the project referenced above. Six water samples were received in good condition on April 14, 2011.

The samples were analyzed for Total Metals, HCID, SVOCs, NWTPH-Gx plus BTEX and general chemistry parameters, as requested on the COC.

The SVOCs CCAL is out of control low for all associated FORM III "Q" flagged analytes with the exception of 2,2'-Oxybis(1-Chloropropane) which is out of control high. All associated samples that contain analyte have been flagged with a "Q" qualifier.

There were no other anomalies with these samples.

A copy of these reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
206.695.6211
kellyb@arilabs.com
www.arilabs.com

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: SR71	Turn-around Requested: Standard
ARI Client Company: AMEC GMX	Phone: 206-342-1760
Client Contact: Niklas Bacher	
Client Project Name: GPT	
Client Project #:	Samplers: Trevor Louviere, Niklas Bacher

Page: 1 of 1	
Date: 4/13/11	Ice Present?
No. of Coolers:	Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Alkalinity/Salinity	F/Cl/NO3/SO4/SRP (300.0)	Ammonia	HCID	TDS	TSS	Total Metals	SVOCs	NWTPH-Dx	NWTPH-Gx plus BTEX	Notes/Comments
PZ-03-0411	4/13/11	0950	W	14	X	X	X	X	X	X	X	X		X	
PZ-12-0411		1110	W	14	X	X	X	X	X	X	X	X		X	
PZ-02-0411		1235	W	14	X	X	X	X	X	X	X	X		X	
SW-01-0411		1315	W	14	X	X	X	X	X	X	X	X		X	
PZ-01-0411		1400	W	14	X	X	X	X	X	X	X	X		X	
PZ-01-D-0411		1410	W	14	X	X	X	X	X	X	X	X		X	
Trip Blanks			W	2											

Comments/Special Instructions

Relinquished by:	Received by:	Relinquished by:	Received by:
(Signature) [signature]	(Signature)	(Signature)	(Signature) [signature]
Printed Name: Trevor Louviere	Printed Name:	Printed Name:	Printed Name: Mikka Mulumba
Company: AMEC Geomatrix	Company: FEDEX	Company:	Company: ARI
Date & Time: 4/13/11 16:15	Date & Time: 4/14 1450 1614	Date & Time:	Date & Time: 4/14/11 0940

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: SR71
Client: Amec Geomatrix
Project Event: N/A
Project Name: GPT

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	PZ-03-0411	SR71A	11-8144	Water	04/13/11 09:50	04/14/11 09:45
2.	PZ-12-0411	SR71B	11-8145	Water	04/13/11 11:10	04/14/11 09:45
3.	PZ-02-0411	SR71C	11-8146	Water	04/13/11 12:35	04/14/11 09:45
4.	SW-01-0411	SR71D	11-8147	Water	04/13/11 13:15	04/14/11 09:45
5.	PZ-01-0411	SR71E	11-8148	Water	04/13/11 14:00	04/14/11 09:45
6.	PZ-01-D-0411	SR71F	11-8149	Water	04/13/11 14:10	04/14/11 09:45
7.	Trip Blanks	SR71G	11-8150	Water	04/13/11	04/14/11 09:45

Printed 04/14/11

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: AMEC GMX

Project Name: GPI

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: SR71

Tracking No: 9746145016 14 NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 3.7 3.7 3.9 ___

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90941614

Cooler Accepted by: MM Date: 4/14/11 Time: 0945

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	YES	NO
Were all bottles sealed in individual plastic bags?		YES	NO
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA	4/6/11	

Was Sample Split by ARI : NA YES Date/Time: _____ Equipment: _____ Split by: _____

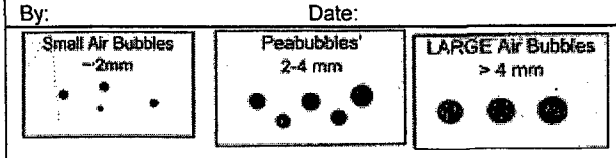
Samples Logged by: MM Date: 4/14/11 Time: 1140

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID

Matrix: Water

QC Report No: SR71-Amec Geomatrix
Project: GPT

Data Release Authorized:
Reported: 04/18/11

ARI ID	Sample ID	Extraction Date	Analysis Date	DL	Range	Result
MB-041511	Method Blank	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8144					Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	95.0%
SR71A	PZ-03-0411	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8144	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	99.0%
SR71B	PZ-12-0411	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8145	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	96.3%
SR71C	PZ-02-0411	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8146	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	102%
SR71D	SW-01-0411	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8147	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	84.9%
SR71E	PZ-01-0411	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8148	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	93.4%
SR71F	PZ-01-D-0411	04/15/11	04/16/11	1.0	Gas	< 0.25 U
11-8149	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	99.0%

Reported in mg/L (ppm)

Gas value based on total peaks in the range from Toluene to C12.
Diesel value based on the total peaks in the range from C12 to C24.
Oil value based on the total peaks in the range from C24 to C38.

FORM I

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID

Sample ID: LCS-041511
LCS/LCSD

Lab Sample ID: LCS-041511
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted LCS/LCSD: 04/15/11

Date Analyzed LCS: 04/16/11 10:11
LCSD: 04/16/11 10:35
Instrument/Analyst LCS: FID/MS
LCSD: FID/MS

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Diesel	3.07	3.00	102%	2.87	3.00	95.7%	6.7%

HCID Surrogate Recovery

	LCS	LCSD
o-Terphenyl	99.1%	90.5%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

HCID SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: SR71-Amec Geomatrix
Project: GPT

Client ID	O-TER	TOT OUT
MB-041511	95.0%	0
LCS-041511	99.1%	0
LCSD-041511	90.5%	0
PZ-03-0411	99.0%	0
PZ-12-0411	96.3%	0
PZ-02-0411	102%	0
SW-01-0411	84.9%	0
PZ-01-0411	93.4%	0
PZ-01-D-0411	99.0%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(55-110)	(50-150)

Prep Method: SW3510C
Log Number Range: 11-8144 to 11-8149

FORM-II HCID

ANALYTICAL RESOURCES INCORPORATED

TOTAL HCID RANGE HYDROCARBONS-EXTRACTION REPORT

ARI Job: SR71
Project: GPT

Matrix: Water
Date Received: 04/14/11

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
11-8144-041511MB	Method Blank	500 mL	1.00 mL	04/15/11
11-8144-041511LCS	Lab Control	500 mL	1.00 mL	04/15/11
11-8144-041511LCSD	Lab Control Dup	500 mL	1.00 mL	04/15/11
11-8144-SR71A	PZ-03-0411	500 mL	1.00 mL	04/15/11
11-8145-SR71B	PZ-12-0411	500 mL	1.00 mL	04/15/11
11-8146-SR71C	PZ-02-0411	500 mL	1.00 mL	04/15/11
11-8147-SR71D	SW-01-0411	500 mL	1.00 mL	04/15/11

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-03-0411
SAMPLE

Lab Sample ID: SR71A
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 19:27
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U
84-66-2	Diethylphthalate	1.0	< 1.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-03-0411
SAMPLE

Lab Sample ID: SR71A
LIMS ID: 11-8144
Matrix: Water
Date Analyzed: 04/20/11 19:27

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	70.0%	2-Fluorobiphenyl	62.4%
d14-p-Terphenyl	74.4%	d4-1,2-Dichlorobenzene	57.2%
d5-Phenol	66.9%	2-Fluorophenol	68.0%
2,4,6-Tribromophenol	63.2%	d4-2-Chlorophenol	68.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-12-0411
SAMPLE

Lab Sample ID: SR71B
LIMS ID: 11-8145
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 20:00
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-12-0411
SAMPLE

Lab Sample ID: SR71B
LIMS ID: 11-8145
Matrix: Water
Date Analyzed: 04/20/11 20:00

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	62.0%	2-Fluorobiphenyl	53.6%
d14-p-Terphenyl	64.0%	d4-1,2-Dichlorobenzene	49.2%
d5-Phenol	57.1%	2-Fluorophenol	60.8%
2,4,6-Tribromophenol	59.5%	d4-2-Chlorophenol	60.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-02-0411
SAMPLE

Lab Sample ID: SR71C
LIMS ID: 11-8146
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 20:33
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-02-0411
SAMPLE

Lab Sample ID: SR71C
LIMS ID: 11-8146
Matrix: Water
Date Analyzed: 04/20/11 20:33

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.8**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	69.2%	2-Fluorobiphenyl	56.4%
d14-p-Terphenyl	66.8%	d4-1,2-Dichlorobenzene	50.8%
d5-Phenol	67.2%	2-Fluorophenol	69.1%
2,4,6-Tribromophenol	64.5%	d4-2-Chlorophenol	68.5%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: SW-01-0411
SAMPLE

Lab Sample ID: SR71D
LIMS ID: 11-8147
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 21:06
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: SW-01-0411
SAMPLE

Lab Sample ID: SR71D
LIMS ID: 11-8147
Matrix: Water
Date Analyzed: 04/20/11 21:06

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**4.7**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	73.2%	2-Fluorobiphenyl	66.0%
d14-p-Terphenyl	54.0%	d4-1,2-Dichlorobenzene	57.6%
d5-Phenol	68.8%	2-Fluorophenol	70.1%
2,4,6-Tribromophenol	70.7%	d4-2-Chlorophenol	70.9%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-01-0411
SAMPLE

Lab Sample ID: SR71E
LIMS ID: 11-8148
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 21:39
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-01-0411
SAMPLE

Lab Sample ID: SR71E
LIMS ID: 11-8148
Matrix: Water
Date Analyzed: 04/20/11 21:39

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	55.2%	2-Fluorobiphenyl	46.4%
d14-p-Terphenyl	60.4%	d4-1,2-Dichlorobenzene	40.0%
d5-Phenol	51.2%	2-Fluorophenol	52.0%
2,4,6-Tribromophenol	52.3%	d4-2-Chlorophenol	52.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-01-D-0411
SAMPLE

Lab Sample ID: SR71F
LIMS ID: 11-8149
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 22:12
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-01-D-0411
SAMPLE

Lab Sample ID: SR71F
LIMS ID: 11-8149
Matrix: Water
Date Analyzed: 04/20/11 22:12

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	61.2%	2-Fluorobiphenyl	53.6%
d14-p-Terphenyl	64.4%	d4-1,2-Dichlorobenzene	46.0%
d5-Phenol	56.3%	2-Fluorophenol	56.0%
2,4,6-Tribromophenol	60.5%	d4-2-Chlorophenol	57.1%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: MB-041911
METHOD BLANK

Lab Sample ID: MB-041911
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA
Date Sampled: NA
Date Received: NA

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 17:16
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: MB-041911
METHOD BLANK

Lab Sample ID: MB-041911
LIMS ID: 11-8144
Matrix: Water
Date Analyzed: 04/20/11 17:16

QC Report No: SR71-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	79.2%	2-Fluorobiphenyl	70.4%
d14-p-Terphenyl	74.8%	d4-1,2-Dichlorobenzene	62.0%
d5-Phenol	75.2%	2-Fluorophenol	76.5%
2,4,6-Tribromophenol	76.8%	d4-2-Chlorophenol	77.6%

ANALYTICAL RESOURCES INCORPORATED

SW8270 SEMIVOLATILES WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: SR71-Amec Geomatrix
Project: GPT

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT OUT
MB-041911	79.2%	70.4%	74.8%	62.0%	75.2%	76.5%	76.8%	77.6%	0
LCS-041911	72.8%	67.6%	67.2%	57.2%	75.7%	70.1%	80.3%	72.3%	0
LCSD-041911	73.2%	66.8%	72.0%	58.0%	77.3%	73.3%	82.1%	74.1%	0
PZ-03-0411	70.0%	62.4%	74.4%	57.2%	66.9%	68.0%	63.2%	68.3%	0
PZ-12-0411	62.0%	53.6%	64.0%	49.2%	57.1%	60.8%	59.5%	60.8%	0
PZ-02-0411	69.2%	56.4%	66.8%	50.8%	67.2%	69.1%	64.5%	68.5%	0
SW-01-0411	73.2%	66.0%	54.0%	57.6%	68.8%	70.1%	70.7%	70.9%	0
PZ-01-0411	55.2%	46.4%	60.4%	40.0%	51.2%	52.0%	52.3%	52.3%	0
PZ-01-D-0411	61.2%	53.6%	64.4%	46.0%	56.3%	56.0%	60.5%	57.1%	0

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(46-100)	(39-100)
(FBP) = 2-Fluorobiphenyl	(49-100)	(42-100)
(TPH) = d14-p-Terphenyl	(53-119)	(26-114)
(DCB) = d4-1,2-Dichlorobenzene	(38-100)	(32-100)
(PHL) = d5-Phenol	(50-100)	(41-100)
(2FP) = 2-Fluorophenol	(46-100)	(38-100)
(TBP) = 2,4,6-Tribromophenol	(52-123)	(48-118)
(2CP) = d4-2-Chlorophenol	(53-100)	(44-100)

Prep Method: SW3520C
Log Number Range: 11-8144 to 11-8149

FORM-II SW8270

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-041911
LCS/LCSD

Lab Sample ID: LCS-041911
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/26/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Date Extracted LCS/LCSD: 04/19/11

Date Analyzed LCS: 04/20/11 17:49
LCSD: 04/20/11 18:22
Instrument/Analyst LCS: NT6/JZ
LCSD: NT6/JZ
GPC Cleanup: NO

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Phenol	18.2	25.0	72.8%	19.2	25.0	76.8%	5.3%
Bis-(2-Chloroethyl) Ether	18.9	25.0	75.6%	19.5	25.0	78.0%	3.1%
2-Chlorophenol	18.0	25.0	72.0%	18.8	25.0	75.2%	4.3%
1,3-Dichlorobenzene	13.2	25.0	52.8%	14.0	25.0	56.0%	5.9%
1,4-Dichlorobenzene	13.5	25.0	54.0%	14.4	25.0	57.6%	6.5%
Benzyl Alcohol	16.9	50.0	33.8%	17.5	50.0	35.0%	3.5%
1,2-Dichlorobenzene	14.2	25.0	56.8%	15.3	25.0	61.2%	7.5%
2-Methylphenol	16.6	25.0	66.4%	17.4	25.0	69.6%	4.7%
2,2'-Oxybis(1-Chloropropane)	23.3 Q	25.0	93.2%	24.2 Q	25.0	96.8%	3.8%
4-Methylphenol	34.6	50.0	69.2%	35.8	50.0	71.6%	3.4%
N-Nitroso-Di-N-Propylamine	18.0	25.0	72.0%	18.4	25.0	73.6%	2.2%
Hexachloroethane	11.7	25.0	46.8%	13.0	25.0	52.0%	10.5%
Nitrobenzene	19.0	25.0	76.0%	19.5	25.0	78.0%	2.6%
Isophorone	19.1	25.0	76.4%	19.3	25.0	77.2%	1.0%
2-Nitrophenol	53.2	75.0	70.9%	55.6	75.0	74.1%	4.4%
2,4-Dimethylphenol	13.2	25.0	52.8%	13.1	25.0	52.4%	0.8%
Benzoic Acid	109	138	79.0%	107	138	77.5%	1.9%
bis(2-Chloroethoxy) Methane	16.9	25.0	67.6%	17.4	25.0	69.6%	2.9%
2,4-Dichlorophenol	51.3	75.0	68.4%	52.8	75.0	70.4%	2.9%
1,2,4-Trichlorobenzene	14.9	25.0	59.6%	15.6	25.0	62.4%	4.6%
Naphthalene	17.3	25.0	69.2%	18.1	25.0	72.4%	4.5%
4-Chloroaniline	51.6	75.0	68.8%	56.2	75.0	74.9%	8.5%
Hexachlorobutadiene	13.6	25.0	54.4%	14.0	25.0	56.0%	2.9%
4-Chloro-3-methylphenol	51.7	75.0	68.9%	53.6	75.0	71.5%	3.6%
2-Methylnaphthalene	16.6	25.0	66.4%	17.4	25.0	69.6%	4.7%
Hexachlorocyclopentadiene	14.1	75.0	18.8%	18.2	75.0	24.3%	25.4%
2,4,6-Trichlorophenol	55.1	75.0	73.5%	56.8	75.0	75.7%	3.0%
2,4,5-Trichlorophenol	60.1	75.0	80.1%	61.8	75.0	82.4%	2.8%
2-Chloronaphthalene	17.7	25.0	70.8%	18.2	25.0	72.8%	2.8%
2-Nitroaniline	67.1	75.0	89.5%	70.9	75.0	94.5%	5.5%
Dimethylphthalate	18.8	25.0	75.2%	19.6	25.0	78.4%	4.2%
Acenaphthylene	19.2	25.0	76.8%	19.5	25.0	78.0%	1.6%
3-Nitroaniline	64.1 Q	75.0	85.5%	69.4 Q	75.0	92.5%	7.9%
Acenaphthene	18.3	25.0	73.2%	18.8	25.0	75.2%	2.7%
2,4-Dinitrophenol	97.6	138	70.7%	103	138	74.6%	5.4%
4-Nitrophenol	64.7	75.0	86.3%	68.8	75.0	91.7%	6.1%
Dibenzofuran	19.1	25.0	76.4%	19.6	25.0	78.4%	2.6%
2,6-Dinitrotoluene	57.2	75.0	76.3%	60.0	75.0	80.0%	4.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-041911
LCS/LCSD

Lab Sample ID: LCS-041911
LIMS ID: 11-8144
Matrix: Water
Date Analyzed LCS: 04/20/11 17:49
LCSD: 04/20/11 18:22

QC Report No: SR71-Amec Geomatrix
Project: GPT

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
2,4-Dinitrotoluene	56.9	75.0	75.9%	60.5	75.0	80.7%	6.1%
Diethylphthalate	19.0	25.0	76.0%	20.1	25.0	80.4%	5.6%
4-Chlorophenyl-phenylether	17.8	25.0	71.2%	18.3	25.0	73.2%	2.8%
Fluorene	18.9	25.0	75.6%	19.6	25.0	78.4%	3.6%
4-Nitroaniline	66.1 Q	75.0	88.1%	69.5 Q	75.0	92.7%	5.0%
4,6-Dinitro-2-Methylphenol	116	138	84.1%	119	138	86.2%	2.6%
N-Nitrosodiphenylamine	15.6	25.0	62.4%	16.1	25.0	64.4%	3.2%
4-Bromophenyl-phenylether	18.6	25.0	74.4%	19.3	25.0	77.2%	3.7%
Hexachlorobenzene	19.2	25.0	76.8%	20.7	25.0	82.8%	7.5%
Pentachlorophenol	61.0	75.0	81.3%	60.8	75.0	81.1%	0.3%
Phenanthrene	20.6	25.0	82.4%	21.7	25.0	86.8%	5.2%
Carbazole	20.1	25.0	80.4%	20.6	25.0	82.4%	2.5%
Anthracene	19.9	25.0	79.6%	20.4	25.0	81.6%	2.5%
Di-n-Butylphthalate	20.2	25.0	80.8%	21.2	25.0	84.8%	4.8%
Fluoranthene	21.0	25.0	84.0%	21.4	25.0	85.6%	1.9%
Pyrene	18.5	25.0	74.0%	20.2	25.0	80.8%	8.8%
Butylbenzylphthalate	17.8	25.0	71.2%	19.1	25.0	76.4%	7.0%
3,3'-Dichlorobenzidine	53.8	75.0	71.7%	59.6	75.0	79.5%	10.2%
Benzo(a)anthracene	19.8	25.0	79.2%	20.8	25.0	83.2%	4.9%
bis(2-Ethylhexyl)phthalate	18.2	25.0	72.8%	20.0	25.0	80.0%	9.4%
Chrysene	20.9	25.0	83.6%	21.6	25.0	86.4%	3.3%
Di-n-Octyl phthalate	19.0	25.0	76.0%	20.0	25.0	80.0%	5.1%
Benzo(a)pyrene	17.3	25.0	69.2%	18.3	25.0	73.2%	5.6%
Indeno(1,2,3-cd)pyrene	22.8	25.0	91.2%	24.6	25.0	98.4%	7.6%
Dibenz(a,h)anthracene	23.5	25.0	94.0%	25.2	25.0	101%	7.0%
Benzo(g,h,i)perylene	22.5	25.0	90.0%	24.3	25.0	97.2%	7.7%
1-Methylnaphthalene	16.3	25.0	65.2%	16.9	25.0	67.6%	3.6%
Total Benzofluoranthenes	38.1	50.0	76.2%	40.0	50.0	80.0%	4.9%

Semivolatile Surrogate Recovery

	LCS	LCSD
d5-Nitrobenzene	72.8%	73.2%
2-Fluorobiphenyl	67.6%	66.8%
d14-p-Terphenyl	67.2%	72.0%
d4-1,2-Dichlorobenzene	57.2%	58.0%
d5-Phenol	75.7%	77.3%
2-Fluorophenol	70.1%	73.3%
2,4,6-Tribromophenol	80.3%	82.1%
d4-2-Chlorophenol	72.3%	74.1%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-03-0411
SAMPLE

Lab Sample ID: SR71A
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 09:44
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	94.8%
Bromobenzene	89.3%

Gasoline Surrogate Recovery

Trifluorotoluene	94.7%
Bromobenzene	91.8%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-12-0411
SAMPLE

Lab Sample ID: SR71B
LIMS ID: 11-8145
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 10:12
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	92.7%
Bromobenzene	89.1%

Gasoline Surrogate Recovery

Trifluorotoluene	92.7%
Bromobenzene	89.8%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-02-0411
SAMPLE

Lab Sample ID: SR71C
LIMS ID: 11-8146
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 10:40
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	97.0%
Bromobenzene	93.7%

Gasoline Surrogate Recovery

Trifluorotoluene	96.9%
Bromobenzene	95.1%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: SW-01-0411
SAMPLE

Lab Sample ID: SR71D
LIMS ID: 11-8147
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 11:08
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	93.3%
Bromobenzene	91.5%

Gasoline Surrogate Recovery

Trifluorotoluene	94.2%
Bromobenzene	92.3%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-01-0411
SAMPLE

Lab Sample ID: SR71E
LIMS ID: 11-8148
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 11:36
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	92.8%
Bromobenzene	90.3%

Gasoline Surrogate Recovery

Trifluorotoluene	93.7%
Bromobenzene	91.6%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-01-D-0411
SAMPLE

Lab Sample ID: SR71F
LIMS ID: 11-8149
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 12:04
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	91.5%
Bromobenzene	92.6%

Gasoline Surrogate Recovery

Trifluorotoluene	92.7%
Bromobenzene	93.3%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: Trip Blanks
SAMPLE

Lab Sample ID: SR71G
LIMS ID: 11-8150
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Date Analyzed: 04/15/11 09:15
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	96.6%

Gasoline Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	96.2%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MB-041511
METHOD BLANK

Lab Sample ID: MB-041511
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed: 04/15/11 08:29
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	90.2%
Bromobenzene	88.4%

Gasoline Surrogate Recovery

Trifluorotoluene	90.4%
Bromobenzene	89.5%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: SR71
Matrix: Water

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA

Client ID	TFT	BBZ	TOT OUT
MB-041511	90.2%	88.4%	0
LCS-041511	94.0%	90.8%	0
LCSD-041511	94.8%	90.7%	0
PZ-03-0411	94.8%	89.3%	0
PZ-12-0411	92.7%	89.1%	0
PZ-02-0411	97.0%	93.7%	0
SW-01-0411	93.3%	91.5%	0
PZ-01-0411	92.8%	90.3%	0
PZ-01-D-0411	91.5%	92.6%	0
Trip Blanks	102%	96.6%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 11-8144 to 11-8150

FORM II BETX

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: SR71
Matrix: Water

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA

Client ID	TFT	BBZ	TOT OUT
MB-041511	90.4%	89.5%	0
LCS-041511	98.5%	98.5%	0
LCSD-041511	97.8%	97.4%	0
PZ-03-0411	94.7%	91.8%	0
PZ-12-0411	92.7%	89.8%	0
PZ-02-0411	96.9%	95.1%	0
SW-01-0411	94.2%	92.3%	0
PZ-01-0411	93.7%	91.6%	0
PZ-01-D-0411	92.7%	93.3%	0
Trip Blanks	100%	96.2%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 11-8144 to 11-8150

FORM II TPHG

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG

Sample ID: LCS-041511
LAB CONTROL SAMPLE

Lab Sample ID: LCS-041511
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 04/15/11 07:33
LCSD: 04/15/11 08:01
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.08	1.00	108%	0.98	1.00	98.0%	9.7%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	98.5%	97.8%
Bromobenzene	98.5%	97.4%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

Sample ID: LCS-041511
LAB CONTROL SAMPLE

Lab Sample ID: LCS-041511
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/18/11

QC Report No: SR71-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 04/15/11 07:33
LCSD: 04/15/11 08:01
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	4.09	3.70	111%	4.08	3.70	110%	0.2%
Toluene	37.1	36.5	102%	36.3	36.5	99.5%	2.2%
Ethylbenzene	10.8	10.7	101%	10.6	10.7	99.1%	1.9%
m,p-Xylene	40.4	40.1	101%	39.4	40.1	98.3%	2.5%
o-Xylene	17.2	18.1	95.0%	16.7	18.1	92.3%	2.9%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	94.0%	94.8%
Bromobenzene	90.8%	90.7%

SAMPLE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Client ID: PZ-03-0411
ARI ID: 11-8144 SR71A

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	308
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	308
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	654
Total Dissolved Solids	04/18/11 041811#1	EPA 160.1	mg/L	10.0	345
Total Suspended Solids	04/14/11 041411#1	EPA 160.2	mg/L	1.1	< 1.1 U
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.30
Chloride	04/15/11 041511#1	EPA 300.0	mg/L	1.0	24.0
Fluoride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	04/14/11 041411#1	EPA 300.0	mg-N/L	0.1	0.3
Ortho-Phosphorous	04/14/11 041411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	< 0.010 U
Sulfate	04/15/11 041511#1	EPA 300.0	mg/L	1.0	25.3

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Client ID: PZ-12-0411
ARI ID: 11-8145 SR71B

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	406
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	406
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	815
Total Dissolved Solids	04/18/11 041811#1	EPA 160.1	mg/L	10.0	469
Total Suspended Solids	04/14/11 041411#1	EPA 160.2	mg/L	1.1	1.2
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.40
Chloride	04/15/11 041511#1	EPA 300.0	mg/L	1.0	32.4
Fluoride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	04/14/11 041411#1	EPA 300.0	mg-N/L	0.1	0.3
Ortho-Phosphorous	04/14/11 041411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.026
Sulfate	04/15/11 041511#1	EPA 300.0	mg/L	1.0	24.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Client ID: PZ-02-0411
ARI ID: 11-8146 SR71C

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	318
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	318
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	708
Total Dissolved Solids	04/18/11 041811#1	EPA 160.1	mg/L	10.0	357
Total Suspended Solids	04/14/11 041411#1	EPA 160.2	mg/L	1.1	1.1
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.30
Chloride	04/15/11 041511#1	EPA 300.0	mg/L	2.0	28.0
Fluoride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	04/14/11 041411#1	EPA 300.0	mg-N/L	0.1	0.1
Ortho-Phosphorous	04/14/11 041411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.025
Sulfate	04/15/11 041511#1	EPA 300.0	mg/L	2.0	40.7

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Client ID: SW-01-0411
ARI ID: 11-8147 SR71D

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	48.3
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	48.3
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	116
Total Dissolved Solids	04/18/11 041811#1	EPA 160.1	mg/L	5.0	83.0
Total Suspended Solids	04/14/11 041411#1	EPA 160.2	mg/L	1.1	2.9
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.10
Chloride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	3.7
Fluoride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/14/11 041411#1	EPA 300.0	mg-N/L	0.1	0.1
Ortho-Phosphorous	04/14/11 041411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.035
Sulfate	04/14/11 041411#1	EPA 300.0	mg/L	0.1	4.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Client ID: PZ-01-0411
ARI ID: 11-8148 SR71E

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	493
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	493
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	1,570
Total Dissolved Solids	04/18/11 041811#1	EPA 160.1	mg/L	13.3	829
Total Suspended Solids	04/14/11 041411#1	EPA 160.2	mg/L	1.1	< 1.1 U
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.80
Chloride	04/28/11 042811#1	EPA 300.0	mg/L	10.0	219
Fluoride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	04/14/11 041411#1	EPA 300.0	mg-N/L	0.1	0.6
Ortho-Phosphorous	04/14/11 041411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.045
Sulfate	04/15/11 041511#1	EPA 300.0	mg/L	2.0	41.7

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Client ID: PZ-01-D-0411
ARI ID: 11-8149 SR71F

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	493
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	493
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	1,580
Total Dissolved Solids	04/18/11 041811#1	EPA 160.1	mg/L	13.3	833
Total Suspended Solids	04/14/11 041411#1	EPA 160.2	mg/L	1.1	< 1.1 U
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.80
Chloride	04/28/11 042811#1	EPA 300.0	mg/L	10.0	227
Fluoride	04/14/11 041411#1	EPA 300.0	mg/L	0.1	0.3
N-Nitrate	04/14/11 041411#1	EPA 300.0	mg-N/L	0.1	0.5
Ortho-Phosphorous	04/14/11 041411#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.048
Sulfate	04/15/11 041511#1	EPA 300.0	mg/L	2.0	36.9

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Conductivity	EPA 120.1	04/15/11	umhos/cm	< 1.00 U	
Total Dissolved Solids	EPA 160.1	04/18/11	mg/L	< 5.0 U	
Total Suspended Solids	EPA 160.2	04/14/11	mg/L	< 1.0 U	
Salinity	SM 2520.B	04/15/11	ppt	< 0.10 U	
Chloride	EPA 300.0	04/14/11	mg/L	< 0.1 U	
		04/15/11		< 0.1 U	
		04/28/11		< 0.1 U	
Fluoride	EPA 300.0	04/14/11	mg/L	< 0.1 U	
N-Nitrate	EPA 300.0	04/14/11	mg-N/L	< 0.1 U	
Ortho-Phosphorous	EPA 300.0	04/14/11	mg-P/L	< 0.1 U	
N-Ammonia	EPA 350.1M	04/27/11	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	04/14/11	mg/L	< 0.1 U	
		04/15/11		< 0.1 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	04/18/11	mg/L	452	500	90.4%
Total Suspended Solids EPA 160.2	ICVL	04/14/11	mg/L	49.9	50.0	99.8%
Salinity SM 2520.B	ICVL	04/15/11	ppt	45,100	47,600	94.7%

STANDARD REFERENCE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Alkalinity	SM 2320	04/19/11	mg/L CaCO3	65.9	66.3	99.4%
P190-506		04/19/11		63.2	66.3	95.3%
Conductivity	EPA 120.1	04/15/11	umhos/cm	996	1,000	99.6%
Ricca #3193						
Chloride	EPA 300.0	04/14/11	mg/L	2.8	3.0	93.3%
ERA #230109		04/15/11		2.8	3.0	93.3%
		04/28/11		2.8	3.0	93.3%
Fluoride	EPA 300.0	04/14/11	mg/L	2.9	3.0	96.7%
ERA #02098						
N-Nitrate	EPA 300.0	04/14/11	mg-N/L	2.9	3.0	96.7%
ERA #09127						
Ortho-Phosphorous	EPA 300.0	04/14/11	mg-P/L	2.9	3.0	96.7%
EAR #210109						
N-Ammonia	EPA 350.1M	04/27/11	mg-N/L	0.539	0.500	107.8%
ERA #15125						
Sulfate	EPA 300.0	04/14/11	mg/L	2.9	3.0	96.7%
ERA #220109		04/15/11		2.9	3.0	96.7%

REPLICATE RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: SR71A Client ID: PZ-03-0411						
Alkalinity	SM 2320	04/19/11	mg/L CaCO3	308	306	0.7%
Carbonate	SM 2320	04/19/11	mg/L CaCO3	< 1.0	< 1.0	NA
Bicarbonate	SM 2320	04/19/11	mg/L CaCO3	308	306	0.7%
Hydroxide	SM 2320	04/19/11	mg/L CaCO3	< 1.0	< 1.0	NA
Conductivity	EPA 120.1	04/15/11	umhos/cm	654	655	0.2%
Salinity	SM 2520.B	04/15/11	ppt	0.30	0.30	0.0%
Chloride	EPA 300.0	04/15/11	mg/L	24.0	23.5	2.1%
Fluoride	EPA 300.0	04/14/11	mg/L	0.3	0.3	0.0%
N-Nitrate	EPA 300.0	04/14/11	mg-N/L	0.3	0.3	0.0%
Ortho-Phosphorous	EPA 300.0	04/14/11	mg-P/L	< 0.1	< 0.1	NA
N-Ammonia	EPA 350.1M	04/27/11	mg-N/L	< 0.010	< 0.010	NA
Sulfate	EPA 300.0	04/15/11	mg/L	25.3	25.0	1.2%
ARI ID: SR71E Client ID: PZ-01-0411						
Total Dissolved Solids	EPA 160.1	04/18/11	mg/L	829	827	0.2%

MS/MSD RESULTS-CONVENTIONALS
SR71-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/13/11
Date Received: 04/14/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: SR71A Client ID: PZ-03-0411							
Chloride	EPA 300.0	04/15/11	mg/L	24.0	42.8	20.0	94.0%
Fluoride	EPA 300.0	04/14/11	mg/L	0.3	2.2	2.0	95.0%
N-Nitrate	EPA 300.0	04/14/11	mg-N/L	0.3	2.2	2.0	95.0%
Ortho-Phosphorous	EPA 300.0	04/14/11	mg-P/L	< 0.1	1.6	2.0	80.0%
N-Ammonia	EPA 350.1M	04/27/11	mg-N/L	< 0.010	0.504	0.500	100.8%
Sulfate	EPA 300.0	04/15/11	mg/L	25.3	43.5	20.0	91.0%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-03-0411
SAMPLE

Lab Sample ID: SR71A
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**50.3**	
3010A	04/15/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**32.8**	
3010A	04/15/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**4.8**	
3010A	04/15/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**37.3**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-12-0411
SAMPLE

Lab Sample ID: SR71B
LIMS ID: 11-8145
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**62.9**	
3010A	04/15/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**41.3**	
3010A	04/15/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**4.4**	
3010A	04/15/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**57.7**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-02-0411
SAMPLE

Lab Sample ID: SR71C
LIMS ID: 11-8146
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**64.6**	
3010A	04/15/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**32.4**	
3010A	04/15/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**3.4**	
3010A	04/15/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**33.8**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: SW-01-0411
SAMPLE

Lab Sample ID: SR71D
LIMS ID: 11-8147
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**11.6**	
3010A	04/15/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**5.00**	
3010A	04/15/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**0.9**	
3010A	04/15/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**5.3**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-01-0411
SAMPLE

Lab Sample ID: SR71E
LIMS ID: 11-8148
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**140**	
3010A	04/15/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**65.2**	
3010A	04/15/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**5.7**	
3010A	04/15/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**101**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-01-D-0411
SAMPLE

Lab Sample ID: SR71F
LIMS ID: 11-8149
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: 04/13/11
Date Received: 04/14/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**138**	
3010A	04/15/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**65.6**	
3010A	04/15/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**5.5**	
3010A	04/15/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**97.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: METHOD BLANK

Lab Sample ID: SR71MB
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/15/11	6010B	04/19/11	7440-70-2	Calcium	0.05	0.05	U
3010A	04/15/11	6010B	04/19/11	7439-95-4	Magnesium	0.05	0.05	U
3010A	04/15/11	6010B	04/19/11	7440-09-7	Potassium	0.5	0.5	U
3010A	04/15/11	6010B	04/19/11	7440-23-5	Sodium	0.5	0.5	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: LAB CONTROL

Lab Sample ID: SR71LCS
LIMS ID: 11-8144
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR71-Amec Geomatrix
Project: GPT

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Calcium	6010B	9.74	10.0	97.4%	
Magnesium	6010B	9.96	10.0	99.6%	
Potassium	6010B	10.2	10.0	102%	
Sodium	6010B	10.4	10.0	104%	

Reported in mg/L

N-Control limit not met
Control Limits: 80-120%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

May 3, 2011

Niklas Bacher
AMEC
600 University Street, Suite 1020
Seattle, WA 98101

Client Project: Gateway Pacific Terminal (GPT)
ARI ID: SR88

Dear Mr. Bacher:

Please find enclosed the original chain of custody (COC) records and the final results for the samples from the project referenced above. Four water samples and a trip blank were received in good condition on April 15, 2011.

The samples were analyzed for Total Metals, HCID, SVOCs, NWTPH-Gx plus BTEX and general chemistry parameters, as requested on the COC.

The SVOCs CCAL is out of control low for all associated FORM III "Q" flagged analytes with the exception of 2,2'-Oxybis(1-Chloropropane) which is out of control high. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The BTEX LCS is out of control high for Benzene. The LCSD is in control and no further action was taken.

There were no other anomalies associated with these samples.

A copy of these reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
206.695.6211
kellyb@arilabs.com
www.arilabs.com

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: SR88	Turn-around Requested: Standard
ARI Client Company: AMEC Geomatrix	Phone: 206-342-1760
Client Contact: NIKLAS BACHER	
Client Project Name: GPT	
Client Project #:	Samplers: Trevor Louviere, Niklas Bacher

Page: 1 of 1	
Date: 4/14/11	Ice Present?
No. of Coolers:	Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Alkalinity Salinity	Fl, Cl, NO3, SO4 (SEP 300.0)	Ammonia	HCID	TDS	TSS	Total Metals	SVOC's	NWTPH-Dx	NWTPH-Gx plus BTEX	Notes/Comments
PZ-11-0411	4/14/11	0850	W	14	X	X	X	X	X	X	X	X		X	
PZ-04-0411	↓	1025	W	14	X	X	X	X	X	X	X	X		X	
PZ-07-0411	↓	1235	W	14	X	X	X	X	X	X	X	X		X	
PZ-06-0411	↓	1420	W	14	X	X	X	X	X	X	X	X		X	
Trip Blank	↓		W	1										X	

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
	(Signature) [signature]	(Signature)	(Signature)	(Signature) [signature]
	Printed Name: Trevor Louviere	Printed Name:	Printed Name:	Printed Name: Mikka Lyttunen
	Company: AMEC Geomatrix	Company: FEDEX	Company:	Company: ARI
	Date & Time: 4/14/11 1405	Date & Time: 8757 1437 5274	Date & Time:	Date & Time: 4/15/11 0700

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Amec Geomatrix

Project Name: GPT

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: SR88

Tracking No: 8757 1437 5274 NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.7 4.9 ___ ___ ___

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90941619

Cooler Accepted by: JM Date: 4/15/11 Time: 0700

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: Cardboard			
Was sufficient ice used (if appropriate)?	NA	YES	NO
Were all bottles sealed in individual plastic bags?		YES	NO
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA	4/5/11	

Was Sample Split by ARI : NA YES Date/Time:_____ Equipment:_____ Split by:_____

Samples Logged by: JM Date: 4/15/11 Time: 1112

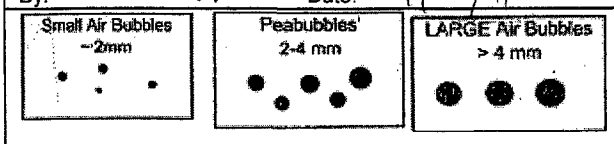
***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

Trip Blank = sm in 1 of 1

By: JM Date: 4/15/11



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: SR88
Client: Amec Geomatrix
Project Event: N/A
Project Name: GPT

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	PZ-11-0411	SR88A	11-8241	Water	04/14/11 08:50	04/15/11 07:00
2.	PZ-04-0411	SR88B	11-8242	Water	04/14/11 10:25	04/15/11 07:00
3.	PZ-07-0411	SR88C	11-8243	Water	04/14/11 12:35	04/15/11 07:00
4.	PZ-06-0411	SR88D	11-8244	Water	04/14/11 14:20	04/15/11 07:00
5.	Trip Blank	SR88E	11-8245	Water	04/14/11	04/15/11 07:00

Printed 04/15/11

PRESERVATION VERIFICATION 04/15/11

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **SR88**

PC: Kelly
VTSR: 04/15/11

Inquiry Number: NONE
Analysis Requested: 04/15/11
Contact: Bacher, Nick
Client: Amec Geomatrix
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #:
Project: GPT
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
11-8241 **SR88A**	PZ-11-0411			pass			TOT pass															
11-8242 **SR88B**	PZ-04-0411						TOT															
11-8243 **SR88C**	PZ-07-0411						TOT															
11-8244 **SR88D**	PZ-06-0411						TOT															

Checked By JM Date 4/15/11

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-11-0411
SAMPLE

Lab Sample ID: SR88A
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized: MW
Reported: 04/27/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 22:45
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U
84-66-2	Diethylphthalate	1.0	< 1.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-11-0411
SAMPLE

Lab Sample ID: SR88A
LIMS ID: 11-8241
Matrix: Water
Date Analyzed: 04/20/11 22:45

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	51.2%	2-Fluorobiphenyl	46.4%
d14-p-Terphenyl	63.2%	d4-1,2-Dichlorobenzene	40.8%
d5-Phenol	48.0%	2-Fluorophenol	48.8%
2,4,6-Tribromophenol	57.6%	d4-2-Chlorophenol	48.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-04-0411
SAMPLE

Lab Sample ID: SR88B
LIMS ID: 11-8242
Matrix: Water
Data Release Authorized:
Reported: 04/27/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Extracted: 04/19/11
Date Analyzed: 04/25/11 19:21
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-04-0411
SAMPLE

Lab Sample ID: SR88B
LIMS ID: 11-8242
Matrix: Water
Date Analyzed: 04/25/11 19:21

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	55.6%	2-Fluorobiphenyl	46.4%
d14-p-Terphenyl	54.8%	d4-1,2-Dichlorobenzene	44.4%
d5-Phenol	55.7%	2-Fluorophenol	55.2%
2,4,6-Tribromophenol	65.1%	d4-2-Chlorophenol	56.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-07-0411
SAMPLE

Lab Sample ID: SR88C
LIMS ID: 11-8243
Matrix: Water
Data Release Authorized:
Reported: 04/27/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Extracted: 04/19/11
Date Analyzed: 04/25/11 19:54
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-07-0411
SAMPLE

Lab Sample ID: SR88C
LIMS ID: 11-8243
Matrix: Water
Date Analyzed: 04/25/11 19:54

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	71.6%	2-Fluorobiphenyl	62.8%
d14-p-Terphenyl	66.0%	d4-1,2-Dichlorobenzene	58.4%
d5-Phenol	71.5%	2-Fluorophenol	68.3%
2,4,6-Tribromophenol	85.6%	d4-2-Chlorophenol	70.4%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-06-0411
SAMPLE

Lab Sample ID: SR88D
LIMS ID: 11-8244
Matrix: Water
Data Release Authorized:
Reported: 04/27/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Extracted: 04/19/11
Date Analyzed: 04/25/11 20:27
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-06-0411
SAMPLE

Lab Sample ID: SR88D
LIMS ID: 11-8244
Matrix: Water
Date Analyzed: 04/25/11 20:27

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	78.4%	2-Fluorobiphenyl	67.6%
d14-p-Terphenyl	67.6%	d4-1,2-Dichlorobenzene	58.4%
d5-Phenol	76.0%	2-Fluorophenol	69.3%
2,4,6-Tribromophenol	83.5%	d4-2-Chlorophenol	71.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: MB-041911
METHOD BLANK

Lab Sample ID: MB-041911
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/27/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA
Date Sampled: NA
Date Received: NA

Date Extracted: 04/19/11
Date Analyzed: 04/20/11 17:16
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: MB-041911
METHOD BLANK

Lab Sample ID: MB-041911
LIMS ID: 11-8241
Matrix: Water
Date Analyzed: 04/20/11 17:16

QC Report No: SR88-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	79.2%	2-Fluorobiphenyl	70.4%
d14-p-Terphenyl	74.8%	d4-1,2-Dichlorobenzene	62.0%
d5-Phenol	75.2%	2-Fluorophenol	76.5%
2,4,6-Tribromophenol	76.8%	d4-2-Chlorophenol	77.6%

ANALYTICAL RESOURCES INCORPORATED

SW8270 SEMIVOLATILES WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: SR88-Amec Geomatrix
Project: GPT

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT OUT
MB-041911	79.2%	70.4%	74.8%	62.0%	75.2%	76.5%	76.8%	77.6%	0
LCS-041911	72.8%	67.6%	67.2%	57.2%	75.7%	70.1%	80.3%	72.3%	0
LCSD-041911	73.2%	66.8%	72.0%	58.0%	77.3%	73.3%	82.1%	74.1%	0
PZ-11-0411	51.2%	46.4%	63.2%	40.8%	48.0%	48.8%	57.6%	48.3%	0
PZ-04-0411	55.6%	46.4%	54.8%	44.4%	55.7%	55.2%	65.1%	56.0%	0
PZ-07-0411	71.6%	62.8%	66.0%	58.4%	71.5%	68.3%	85.6%	70.4%	0
PZ-06-0411	78.4%	67.6%	67.6%	58.4%	76.0%	69.3%	83.5%	71.2%	0

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(46-100)	(39-100)
(FBP) = 2-Fluorobiphenyl	(49-100)	(42-100)
(TPH) = d14-p-Terphenyl	(53-119)	(26-114)
(DCB) = d4-1,2-Dichlorobenzene	(38-100)	(32-100)
(PHL) = d5-Phenol	(50-100)	(41-100)
(2FP) = 2-Fluorophenol	(46-100)	(38-100)
(TBP) = 2,4,6-Tribromophenol	(52-123)	(48-118)
(2CP) = d4-2-Chlorophenol	(53-100)	(44-100)

Prep Method: SW3520C
Log Number Range: 11-8241 to 11-8244

FORM-II SW8270

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-041911
LCS/LCSD

Lab Sample ID: LCS-041911
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/27/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: 04/14/11
Date Received: 04/15/11

Date Extracted LCS/LCSD: 04/19/11

Date Analyzed LCS: 04/20/11 17:49
LCSD: 04/20/11 18:22
Instrument/Analyst LCS: NT6/JZ
LCSD: NT6/JZ
GPC Cleanup: NO

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Phenol	18.2	25.0	72.8%	19.2	25.0	76.8%	5.3%
Bis-(2-Chloroethyl) Ether	18.9	25.0	75.6%	19.5	25.0	78.0%	3.1%
2-Chlorophenol	18.0	25.0	72.0%	18.8	25.0	75.2%	4.3%
1,3-Dichlorobenzene	13.2	25.0	52.8%	14.0	25.0	56.0%	5.9%
1,4-Dichlorobenzene	13.5	25.0	54.0%	14.4	25.0	57.6%	6.5%
Benzyl Alcohol	16.9	50.0	33.8%	17.5	50.0	35.0%	3.5%
1,2-Dichlorobenzene	14.2	25.0	56.8%	15.3	25.0	61.2%	7.5%
2-Methylphenol	16.6	25.0	66.4%	17.4	25.0	69.6%	4.7%
2,2'-Oxybis(1-Chloropropane)	23.3 Q	25.0	93.2%	24.2 Q	25.0	96.8%	3.8%
4-Methylphenol	34.6	50.0	69.2%	35.8	50.0	71.6%	3.4%
N-Nitroso-Di-N-Propylamine	18.0	25.0	72.0%	18.4	25.0	73.6%	2.2%
Hexachloroethane	11.7	25.0	46.8%	13.0	25.0	52.0%	10.5%
Nitrobenzene	19.0	25.0	76.0%	19.5	25.0	78.0%	2.6%
Isophorone	19.1	25.0	76.4%	19.3	25.0	77.2%	1.0%
2-Nitrophenol	53.2	75.0	70.9%	55.6	75.0	74.1%	4.4%
2,4-Dimethylphenol	13.2	25.0	52.8%	13.1	25.0	52.4%	0.8%
Benzoic Acid	109	138	79.0%	107	138	77.5%	1.9%
bis(2-Chloroethoxy) Methane	16.9	25.0	67.6%	17.4	25.0	69.6%	2.9%
2,4-Dichlorophenol	51.3	75.0	68.4%	52.8	75.0	70.4%	2.9%
1,2,4-Trichlorobenzene	14.9	25.0	59.6%	15.6	25.0	62.4%	4.6%
Naphthalene	17.3	25.0	69.2%	18.1	25.0	72.4%	4.5%
4-Chloroaniline	51.6	75.0	68.8%	56.2	75.0	74.9%	8.5%
Hexachlorobutadiene	13.6	25.0	54.4%	14.0	25.0	56.0%	2.9%
4-Chloro-3-methylphenol	51.7	75.0	68.9%	53.6	75.0	71.5%	3.6%
2-Methylnaphthalene	16.6	25.0	66.4%	17.4	25.0	69.6%	4.7%
Hexachlorocyclopentadiene	14.1	75.0	18.8%	18.2	75.0	24.3%	25.4%
2,4,6-Trichlorophenol	55.1	75.0	73.5%	56.8	75.0	75.7%	3.0%
2,4,5-Trichlorophenol	60.1	75.0	80.1%	61.8	75.0	82.4%	2.8%
2-Chloronaphthalene	17.7	25.0	70.8%	18.2	25.0	72.8%	2.8%
2-Nitroaniline	67.1	75.0	89.5%	70.9	75.0	94.5%	5.5%
Dimethylphthalate	18.8	25.0	75.2%	19.6	25.0	78.4%	4.2%
Acenaphthylene	19.2	25.0	76.8%	19.5	25.0	78.0%	1.6%
3-Nitroaniline	64.1 Q	75.0	85.5%	69.4 Q	75.0	92.5%	7.9%
Acenaphthene	18.3	25.0	73.2%	18.8	25.0	75.2%	2.7%
2,4-Dinitrophenol	97.6	138	70.7%	103	138	74.6%	5.4%
4-Nitrophenol	64.7	75.0	86.3%	68.8	75.0	91.7%	6.1%
Dibenzofuran	19.1	25.0	76.4%	19.6	25.0	78.4%	2.6%
2,6-Dinitrotoluene	57.2	75.0	76.3%	60.0	75.0	80.0%	4.8%
2,4-Dinitrotoluene	56.9	75.0	75.9%	60.5	75.0	80.7%	6.1%
Diethylphthalate	19.0	25.0	76.0%	20.1	25.0	80.4%	5.6%
4-Chlorophenyl-phenylether	17.8	25.0	71.2%	18.3	25.0	73.2%	2.8%
Fluorene	18.9	25.0	75.6%	19.6	25.0	78.4%	3.6%
4-Nitroaniline	66.1 Q	75.0	88.1%	69.5 Q	75.0	92.7%	5.0%
4,6-Dinitro-2-Methylphenol	116	138	84.1%	119	138	86.2%	2.6%
N-Nitrosodiphenylamine	15.6	25.0	62.4%	16.1	25.0	64.4%	3.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-041911
LCS/LCSD

Lab Sample ID: LCS-041911
LIMS ID: 11-8241
Matrix: Water
Date Analyzed LCS: 04/20/11 17:49
LCSD: 04/20/11 18:22

QC Report No: SR88-Amec Geomatrix
Project: GPT

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
4-Bromophenyl-phenylether	18.6	25.0	74.4%	19.3	25.0	77.2%	3.7%
Hexachlorobenzene	19.2	25.0	76.8%	20.7	25.0	82.8%	7.5%
Pentachlorophenol	61.0	75.0	81.3%	60.8	75.0	81.1%	0.3%
Phenanthrene	20.6	25.0	82.4%	21.7	25.0	86.8%	5.2%
Carbazole	20.1	25.0	80.4%	20.6	25.0	82.4%	2.5%
Anthracene	19.9	25.0	79.6%	20.4	25.0	81.6%	2.5%
Di-n-Butylphthalate	20.2	25.0	80.8%	21.2	25.0	84.8%	4.8%
Fluoranthene	21.0	25.0	84.0%	21.4	25.0	85.6%	1.9%
Pyrene	18.5	25.0	74.0%	20.2	25.0	80.8%	8.8%
Butylbenzylphthalate	17.8	25.0	71.2%	19.1	25.0	76.4%	7.0%
3,3'-Dichlorobenzidine	53.8	75.0	71.7%	59.6	75.0	79.5%	10.2%
Benzo(a)anthracene	19.8	25.0	79.2%	20.8	25.0	83.2%	4.9%
bis(2-Ethylhexyl)phthalate	18.2	25.0	72.8%	20.0	25.0	80.0%	9.4%
Chrysene	20.9	25.0	83.6%	21.6	25.0	86.4%	3.3%
Di-n-Octyl phthalate	19.0	25.0	76.0%	20.0	25.0	80.0%	5.1%
Benzo(a)pyrene	17.3	25.0	69.2%	18.3	25.0	73.2%	5.6%
Indeno(1,2,3-cd)pyrene	22.8	25.0	91.2%	24.6	25.0	98.4%	7.6%
Dibenz(a,h)anthracene	23.5	25.0	94.0%	25.2	25.0	101%	7.0%
Benzo(g,h,i)perylene	22.5	25.0	90.0%	24.3	25.0	97.2%	7.7%
1-Methylnaphthalene	16.3	25.0	65.2%	16.9	25.0	67.6%	3.6%
Total Benzofluoranthenes	38.1	50.0	76.2%	40.0	50.0	80.0%	4.9%

Semivolatile Surrogate Recovery

	LCS	LCSD
d5-Nitrobenzene	72.8%	73.2%
2-Fluorobiphenyl	67.6%	66.8%
d14-p-Terphenyl	67.2%	72.0%
d4-1,2-Dichlorobenzene	57.2%	58.0%
d5-Phenol	75.7%	77.3%
2-Fluorophenol	70.1%	73.3%
2,4,6-Tribromophenol	80.3%	82.1%
d4-2-Chlorophenol	72.3%	74.1%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-11-0411
SAMPLE

Lab Sample ID: SR88A
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 08:12
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	97.7%

Gasoline Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	99.4%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-04-0411
SAMPLE

Lab Sample ID: SR88B
LIMS ID: 11-8242
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 08:40
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	96.0%
Bromobenzene	91.9%

Gasoline Surrogate Recovery

Trifluorotoluene	97.3%
Bromobenzene	94.2%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-07-0411
SAMPLE

Lab Sample ID: SR88C
LIMS ID: 11-8243
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 09:09
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	93.5%
Bromobenzene	90.9%

Gasoline Surrogate Recovery

Trifluorotoluene	95.3%
Bromobenzene	93.9%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-06-0411
SAMPLE

Lab Sample ID: SR88D
LIMS ID: 11-8244
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 09:37
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	93.8%
Bromobenzene	92.7%

Gasoline Surrogate Recovery

Trifluorotoluene	94.7%
Bromobenzene	94.2%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: Trip Blank SAMPLE

Lab Sample ID: SR88E
LIMS ID: 11-8245
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 07:44
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	106%
Bromobenzene	101%

Gasoline Surrogate Recovery

Trifluorotoluene	105%
Bromobenzene	99.7%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MB-041811
METHOD BLANK

Lab Sample ID: MB-041811
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed: 04/18/11 06:42
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	96.6%
Bromobenzene	92.0%

Gasoline Surrogate Recovery

Trifluorotoluene	97.1%
Bromobenzene	94.2%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: SR88
Matrix: Water

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA

Client ID	TFT	BBZ	TOT OUT
MB-041811	96.6%	92.0%	0
LCS-041811	98.5%	95.4%	0
LCSD-041811	98.3%	94.0%	0
PZ-11-0411	101%	97.7%	0
PZ-04-0411	96.0%	91.9%	0
PZ-07-0411	93.5%	90.9%	0
PZ-06-0411	93.8%	92.7%	0
Trip Blank	106%	101%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 11-8241 to 11-8245

FORM II BETX

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: SR88
Matrix: Water

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA

Client ID	TFT	BBZ	TOT OUT
MB-041811	97.1%	94.2%	0
LCS-041811	107%	107%	0
LCSD-041811	103%	103%	0
PZ-11-0411	102%	99.4%	0
PZ-04-0411	97.3%	94.2%	0
PZ-07-0411	95.3%	93.9%	0
PZ-06-0411	94.7%	94.2%	0
Trip Blank	105%	99.7%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 11-8241 to 11-8245

FORM II TPHG

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG

Sample ID: LCS-041811
LAB CONTROL SAMPLE

Lab Sample ID: LCS-041811
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 04/18/11 05:45
LCSD: 04/18/11 06:13
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.11	1.00	111%	1.02	1.00	102%	8.5%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	107%	103%
Bromobenzene	107%	103%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

Sample ID: LCS-041811
LAB CONTROL SAMPLE

Lab Sample ID: LCS-041811
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 04/18/11 05:45
LCSD: 04/18/11 06:13
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	4.54	3.70	123%	4.42	3.70	119%	2.7%
Toluene	37.3	36.5	102%	36.2	36.5	99.2%	3.0%
Ethylbenzene	10.7	10.7	100%	10.5	10.7	98.1%	1.9%
m,p-Xylene	39.7	40.1	99.0%	38.4	40.1	95.8%	3.3%
o-Xylene	16.5	18.1	91.2%	16.0	18.1	88.4%	3.1%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	98.5%	98.3%
Bromobenzene	95.4%	94.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID

Matrix: Water

QC Report No: SR88-Amec Geomatrix
Project: GPT

Data Release Authorized:
Reported: 04/19/11

ARI ID	Sample ID	Extraction Date	Analysis Date	DL	Range	Result
MB-041511	Method Blank	04/15/11	04/18/11	1.0	Gas	< 0.25 U
11-8241					Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	93.8%
SR88A	PZ-11-0411	04/15/11	04/18/11	1.0	Gas	< 0.25 U
11-8241	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	82.1%
SR88B	PZ-04-0411	04/15/11	04/18/11	1.0	Gas	< 0.25 U
11-8242	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	97.6%
SR88C	PZ-07-0411	04/15/11	04/18/11	1.0	Gas	< 0.25 U
11-8243	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	80.5%
SR88D	PZ-06-0411	04/15/11	04/18/11	1.0	Gas	< 0.25 U
11-8244	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	83.1%

Reported in mg/L (ppm)

Gas value based on total peaks in the range from Toluene to C12.
Diesel value based on the total peaks in the range from C12 to C24.
Oil value based on the total peaks in the range from C24 to C38.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID

Sample ID: LCS-041511
LCS/LCSD

Lab Sample ID: LCS-041511
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: 04/14/11
Date Received: 04/15/11

Date Extracted LCS/LCSD: 04/15/11

Date Analyzed LCS: 04/18/11 20:56
LCSD: 04/18/11 21:20
Instrument/Analyst LCS: FID/MS
LCSD: FID/MS

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Diesel	2.66	3.00	88.7%	2.85	3.00	95.0%	6.9%

HCID Surrogate Recovery

	LCS	LCSD
o-Terphenyl	84.6%	91.1%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

HCID SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: SR88-Amec Geomatrix
Project: GPT

Client ID	O-TER	TOT OUT
MB-041511	93.8%	0
LCS-041511	84.6%	0
LCSD-041511	91.1%	0
PZ-11-0411	82.1%	0
PZ-04-0411	97.6%	0
PZ-07-0411	80.5%	0
PZ-06-0411	83.1%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(55-110)	(50-150)

Prep Method: SW3510C
Log Number Range: 11-8241 to 11-8244

FORM-II HCID

ANALYTICAL RESOURCES INCORPORATED

TOTAL HCID RANGE HYDROCARBONS-EXTRACTION REPORT

ARI Job: SR88
Project: GPT

Matrix: Water
Date Received: 04/15/11

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
11-8241-041511MB	Method Blank	500 mL	1.00 mL	04/15/11
11-8241-041511LCS	Lab Control	500 mL	1.00 mL	04/15/11
11-8241-041511LCSD	Lab Control Dup	500 mL	1.00 mL	04/15/11
11-8241-SR88A	PZ-11-0411	500 mL	1.00 mL	04/15/11
11-8242-SR88B	PZ-04-0411	500 mL	1.00 mL	04/15/11
11-8243-SR88C	PZ-07-0411	500 mL	1.00 mL	04/15/11
11-8244-SR88D	PZ-06-0411	500 mL	1.00 mL	04/15/11

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-11-0411
SAMPLE

Lab Sample ID: SR88A
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: 04/14/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/18/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**21.2**	
3010A	04/18/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**14.7**	
3010A	04/18/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**2.9**	
3010A	04/18/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**62.2**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-04-0411
SAMPLE

Lab Sample ID: SR88B
LIMS ID: 11-8242
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: 04/14/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/18/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**97.7**	
3010A	04/18/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**62.7**	
3010A	04/18/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**6.3**	
3010A	04/18/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**73.5**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-07-0411
SAMPLE

Lab Sample ID: SR88C
LIMS ID: 11-8243
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: 04/14/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/18/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**44.9**	
3010A	04/18/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**30.7**	
3010A	04/18/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**5.5**	
3010A	04/18/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**70.1**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-06-0411
SAMPLE

Lab Sample ID: SR88D
LIMS ID: 11-8244
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: 04/14/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/18/11	6010B	04/19/11	**7440-70-2**	**Calcium**	0.05	**28.4**	
3010A	04/18/11	6010B	04/19/11	**7439-95-4**	**Magnesium**	0.05	**16.5**	
3010A	04/18/11	6010B	04/19/11	**7440-09-7**	**Potassium**	0.5	**2.9**	
3010A	04/18/11	6010B	04/19/11	**7440-23-5**	**Sodium**	0.5	**31.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: METHOD BLANK

Lab Sample ID: SR88MB
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/18/11	6010B	04/19/11	7440-70-2	Calcium	0.05	0.05	U
3010A	04/18/11	6010B	04/19/11	7439-95-4	Magnesium	0.05	0.05	U
3010A	04/18/11	6010B	04/19/11	7440-09-7	Potassium	0.5	0.5	U
3010A	04/18/11	6010B	04/19/11	7440-23-5	Sodium	0.5	0.5	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: LAB CONTROL

Lab Sample ID: SR88LCS
LIMS ID: 11-8241
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SR88-Amec Geomatrix
Project: GPT

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Calcium	6010B	9.77	10.0	97.7%	
Magnesium	6010B	10.1	10.0	101%	
Potassium	6010B	10.2	10.0	102%	
Sodium	6010B	10.4	10.0	104%	

Reported in mg/L

N-Control limit not met
Control Limits: 80-120%

SAMPLE RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Client ID: PZ-11-0411
ARI ID: 11-8241 SR88A

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	126
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	126
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	475
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	252
Total Suspended Solids	04/15/11 041511#1	EPA 160.2	mg/L	1.1	4.1
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.20
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	2.0	61.5
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	0.7
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.067
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	2.0	26.7

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Client ID: PZ-04-0411
ARI ID: 11-8242 SR88B

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	448
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	448
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	1,200
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	10.0	632
Total Suspended Solids	04/15/11 041511#1	EPA 160.2	mg/L	1.1	2.3
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.60
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	0.5	14.8
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.047
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	0.5	9.5

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Client ID: PZ-07-0411
ARI ID: 11-8243 SR88C

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	270
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	270
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	756
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	10.0	386
Total Suspended Solids	04/15/11 041511#1	EPA 160.2	mg/L	1.1	12.9
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.40
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	2.0	84.3
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	1.0
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.039
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	2.0	47.3

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Client ID: PZ-06-0411
ARI ID: 11-8244 SR88D

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	183
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	183
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/15/11 041511#1	EPA 120.1	umhos/cm	1.00	394
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	215
Total Suspended Solids	04/15/11 041511#1	EPA 160.2	mg/L	1.1	11.9
Salinity	04/15/11 041511#1	SM 2520.B	ppt	0.10	0.20
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	2.0	71.2
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	0.3
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/27/11 042711#1	EPA 350.1M	mg-N/L	0.010	0.045
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	2.0	30.7

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Conductivity	EPA 120.1	04/15/11	umhos/cm	< 1.00 U	
Total Dissolved Solids	EPA 160.1	04/19/11	mg/L	< 5.0 U	
Total Suspended Solids	EPA 160.2	04/15/11	mg/L	< 1.0 U	
Salinity	SM 2520.B	04/15/11	ppt	< 0.10 U	
Chloride	EPA 300.0	04/21/11	mg/L	< 0.1 U	
Fluoride	EPA 300.0	04/15/11	mg/L	< 0.1 U	
N-Nitrate	EPA 300.0	04/15/11	mg-N/L	< 0.1 U	
Ortho-Phosphorous	EPA 300.0	04/15/11	mg-P/L	< 0.1 U	
N-Ammonia	EPA 350.1M	04/27/11	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	04/21/11	mg/L	< 0.1 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	04/19/11	mg/L	433	500	86.6%
Total Suspended Solids EPA 160.2	ICVL	04/15/11	mg/L	49.6	50.0	99.2%
Salinity SM 2520.B	ICVL	04/15/11	ppt	45,100	47,600	94.7%

STANDARD REFERENCE RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Alkalinity	SM 2320	04/19/11	mg/L CaCO3	65.9	66.3	99.4%
ERA #P114506		04/19/11		63.2	66.3	95.3%
Conductivity Ricca #3193	EPA 120.1	04/15/11	umhos/cm	996	1,000	99.6%
Chloride ERA #230109	EPA 300.0	04/21/11	mg/L	2.9	3.0	96.7%
Fluoride ERA #02098	EPA 300.0	04/15/11	mg/L	3.1	3.0	103.3%
N-Nitrate ERA #09127	EPA 300.0	04/15/11	mg-N/L	3.1	3.0	103.3%
Ortho-Phosphorous EAR #210109	EPA 300.0	04/15/11	mg-P/L	3.0	3.0	100.0%
N-Ammonia ERA #15125	EPA 350.1M	04/27/11	mg-N/L	0.539	0.500	107.8%
Sulfate ERA #220109	EPA 300.0	04/21/11	mg/L	2.9	3.0	96.7%

REPLICATE RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: SR88A Client ID: PZ-11-0411						
Conductivity	EPA 120.1	04/15/11	umhos/cm	475	479	0.8%
Salinity	SM 2520.B	04/15/11	ppt	0.20	0.20	0.0%
Chloride	EPA 300.0	04/21/11	mg/L	61.5	59.6	3.1%
Fluoride	EPA 300.0	04/15/11	mg/L	0.2	0.2	0.0%
N-Nitrate	EPA 300.0	04/15/11	mg-N/L	0.7	0.7	0.0%
Ortho-Phosphorous	EPA 300.0	04/15/11	mg-P/L	< 0.1	< 0.1	NA
Sulfate	EPA 300.0	04/21/11	mg/L	26.7	26.4	1.1%
ARI ID: SR88B Client ID: PZ-04-0411						
Total Dissolved Solids	EPA 160.1	04/19/11	mg/L	632	655	3.6%

MS/MSD RESULTS-CONVENTIONALS
SR88-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/14/11
Date Received: 04/15/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: SR88A Client ID: PZ-11-0411							
Chloride	EPA 300.0	04/21/11	mg/L	61.5	97.5	40.0	90.0%
Fluoride	EPA 300.0	04/15/11	mg/L	0.2	2.2	2.0	100.0%
N-Nitrate	EPA 300.0	04/15/11	mg-N/L	0.7	2.8	2.0	105.0%
Ortho-Phosphorous	EPA 300.0	04/15/11	mg-P/L	< 0.1	1.6	2.0	80.0%
Sulfate	EPA 300.0	04/21/11	mg/L	26.7	65.5	40.0	97.0%

Analytical Resources, Incorporated
Analytical Chemists and Consultants

May 4, 2011

Niklas Bacher
AMEC
600 University Street, Suite 1020
Seattle, WA 98101

Client Project: Gateway Pacific Terminal (GPT)
ARI ID: SS17

Dear Mr. Bacher:

Please find enclosed the original chain of custody (COC) records and the final results for the samples from the project referenced above. Six water samples and a trip blank were received in good condition on April 15, 2011.

The samples were analyzed for Total Metals, HCID, SVOCs, NWTPH-Gx plus BTEX and general chemistry parameters, as requested on the COC.

The SVOCs CCAL is out of control low for all associated FORM III "Q" flagged analytes with the exception of 2,2'-Oxybis(1-Chloropropane) which is out of control high. All associated samples that contain analyte have been flagged with a "Q" qualifier.

The SVOCs LCSD is out of control low for 2,4Dimethylphenol with a wide RPD. The LCS is in control and no other action was taken.

The BTEX LCS is out of control high for Benzene. The LCSD is in control and no further action was taken.

There were no other anomalies associated with these samples.

A copy of these reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Kelly Bottem
Client Services Manager
206.695.6211
kellyb@arilabs.com
www.arilabs.com

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: SS17	Turn-around Requested: Standard
ARI Client Company: Amec Geomatrix	Phone: 206-342-1760
Client Contact: Niklas Bacher	
Client Project Name: GPT	
Client Project #:	Samplers: Trevor Louviere, Niklas Bacher

Page: 1 of 1

Date: 4/15/11 | Ice Present? Y

No. of Coolers: 3 | Cooler Temps: 4.6, 5.1, 3.9

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Alkalinity/Salinity	F, Cl, NO_3, SO_4 (SRP) (300.0)	Ammonia	HCID	TDS	TSS	Total Metals	SVOC's	NWTPH-Dx	NWTPH-Gx plus BTEX	Notes/Comments
SW-02-0411	4/15/11	0740	W	14	X	X	X	X	X	X	X	X		X	
PZ-10-0411	↓	0835	W	14	X	X	X	X	X	X	X	X		X	
SW-03-0411	↓	0955	W	14	X	X	X	X	X	X	X	X		X	
PZ-08-0411	↓	1100	W	14	X	X	X	X	X	X	X	X		X	
PZ-09-0411	↓	1225	W	14	X	X	X	X	X	X	X	X		X	
PZ-05-0411	↓	1330	W	14	X	X	X	X	X	X	X	X		X	
Trip Blank	↓		W	1											

Comments/Special Instructions

Relinquished by:	Received by:	Relinquished by:	Received by:
(Signature)	(Signature)	(Signature)	(Signature)
Printed Name: Trevor Louviere	Printed Name: A. Volgardsen	Printed Name:	Printed Name:
Company: AMEC Geomatrix	Company: ARI	Company:	Company:
Date & Time: 4/15/11 1719	Date & Time: 4/15/11 1719	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: AmeC

Project Name: GPT

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: S317

Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 4.6 5.1 3.9 ___ ___ ___

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 90941619

Cooler Accepted by: AV Date: 4/15/11 Time: 1719

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... (Bubble Wrap) (Wet Ice) Gel Packs Baggies Foam Block Paper Other: _____			
Was sufficient ice used (if appropriate)?	NA	(YES)	NO
Were all bottles sealed in individual plastic bags?		YES	(NO)
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	(YES)	NO
Were all VOC vials free of air bubbles?	NA	YES	(NO)
Was sufficient amount of sample sent in each bottle?		(YES)	NO
Date VOC Trip Blank was made at ARI	NA	4/16/11	

Was Sample Split by ARI : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JM Date: 4/15/11 Time: 1730

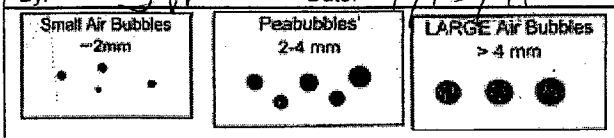
***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

Trip Blank = sm in 1of1

By: JM Date: 4/15/11



Small → "sm"	
Peabubbles → "pb"	
Large → "lg"	
Headspace → "hs"	

PRESERVATION VERIFICATION 04/15/11
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **SS17**

PC: Kelly
VTSR: 04/15/11

Inquiry Number: NONE
Analysis Requested: 04/18/11
Contact: Bacher, Nick
Client: Amec Geomatrix
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #:
Project: GPT
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	AK102 <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
11-8376 **SS17A**	SW-02-0411			pass			TOT pass															
11-8377 **SS17B**	PZ-10-0411						TOT															
11-8378 **SS17C**	SW-03-0411						TOT															
11-8379 **SS17D**	PZ-08-0411						TOT															
11-8380 **SS17E**	PZ-09-0411						TOT															
11-8381 **SS17F**	PZ-05-0411						TOT															

Checked By JM Date 4/15/11

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: SS17
Client: Amec Geomatrix
Project Event: N/A
Project Name: GPT

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	SW-02-0411	SS17A	11-8376	Water	04/15/11 07:40	04/15/11 17:19
2.	PZ-10-0411	SS17B	11-8377	Water	04/15/11 08:35	04/15/11 17:19
3.	SW-03-0411	SS17C	11-8378	Water	04/15/11 09:55	04/15/11 17:19
4.	PZ-08-0411	SS17D	11-8379	Water	04/15/11 11:00	04/15/11 17:19
5.	PZ-09-0411	SS17E	11-8380	Water	04/15/11 12:25	04/15/11 17:19
6.	PZ-05-0411	SS17F	11-8381	Water	04/15/11 13:30	04/15/11 17:19
7.	Trip Blank	SS17G	11-8382	Water	04/15/11	04/15/11 17:19

Printed 04/15/11

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: SW-02-0411
SAMPLE

Lab Sample ID: SS17A
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 18:44
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U
84-66-2	Diethylphthalate	1.0	< 1.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: SW-02-0411
SAMPLE

Lab Sample ID: SS17A
LIMS ID: 11-8376
Matrix: Water
Date Analyzed: 04/27/11 18:44

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	77.6%	2-Fluorobiphenyl	74.0%
d14-p-Terphenyl	40.8%	d4-1,2-Dichlorobenzene	67.6%
d5-Phenol	73.9%	2-Fluorophenol	74.4%
2,4,6-Tribromophenol	89.9%	d4-2-Chlorophenol	73.9%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-10-0411
SAMPLE

Lab Sample ID: SS17B
LIMS ID: 11-8377
Matrix: Water
Data Release Authorized: MW
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 19:17
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-10-0411
SAMPLE

Lab Sample ID: SS17B
LIMS ID: 11-8377
Matrix: Water
Date Analyzed: 04/27/11 19:17

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	76.4%	2-Fluorobiphenyl	74.4%
d14-p-Terphenyl	64.8%	d4-1,2-Dichlorobenzene	62.4%
d5-Phenol	69.3%	2-Fluorophenol	70.1%
2,4,6-Tribromophenol	79.7%	d4-2-Chlorophenol	69.3%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: SW-03-0411
SAMPLE

Lab Sample ID: SS17C
LIMS ID: 11-8378
Matrix: Water
Data Release Authorized: MW
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 19:50
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: SW-03-0411
SAMPLE

Lab Sample ID: SS17C
LIMS ID: 11-8378
Matrix: Water
Date Analyzed: 04/27/11 19:50

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.0**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	61.6%	2-Fluorobiphenyl	64.4%
d14-p-Terphenyl	54.4%	d4-1,2-Dichlorobenzene	53.6%
d5-Phenol	58.1%	2-Fluorophenol	59.2%
2,4,6-Tribromophenol	85.6%	d4-2-Chlorophenol	58.1%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-08-0411
SAMPLE

Lab Sample ID: SS17D
LIMS ID: 11-8379
Matrix: Water
Data Release Authorized:
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 20:23
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-08-0411
SAMPLE

Lab Sample ID: SS17D
LIMS ID: 11-8379
Matrix: Water
Date Analyzed: 04/27/11 20:23

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**12**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	72.8%	2-Fluorobiphenyl	67.6%
d14-p-Terphenyl	69.6%	d4-1,2-Dichlorobenzene	61.2%
d5-Phenol	68.5%	2-Fluorophenol	66.4%
2,4,6-Tribromophenol	85.1%	d4-2-Chlorophenol	68.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-09-0411
SAMPLE

Lab Sample ID: SS17E
LIMS ID: 11-8380
Matrix: Water
Data Release Authorized:
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 20:56
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-09-0411
SAMPLE

Lab Sample ID: SS17E
LIMS ID: 11-8380
Matrix: Water
Date Analyzed: 04/27/11 20:56

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	60.0%	2-Fluorobiphenyl	57.2%
d14-p-Terphenyl	63.6%	d4-1,2-Dichlorobenzene	51.2%
d5-Phenol	55.2%	2-Fluorophenol	55.5%
2,4,6-Tribromophenol	78.7%	d4-2-Chlorophenol	54.7%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-05-0411
SAMPLE

Lab Sample ID: SS17F
LIMS ID: 11-8381
Matrix: Water
Data Release Authorized: MW
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 21:28
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: PZ-05-0411
SAMPLE

Lab Sample ID: SS17F
LIMS ID: 11-8381
Matrix: Water
Date Analyzed: 04/27/11 21:28

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	**bis(2-Ethylhexyl)phthalate**	**1.0**	**1.2**
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	64.8%	2-Fluorobiphenyl	62.0%
d14-p-Terphenyl	61.6%	d4-1,2-Dichlorobenzene	54.0%
d5-Phenol	59.2%	2-Fluorophenol	58.1%
2,4,6-Tribromophenol	73.9%	d4-2-Chlorophenol	58.9%

ANALYTICAL RESOURCES INCORPORATED

SW8270 SEMIVOLATILES WATER SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: SS17-Amec Geomatrix
Project: GPT

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT OUT
MB-042111	81.2%	76.8%	69.6%	69.6%	76.5%	77.6%	92.0%	78.9%	0
LCS-042111	83.2%	78.4%	69.2%	68.4%	84.5%	79.2%	98.7%	80.5%	0
LCSD-042111	73.2%	76.4%	61.6%	62.8%	73.6%	69.6%	89.1%	69.3%	0
SW-02-0411	77.6%	74.0%	40.8%	67.6%	73.9%	74.4%	89.9%	73.9%	0
PZ-10-0411	76.4%	74.4%	64.8%	62.4%	69.3%	70.1%	79.7%	69.3%	0
SW-03-0411	61.6%	64.4%	54.4%	53.6%	58.1%	59.2%	85.6%	58.1%	0
PZ-08-0411	72.8%	67.6%	69.6%	61.2%	68.5%	66.4%	85.1%	68.8%	0
PZ-09-0411	60.0%	57.2%	63.6%	51.2%	55.2%	55.5%	78.7%	54.7%	0
PZ-05-0411	64.8%	62.0%	61.6%	54.0%	59.2%	58.1%	73.9%	58.9%	0

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(46-100)	(39-100)
(FBP) = 2-Fluorobiphenyl	(49-100)	(42-100)
(TPH) = d14-p-Terphenyl	(53-119)	(26-114)
(DCB) = d4-1,2-Dichlorobenzene	(38-100)	(32-100)
(PHL) = d5-Phenol	(50-100)	(41-100)
(2FP) = 2-Fluorophenol	(46-100)	(38-100)
(TBP) = 2,4,6-Tribromophenol	(52-123)	(48-118)
(2CP) = d4-2-Chlorophenol	(53-100)	(44-100)

Prep Method: SW3520C
Log Number Range: 11-8376 to 11-8381

FORM-II SW8270

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
+.name SVOA Form I Water
Semivolatiles by SW8270D GC/MS

Sample ID: MB-042111
METHOD BLANK

Lab Sample ID: MB-042111
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized: MW
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA
Date Sampled: NA
Date Received: NA

Date Extracted: 04/21/11
Date Analyzed: 04/27/11 16:33
Instrument/Analyst: NT6/JZ

Sample Amount: 500 mL
Final Extract Volume: 0.50 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
108-95-2	Phenol	1.0	< 1.0 U
111-44-4	Bis-(2-Chloroethyl) Ether	1.0	< 1.0 U
95-57-8	2-Chlorophenol	1.0	< 1.0 U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0 U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0 U
100-51-6	Benzyl Alcohol	5.0	< 5.0 U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0 U
95-48-7	2-Methylphenol	1.0	< 1.0 U
108-60-1	2,2'-Oxybis(1-Chloropropane)	1.0	< 1.0 U
106-44-5	4-Methylphenol	1.0	< 1.0 U
621-64-7	N-Nitroso-Di-N-Propylamine	1.0	< 1.0 U
67-72-1	Hexachloroethane	1.0	< 1.0 U
98-95-3	Nitrobenzene	1.0	< 1.0 U
78-59-1	Isophorone	1.0	< 1.0 U
88-75-5	2-Nitrophenol	5.0	< 5.0 U
105-67-9	2,4-Dimethylphenol	1.0	< 1.0 U
65-85-0	Benzoic Acid	10	< 10 U
111-91-1	bis(2-Chloroethoxy) Methane	1.0	< 1.0 U
120-83-2	2,4-Dichlorophenol	5.0	< 5.0 U
120-82-1	1,2,4-Trichlorobenzene	1.0	< 1.0 U
91-20-3	Naphthalene	1.0	< 1.0 U
106-47-8	4-Chloroaniline	5.0	< 5.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
59-50-7	4-Chloro-3-methylphenol	5.0	< 5.0 U
91-57-6	2-Methylnaphthalene	1.0	< 1.0 U
77-47-4	Hexachlorocyclopentadiene	5.0	< 5.0 U
88-06-2	2,4,6-Trichlorophenol	5.0	< 5.0 U
95-95-4	2,4,5-Trichlorophenol	5.0	< 5.0 U
91-58-7	2-Chloronaphthalene	1.0	< 1.0 U
88-74-4	2-Nitroaniline	5.0	< 5.0 U
131-11-3	Dimethylphthalate	1.0	< 1.0 U
208-96-8	Acenaphthylene	1.0	< 1.0 U
99-09-2	3-Nitroaniline	5.0	< 5.0 U
83-32-9	Acenaphthene	1.0	< 1.0 U
51-28-5	2,4-Dinitrophenol	10	< 10 U
100-02-7	4-Nitrophenol	5.0	< 5.0 U
132-64-9	Dibenzofuran	1.0	< 1.0 U
606-20-2	2,6-Dinitrotoluene	5.0	< 5.0 U
121-14-2	2,4-Dinitrotoluene	5.0	< 5.0 U

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: MB-042111
METHOD BLANK

Lab Sample ID: MB-042111
LIMS ID: 11-8376
Matrix: Water
Date Analyzed: 04/27/11 16:33

QC Report No: SS17-Amec Geomatrix
Project: GPT
NA

CAS Number	Analyte	RL	Result
84-66-2	Diethylphthalate	1.0	< 1.0 U
7005-72-3	4-Chlorophenyl-phenylether	1.0	< 1.0 U
86-73-7	Fluorene	1.0	< 1.0 U
100-01-6	4-Nitroaniline	5.0	< 5.0 U
534-52-1	4,6-Dinitro-2-Methylphenol	10	< 10 U
86-30-6	N-Nitrosodiphenylamine	1.0	< 1.0 U
101-55-3	4-Bromophenyl-phenylether	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-86-5	Pentachlorophenol	5.0	< 5.0 U
85-01-8	Phenanthrene	1.0	< 1.0 U
86-74-8	Carbazole	1.0	< 1.0 U
120-12-7	Anthracene	1.0	< 1.0 U
84-74-2	Di-n-Butylphthalate	1.0	< 1.0 U
206-44-0	Fluoranthene	1.0	< 1.0 U
129-00-0	Pyrene	1.0	< 1.0 U
85-68-7	Butylbenzylphthalate	1.0	< 1.0 U
91-94-1	3,3'-Dichlorobenzidine	5.0	< 5.0 U
56-55-3	Benzo(a)anthracene	1.0	< 1.0 U
117-81-7	bis(2-Ethylhexyl)phthalate	1.0	< 1.0 U
218-01-9	Chrysene	1.0	< 1.0 U
117-84-0	Di-n-Octyl phthalate	1.0	< 1.0 U
50-32-8	Benzo(a)pyrene	1.0	< 1.0 U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	< 1.0 U
53-70-3	Dibenz(a,h)anthracene	1.0	< 1.0 U
191-24-2	Benzo(g,h,i)perylene	1.0	< 1.0 U
90-12-0	1-Methylnaphthalene	1.0	< 1.0 U
TOTBFA	Total Benzofluoranthenes	1.0	< 1.0 U

Reported in µg/L (ppb)

Semivolatile Surrogate Recovery

d5-Nitrobenzene	81.2%	2-Fluorobiphenyl	76.8%
d14-p-Terphenyl	69.6%	d4-1,2-Dichlorobenzene	69.6%
d5-Phenol	76.5%	2-Fluorophenol	77.6%
2,4,6-Tribromophenol	92.0%	d4-2-Chlorophenol	78.9%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-042111
LCS/LCSD

Lab Sample ID: LCS-042111
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/29/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted LCS/LCSD: 04/21/11

Date Analyzed LCS: 04/27/11 17:06
LCSD: 04/27/11 17:39
Instrument/Analyst LCS: NT6/JZ
LCSD: NT6/JZ
GPC Cleanup: NO

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 0.50 mL
LCSD: 0.50 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Phenol	19.6	25.0	78.4%	18.1	25.0	72.4%	8.0%
Bis-(2-Chloroethyl) Ether	21.2	25.0	84.8%	18.7	25.0	74.8%	12.5%
2-Chlorophenol	19.8	25.0	79.2%	17.7	25.0	70.8%	11.2%
1,3-Dichlorobenzene	13.8	25.0	55.2%	13.4	25.0	53.6%	2.9%
1,4-Dichlorobenzene	14.3	25.0	57.2%	13.8	25.0	55.2%	3.6%
Benzyl Alcohol	19.0	50.0	38.0%	17.2	50.0	34.4%	9.9%
1,2-Dichlorobenzene	14.9	25.0	59.6%	14.3	25.0	57.2%	4.1%
2-Methylphenol	18.3	25.0	73.2%	15.5	25.0	62.0%	16.6%
2,2'-Oxybis(1-Chloropropane)	24.6 Q	25.0	98.4%	22.6 Q	25.0	90.4%	8.5%
4-Methylphenol	37.3	50.0	74.6%	32.6	50.0	65.2%	13.4%
N-Nitroso-Di-N-Propylamine	18.9	25.0	75.6%	17.4	25.0	69.6%	8.3%
Hexachloroethane	13.4	25.0	53.6%	12.9	25.0	51.6%	3.8%
Nitrobenzene	21.0	25.0	84.0%	19.0	25.0	76.0%	10.0%
Isophorone	21.2	25.0	84.8%	20.4	25.0	81.6%	3.8%
2-Nitrophenol	60.3	75.0	80.4%	54.3	75.0	72.4%	10.5%
2,4-Dimethylphenol	9.4	25.0	37.6%	4.8	25.0	19.2%	64.1%
Benzoic Acid	126	138	91.3%	116	138	84.1%	8.3%
bis(2-Chloroethoxy) Methane	18.9	25.0	75.6%	17.8	25.0	71.2%	6.0%
2,4-Dichlorophenol	56.6	75.0	75.5%	52.2	75.0	69.6%	8.1%
1,2,4-Trichlorobenzene	16.5	25.0	66.0%	15.2	25.0	60.8%	8.2%
Naphthalene	19.3	25.0	77.2%	18.1	25.0	72.4%	6.4%
4-Chloroaniline	52.7 Q	75.0	70.3%	48.6 Q	75.0	64.8%	8.1%
Hexachlorobutadiene	14.8	25.0	59.2%	13.6	25.0	54.4%	8.5%
4-Chloro-3-methylphenol	58.7	75.0	78.3%	55.0	75.0	73.3%	6.5%
2-Methylnaphthalene	21.3	25.0	85.2%	20.5	25.0	82.0%	3.8%
Hexachlorocyclopentadiene	24.3	75.0	32.4%	22.5	75.0	30.0%	7.7%
2,4,6-Trichlorophenol	64.0	75.0	85.3%	63.0	75.0	84.0%	1.6%
2,4,5-Trichlorophenol	67.8	75.0	90.4%	66.7	75.0	88.9%	1.6%
2-Chloronaphthalene	19.8	25.0	79.2%	19.7	25.0	78.8%	0.5%
2-Nitroaniline	77.2	75.0	103%	75.0	75.0	100%	2.9%
Dimethylphthalate	21.0	25.0	84.0%	20.8	25.0	83.2%	1.0%
Acenaphthylene	21.0	25.0	84.0%	21.1	25.0	84.4%	0.5%
3-Nitroaniline	73.4	75.0	97.9%	68.6	75.0	91.5%	6.8%
Acenaphthene	20.9	25.0	83.6%	20.8	25.0	83.2%	0.5%
2,4-Dinitrophenol	140 Q	138	101%	130 Q	138	94.2%	7.4%
4-Nitrophenol	65.9	75.0	87.9%	61.6	75.0	82.1%	6.7%
Dibenzofuran	21.8	25.0	87.2%	21.6	25.0	86.4%	0.9%
2,6-Dinitrotoluene	65.0	75.0	86.7%	61.9	75.0	82.5%	4.9%
2,4-Dinitrotoluene	64.3	75.0	85.7%	60.1	75.0	80.1%	6.8%
Diethylphthalate	21.5	25.0	86.0%	20.6	25.0	82.4%	4.3%
4-Chlorophenyl-phenylether	20.8	25.0	83.2%	20.3	25.0	81.2%	2.4%
Fluorene	21.6	25.0	86.4%	21.2	25.0	84.8%	1.9%
4-Nitroaniline	75.7	75.0	101%	65.8	75.0	87.7%	14.0%
4,6-Dinitro-2-Methylphenol	140	138	101%	135	138	97.8%	3.6%
N-Nitrosodiphenylamine	17.4	25.0	69.6%	16.9	25.0	67.6%	2.9%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by SW8270D GC/MS

Sample ID: LCS-042111
LCS/LCSD

Lab Sample ID: LCS-042111
LIMS ID: 11-8376
Matrix: Water
Date Analyzed LCS: 04/27/11 17:06
LCSD: 04/27/11 17:39

QC Report No: SS17-Amec Geomatrix
Project: GPT

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
4-Bromophenyl-phenylether	22.3	25.0	89.2%	22.6	25.0	90.4%	1.3%
Hexachlorobenzene	23.5	25.0	94.0%	23.4	25.0	93.6%	0.4%
Pentachlorophenol	70.2	75.0	93.6%	66.5	75.0	88.7%	5.4%
Phenanthrene	24.2	25.0	96.8%	23.3	25.0	93.2%	3.8%
Carbazole	23.8	25.0	95.2%	22.2	25.0	88.8%	7.0%
Anthracene	22.6	25.0	90.4%	21.6	25.0	86.4%	4.5%
Di-n-Butylphthalate	23.4	25.0	93.6%	22.0	25.0	88.0%	6.2%
Fluoranthene	25.9	25.0	104%	23.9	25.0	95.6%	8.0%
Pyrene	19.2	25.0	76.8%	17.9	25.0	71.6%	7.0%
Butylbenzylphthalate	17.7	25.0	70.8%	16.5	25.0	66.0%	7.0%
3,3'-Dichlorobenzidine	63.6	75.0	84.8%	57.1	75.0	76.1%	10.8%
Benzo(a)anthracene	23.2	25.0	92.8%	22.5	25.0	90.0%	3.1%
bis(2-Ethylhexyl)phthalate	20.6	25.0	82.4%	19.5	25.0	78.0%	5.5%
Chrysene	24.6	25.0	98.4%	23.4	25.0	93.6%	5.0%
Di-n-Octyl phthalate	22.5	25.0	90.0%	21.9	25.0	87.6%	2.7%
Benzo(a)pyrene	20.0	25.0	80.0%	19.0	25.0	76.0%	5.1%
Indeno(1,2,3-cd)pyrene	24.7	25.0	98.8%	24.2	25.0	96.8%	2.0%
Dibenz(a,h)anthracene	25.8	25.0	103%	24.8	25.0	99.2%	4.0%
Benzo(g,h,i)perylene	22.9	25.0	91.6%	22.6	25.0	90.4%	1.3%
1-Methylnaphthalene	18.3	25.0	73.2%	17.5	25.0	70.0%	4.5%
Total Benzofluoranthenes	45.4	50.0	90.8%	43.5	50.0	87.0%	4.3%

Semivolatile Surrogate Recovery

	LCS	LCSD
d5-Nitrobenzene	83.2%	73.2%
2-Fluorobiphenyl	78.4%	76.4%
d14-p-Terphenyl	69.2%	61.6%
d4-1,2-Dichlorobenzene	68.4%	62.8%
d5-Phenol	84.5%	73.6%
2-Fluorophenol	79.2%	69.6%
2,4,6-Tribromophenol	98.7%	89.1%
d4-2-Chlorophenol	80.5%	69.3%

Results reported in µg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: SW-02-0411
SAMPLE

Lab Sample ID: SS17A
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 11:57
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	103%
Bromobenzene	97.2%

Gasoline Surrogate Recovery

Trifluorotoluene	103%
Bromobenzene	99.3%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-10-0411
SAMPLE

Lab Sample ID: SS17B
LIMS ID: 11-8377
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 12:25
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	99.5%
Bromobenzene	94.9%

Gasoline Surrogate Recovery

Trifluorotoluene	99.7%
Bromobenzene	96.6%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: SW-03-0411
SAMPLE

Lab Sample ID: SS17C
LIMS ID: 11-8378
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 12:53
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	99.0%
Bromobenzene	94.7%

Gasoline Surrogate Recovery

Trifluorotoluene	99.8%
Bromobenzene	96.5%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-08-0411
SAMPLE

Lab Sample ID: SS17D
LIMS ID: 11-8379
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 13:21
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	96.8%

Gasoline Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	99.7%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-09-0411
SAMPLE

Lab Sample ID: SS17E
LIMS ID: 11-8380
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 13:50
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	99.8%
Bromobenzene	96.4%

Gasoline Surrogate Recovery

Trifluorotoluene	102%
Bromobenzene	99.1%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: PZ-05-0411
SAMPLE

Lab Sample ID: SS17F
LIMS ID: 11-8381
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 14:18
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	98.1%
Bromobenzene	94.2%

Gasoline Surrogate Recovery

Trifluorotoluene	99.1%
Bromobenzene	96.6%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: Trip Blank
SAMPLE

Lab Sample ID: SS17G
LIMS ID: 11-8382
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Date Analyzed: 04/18/11 11:29
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	100%
Bromobenzene	94.4%

Gasoline Surrogate Recovery

Trifluorotoluene	101%
Bromobenzene	96.8%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod
TPHG by Method NWTPHG

Sample ID: MB-041811
METHOD BLANK

Lab Sample ID: MB-041811
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed: 04/18/11 06:42
Instrument/Analyst: PID2/MH

Purge Volume: 5.0 mL
Dilution Factor: 1.00

CAS Number	Analyte	RL	Result	GAS ID
71-43-2	Benzene	0.25	< 0.25 U	
108-88-3	Toluene	0.25	< 0.25 U	
100-41-4	Ethylbenzene	0.25	< 0.25 U	
179601-23-1	m,p-Xylene	0.50	< 0.50 U	
95-47-6	o-Xylene	0.25	< 0.25 U	
	Gasoline Range Hydrocarbons	0.10	< 0.10 U	---

BETX Surrogate Recovery

Trifluorotoluene	96.6%
Bromobenzene	92.0%

Gasoline Surrogate Recovery

Trifluorotoluene	97.1%
Bromobenzene	94.2%

BETX values reported in µg/L (ppb)
Gasoline values reported in mg/L (ppm)

GAS: Indicates the presence of gasoline or weathered gasoline.
GRO: Positive result that does not match an identifiable gasoline pattern.

Quantitation on total peaks in the gasoline range from Toluene to Naphthalene.

ANALYTICAL RESOURCES INCORPORATED

BETX WATER SURROGATE RECOVERY SUMMARY

ARI Job: SS17
Matrix: Water

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA

Client ID	TFT	BBZ	TOT OUT
MB-041811	96.6%	92.0%	0
LCS-041811	98.5%	95.4%	0
LCSD-041811	98.3%	94.0%	0
SW-02-0411	103%	97.2%	0
PZ-10-0411	99.5%	94.9%	0
SW-03-0411	99.0%	94.7%	0
PZ-08-0411	100%	96.8%	0
PZ-09-0411	99.8%	96.4%	0
PZ-05-0411	98.1%	94.2%	0
Trip Blank	100%	94.4%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(79-120)	(80-120)
(BBZ) = Bromobenzene	(79-120)	(80-120)

Log Number Range: 11-8376 to 11-8382

ANALYTICAL RESOURCES INCORPORATED

TPHG WATER SURROGATE RECOVERY SUMMARY

ARI Job: SS17
Matrix: Water

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA

Client ID	TFT	BBZ	TOT OUT
MB-041811	97.1%	94.2%	0
LCS-041811	107%	107%	0
LCSD-041811	103%	103%	0
SW-02-0411	103%	99.3%	0
PZ-10-0411	99.7%	96.6%	0
SW-03-0411	99.8%	96.5%	0
PZ-08-0411	102%	99.7%	0
PZ-09-0411	102%	99.1%	0
PZ-05-0411	99.1%	96.6%	0
Trip Blank	101%	96.8%	0

	LCS/MB LIMITS	QC LIMITS
(TFT) = Trifluorotoluene	(80-120)	(80-120)
(BBZ) = Bromobenzene	(80-120)	(80-120)

Log Number Range: 11-8376 to 11-8382

FORM II TPHG

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
BETX by Method SW8021BMod

Sample ID: LCS-041811
LAB CONTROL SAMPLE

Lab Sample ID: LCS-041811
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 04/18/11 05:45
LCSD: 04/18/11 06:13
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Benzene	4.54	3.70	123%	4.42	3.70	119%	2.7%
Toluene	37.3	36.5	102%	36.2	36.5	99.2%	3.0%
Ethylbenzene	10.7	10.7	100%	10.5	10.7	98.1%	1.9%
m,p-Xylene	39.7	40.1	99.0%	38.4	40.1	95.8%	3.3%
o-Xylene	16.5	18.1	91.2%	16.0	18.1	88.4%	3.1%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

BETX Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	98.5%	98.3%
Bromobenzene	95.4%	94.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
TPHG by Method NWTPHG

Sample ID: LCS-041811
LAB CONTROL SAMPLE

Lab Sample ID: LCS-041811
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/19/11

QC Report No: SS17-Amec Geomatrix
Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Date Analyzed LCS: 04/18/11 05:45
LCSD: 04/18/11 06:13
Instrument/Analyst LCS: PID2/MH
LCSD: PID2/MH

Purge Volume: 5.0 mL

Dilution Factor LCS: 1.0
LCSD: 1.0

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Gasoline Range Hydrocarbons	1.11	1.00	111%	1.02	1.00	102%	8.5%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

TPHG Surrogate Recovery

	LCS	LCSD
Trifluorotoluene	107%	103%
Bromobenzene	107%	103%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID
Page 1 of 1
Matrix: Water

QC Report No: SS17-Amec Geomatrix
Project: GPT

Data Release Authorized:
Reported: 04/20/11

ARI ID	Sample ID	Extraction Date	Analysis Date	DL	Range	Result
MB-041811	Method Blank	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8376					Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	87.6%
SS17A	SW-02-0411	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8376	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	82.1%
SS17B	PZ-10-0411	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8377	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	89.6%
SS17C	SW-03-0411	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8378	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	89.1%
SS17D	PZ-08-0411	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8379	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	87.0%
SS17E	PZ-09-0411	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8380	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	82.1%
SS17F	PZ-05-0411	04/18/11	04/19/11	1.0	Gas	< 0.25 U
11-8381	HC ID: ---				Diesel	< 0.50 U
					Oil	< 0.50 U
					o-Terphenyl	88.2%

Reported in mg/L (ppm)

Gas value based on total peaks in the range from Toluene to C12.
Diesel value based on the total peaks in the range from C12 to C24.
Oil value based on the total peaks in the range from C24 to C38.

ANALYTICAL RESOURCES INCORPORATED

HCID SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: SS17-Amec Geomatrix
Project: GPT

Client ID	O-TER	TOT OUT
MB-041811	87.6%	0
LCS-041811	83.6%	0
LCSD-041811	88.9%	0
SW-02-0411	82.1%	0
PZ-10-0411	89.6%	0
SW-03-0411	89.1%	0
PZ-08-0411	87.0%	0
PZ-09-0411	82.1%	0
PZ-05-0411	88.2%	0

	LCS/MB LIMITS	QC LIMITS
(O-TER) = o-Terphenyl	(55-110)	(50-150)

Prep Method: SW3510C
Log Number Range: 11-8376 to 11-8381

FORM-II HCID

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
NWTPH-HCID Method by GC/FID

Sample ID: LCS-041811
LCS/LCSD

Lab Sample ID: LCS-041811
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/20/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Date Extracted LCS/LCSD: 04/18/11

Date Analyzed LCS: 04/19/11 17:19
LCSD: 04/19/11 17:43
Instrument/Analyst LCS: FID/MS
LCSD: FID/MS

Sample Amount LCS: 500 mL
LCSD: 500 mL
Final Extract Volume LCS: 1.0 mL
LCSD: 1.0 mL
Dilution Factor LCS: 1.00
LCSD: 1.00

Range	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Diesel	2.49	3.00	83.0%	2.78	3.00	92.7%	11.0%

HCID Surrogate Recovery

	LCS	LCSD
o-Terphenyl	83.6%	88.9%

Results reported in mg/L
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

TOTAL HCID RANGE HYDROCARBONS-EXTRACTION REPORT

ARI Job: SS17
Project: GPT

Matrix: Water
Date Received: 04/15/11

ARI ID	Client ID	Sample Amt	Final Vol	Prep Date
11-8376-041811MB	Method Blank	500 mL	1.00 mL	04/18/11
11-8376-041811LCS	Lab Control	500 mL	1.00 mL	04/18/11
11-8376-041811LCSD	Lab Control Dup	500 mL	1.00 mL	04/18/11
11-8376-SS17A	SW-02-0411	500 mL	1.00 mL	04/18/11
11-8377-SS17B	PZ-10-0411	500 mL	1.00 mL	04/18/11
11-8378-SS17C	SW-03-0411	500 mL	1.00 mL	04/18/11
11-8379-SS17D	PZ-08-0411	500 mL	1.00 mL	04/18/11
11-8380-SS17E	PZ-09-0411	500 mL	1.00 mL	04/18/11
11-8381-SS17F	PZ-05-0411	500 mL	1.00 mL	04/18/11

SAMPLE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Client ID: SW-02-0411
ARI ID: 11-8376 SS17A

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	35.6
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	35.6
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/19/11 041911#1	EPA 120.1	umhos/cm	1.00	96.6
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	89.5
Total Suspended Solids	04/18/11 041811#1	EPA 160.2	mg/L	2.5	4.2
Salinity	04/19/11 041911#1	SM 2520.B	ppt	0.10	< 0.10 U
Chloride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	4.0
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	0.2
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/29/11 042911#1	EPA 350.1M	mg-N/L	0.010	0.045
Sulfate	04/15/11 041511#1	EPA 300.0	mg/L	0.1	4.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Client ID: PZ-10-0411
ARI ID: 11-8377 SS17B

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	108
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	108
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/19/11 041911#1	EPA 120.1	umhos/cm	1.00	269
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	126
Total Suspended Solids	04/18/11 041811#1	EPA 160.2	mg/L	1.1	1.7
Salinity	04/19/11 041911#1	SM 2520.B	ppt	0.10	0.10
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	0.5	10.3
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	< 0.1 U
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	0.2
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/29/11 042911#1	EPA 350.1M	mg-N/L	0.010	0.027
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	0.5	14.3

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Client ID: SW-03-0411
ARI ID: 11-8378 SS17C

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	36.8
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	36.8
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/19/11 041911#1	EPA 120.1	umhos/cm	1.00	447
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	228
Total Suspended Solids	04/18/11 041811#1	EPA 160.2	mg/L	1.1	< 1.1 U
Salinity	04/19/11 041911#1	SM 2520.B	ppt	0.10	0.20
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	2.0	96.3
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	1.3
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/29/11 042911#1	EPA 350.1M	mg-N/L	0.010	0.047
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	2.0	18.4

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Client ID: PZ-08-0411
ARI ID: 11-8379 SS17D

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	121
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	121
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/19/11 041911#1	EPA 120.1	umhos/cm	1.00	359
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	194
Total Suspended Solids	04/18/11 041811#1	EPA 160.2	mg/L	1.1	< 1.1 U
Salinity	04/19/11 041911#1	SM 2520.B	ppt	0.10	0.20
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	0.5	19.6
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	3.0
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/29/11 042911#1	EPA 350.1M	mg-N/L	0.010	0.046
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	0.5	16.0

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Client ID: PZ-09-0411
ARI ID: 11-8380 SS17E

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	298
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	298
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/19/11 041911#1	EPA 120.1	umhos/cm	1.00	632
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	10.0	309
Total Suspended Solids	04/18/11 041811#1	EPA 160.2	mg/L	1.1	5.0
Salinity	04/19/11 041911#1	SM 2520.B	ppt	0.10	0.30
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	0.5	23.7
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.1
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	0.4
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/29/11 042911#1	EPA 350.1M	mg-N/L	0.010	0.041
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	0.5	19.8

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Client ID: PZ-05-0411
ARI ID: 11-8381 SS17F

Analyte	Date Batch	Method	Units	RL	Sample
Alkalinity	04/19/11 041911#1	SM 2320	mg/L CaCO3	1.0	222
Carbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Bicarbonate	04/19/11	SM 2320	mg/L CaCO3	1.0	222
Hydroxide	04/19/11	SM 2320	mg/L CaCO3	1.0	< 1.0 U
Conductivity	04/19/11 041911#1	EPA 120.1	umhos/cm	1.00	435
Total Dissolved Solids	04/19/11 041911#1	EPA 160.1	mg/L	5.0	218
Total Suspended Solids	04/18/11 041811#1	EPA 160.2	mg/L	1.1	< 1.1 U
Salinity	04/19/11 041911#1	SM 2520.B	ppt	0.10	0.20
Chloride	04/21/11 042111#1	EPA 300.0	mg/L	0.2	6.4
Fluoride	04/15/11 041511#1	EPA 300.0	mg/L	0.1	0.2
N-Nitrate	04/15/11 041511#1	EPA 300.0	mg-N/L	0.1	< 0.1 U
Ortho-Phosphorous	04/15/11 041511#1	EPA 300.0	mg-P/L	0.1	< 0.1 U
N-Ammonia	04/29/11 042911#1	EPA 350.1M	mg-N/L	0.010	0.039
Sulfate	04/21/11 042111#1	EPA 300.0	mg/L	0.2	7.4

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Conductivity	EPA 120.1	04/19/11	umhos/cm	< 1.00 U	
Total Dissolved Solids	EPA 160.1	04/19/11	mg/L	< 5.0 U	
Total Suspended Solids	EPA 160.2	04/18/11	mg/L	< 1.0 U	
Salinity	SM 2520.B	04/19/11	ppt	< 0.10 U	
Chloride	EPA 300.0	04/15/11	mg/L	< 0.1 U	
		04/21/11		< 0.1 U	
Fluoride	EPA 300.0	04/15/11	mg/L	< 0.1 U	
N-Nitrate	EPA 300.0	04/15/11	mg-N/L	< 0.1 U	
Ortho-Phosphorous	EPA 300.0	04/15/11	mg-P/L	< 0.1 U	
N-Ammonia	EPA 350.1M	04/29/11	mg-N/L	< 0.010 U	FB
Sulfate	EPA 300.0	04/15/11	mg/L	< 0.1 U	
		04/21/11		< 0.1 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	04/19/11	mg/L	433	500	86.6%
Total Suspended Solids EPA 160.2	ICVL	04/18/11	mg/L	48.7	50.0	97.4%
Salinity SM 2520.B	ICVL	04/19/11	ppt	45,200	47,600	95.0%

STANDARD REFERENCE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Alkalinity	SM 2320	04/19/11	mg/L CaCO3	65.9	66.3	99.4%
ERA #P114506		04/19/11		63.2	66.3	95.3%
Conductivity	EPA 120.1	04/19/11	umhos/cm	998	1,000	99.8%
Ricca #3193						
Chloride	EPA 300.0	04/15/11	mg/L	3.0	3.0	100.0%
ERA #230109		04/21/11		2.9	3.0	96.7%
Fluoride	EPA 300.0	04/15/11	mg/L	3.1	3.0	103.3%
ERA #02098						
N-Nitrate	EPA 300.0	04/15/11	mg-N/L	3.1	3.0	103.3%
ERA #09127						
Ortho-Phosphorous	EPA 300.0	04/15/11	mg-P/L	3.0	3.0	100.0%
EAR #210109						
N-Ammonia	EPA 350.1M	04/29/11	mg-N/L	0.535	0.500	107.0%
ERA #15125						
Sulfate	EPA 300.0	04/15/11	mg/L	3.0	3.0	100.0%
ERA #220109		04/21/11		2.9	3.0	96.7%

REPLICATE RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: SS17A Client ID: SW-02-0411						
Alkalinity	SM 2320	04/19/11	mg/L CaCO3	35.6	35.9	0.8%
Carbonate	SM 2320	04/19/11	mg/L CaCO3	< 1.0	< 1.0	NA
Bicarbonate	SM 2320	04/19/11	mg/L CaCO3	35.6	35.9	0.8%
Hydroxide	SM 2320	04/19/11	mg/L CaCO3	< 1.0	< 1.0	NA
Conductivity	EPA 120.1	04/19/11	umhos/cm	96.6	96.8	0.2%
Total Suspended Solids	EPA 160.2	04/18/11	mg/L	4.2	4.5	6.9%
Salinity	SM 2520.B	04/19/11	ppt	< 0.10	< 0.10	NA
N-Ammonia	EPA 350.1M	04/29/11	mg-N/L	0.045	0.044	2.2%
ARI ID: SS17E Client ID: PZ-09-0411						
Total Dissolved Solids	EPA 160.1	04/19/11	mg/L	309	265	15.3%

MS/MSD RESULTS-CONVENTIONALS
SS17-Amec Geomatrix

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 05/03/11

Project: GPT
Event: NA
Date Sampled: 04/15/11
Date Received: 04/15/11

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: SS17A Client ID: SW-02-0411							
N-Ammonia	EPA 350.1M	04/29/11	mg-N/L	0.045	0.584	0.500	107.8%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: SW-02-0411
SAMPLE

Lab Sample ID: SS17A
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/22/11	**7440-70-2**	**Calcium**	0.05	**9.63**	
3010A	04/19/11	6010B	04/22/11	**7439-95-4**	**Magnesium**	0.05	**4.21**	
3010A	04/19/11	6010B	04/22/11	**7440-09-7**	**Potassium**	0.5	**0.9**	
3010A	04/19/11	6010B	04/22/11	**7440-23-5**	**Sodium**	0.5	**4.9**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-10-0411
SAMPLE

Lab Sample ID: SS17B
LIMS ID: 11-8377
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/21/11	**7440-70-2**	**Calcium**	0.05	**21.7**	
3010A	04/19/11	6010B	04/21/11	**7439-95-4**	**Magnesium**	0.05	**11.0**	
3010A	04/19/11	6010B	04/21/11	**7440-09-7**	**Potassium**	0.5	**1.6**	
3010A	04/19/11	6010B	04/21/11	**7440-23-5**	**Sodium**	0.5	**14.6**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: SW-03-0411
SAMPLE

Lab Sample ID: SS17C
LIMS ID: 11-8378
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/21/11	**7440-70-2**	**Calcium**	0.05	**7.98**	
3010A	04/19/11	6010B	04/21/11	**7439-95-4**	**Magnesium**	0.05	**8.16**	
3010A	04/19/11	6010B	04/21/11	**7440-09-7**	**Potassium**	0.5	**3.1**	
3010A	04/19/11	6010B	04/21/11	**7440-23-5**	**Sodium**	0.5	**65.2**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-08-0411
SAMPLE

Lab Sample ID: SS17D
LIMS ID: 11-8379
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/21/11	**7440-70-2**	**Calcium**	0.05	**20.3**	
3010A	04/19/11	6010B	04/21/11	**7439-95-4**	**Magnesium**	0.05	**10.2**	
3010A	04/19/11	6010B	04/21/11	**7440-09-7**	**Potassium**	0.5	**2.5**	
3010A	04/19/11	6010B	04/21/11	**7440-23-5**	**Sodium**	0.5	**32.6**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-09-0411
SAMPLE

Lab Sample ID: SS17E
LIMS ID: 11-8380
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/21/11	**7440-70-2**	**Calcium**	0.05	**56.9**	
3010A	04/19/11	6010B	04/21/11	**7439-95-4**	**Magnesium**	0.05	**32.8**	
3010A	04/19/11	6010B	04/21/11	**7440-09-7**	**Potassium**	0.5	**2.8**	
3010A	04/19/11	6010B	04/21/11	**7440-23-5**	**Sodium**	0.5	**29.1**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: PZ-05-0411
SAMPLE

Lab Sample ID: SS17F
LIMS ID: 11-8381
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: 04/15/11
Date Received: 04/15/11

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/21/11	**7440-70-2**	**Calcium**	0.05	**35.3**	
3010A	04/19/11	6010B	04/21/11	**7439-95-4**	**Magnesium**	0.05	**21.2**	
3010A	04/19/11	6010B	04/21/11	**7440-09-7**	**Potassium**	0.5	**3.0**	
3010A	04/19/11	6010B	04/21/11	**7440-23-5**	**Sodium**	0.5	**27.3**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: METHOD BLANK

Lab Sample ID: SS17MB
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	04/19/11	6010B	04/21/11	7440-70-2	Calcium	0.05	0.05	U
3010A	04/19/11	6010B	04/21/11	7439-95-4	Magnesium	0.05	0.05	U
3010A	04/19/11	6010B	04/21/11	7440-09-7	Potassium	0.5	0.5	U
3010A	04/19/11	6010B	04/21/11	7440-23-5	Sodium	0.5	0.5	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: LAB CONTROL

Lab Sample ID: SS17LCS
LIMS ID: 11-8376
Matrix: Water
Data Release Authorized:
Reported: 04/25/11

QC Report No: SS17-Amec Geomatrix
Project: GPT

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Calcium	6010B	9.90	10.0	99.0%	
Magnesium	6010B	10.1	10.0	101%	
Potassium	6010B	10.1	10.0	101%	
Sodium	6010B	9.7	10.0	97.0%	

Reported in mg/L

N-Control limit not met
Control Limits: 80-120%

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APPENDIX D

Laboratory Report for Geotechnical Analyses

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Analytical Resources, Incorporated
Analytical Chemists and Consultants

AMEC E&E
Received
NOV 9 2010
SEATTLE ORG. 5009

November 1, 2010

John Long
AMEC Geomatrix
600 University Ste 1020
Seattle, WA 98101

Subject: 6PT 091515338C.01.04
ARI Project No.: RP60

Dear Mr. Long,

The following pages provide the information you requested. Please contact me to discuss any questions or comments you may have on the data or its presentation.

Best regards,
Analytical Resources, Incorporated

for
Guenna Smith
Geotechnical Division Manager
206-695-6246
guennas@arilabs.com

Enclosures

cc: File RP60

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: AMEC Geomatrix	**ARI Project No.:** RP60
Client Project: 6PT	**Client Project No.:** 091515338C.01.04

Case Narrative

1. Four samples were received on October 1, 2010.
2. The moisture contents were run according to ASTM D 2216.
3. The hydraulic conductivity testing was run according to ASTM D 5084, and a flexible wall permeameter system was used with tap water for the permeant.
4. Two samples were also submitted for grain size distribution, and were run according to ASTM D 422. The samples were prepared according to ASTM D 421. A standard milkshake mixer type device was used to disperse the sample. An assumed specific gravity of 2.65 was used in the calculations.
5. The data is provided in summary tables and plots.
6. There were no anomalies in the samples or test methods.

Approved by: _____ Date: Nov. 1, 2010
Lead Technician

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

CHAIN-OF-CUSTODY RECORD

RAOD

PROJECT NAME: 6PT			DATE: 9/30/2010 PAGE 1 OF 1
PROJECT NUMBER: 09151533BC.01.04	LABORATORY NAME: ARI	CLIENT INFORMATION: AMEC Geomatrix	REPORTING REQUIREMENTS: Standard Turn-around
RESULTS TO:	LABORATORY ADDRESS: 4611 S 134th Place	600 University Ste 1020	
TURNAROUND TIME: Standard	Tukwila, WA 98168	Seattle, WA 98101	
SAMPLE SHIPMENT METHOD: Courier	LABORATORY CONTACT: Gwenna Smith	(206) 342-1760	~~GEOTRACKER~~ EIMS REQUIRED if possible YES NO
	LABORATORY PHONE NUMBER: 206 695-6246		SITE SPECIFIC GLOBAL ID NO.

SAMPLERS (SIGNATURE): [signature]

ANALYSES

DATE	TIME	SAMPLE NUMBER	Sieve + Hydro ASTM D-422/1422	Moisture ASTM D-2216	Flexible Wall Hyd ASTM-5084	Remolded Hyd ASTM-D-5084	CONTAINER TYPE AND SIZE	Soil (S), Water (W), Vapor (V), or Other (O)	Filtered	Preservative Type	Cooled	MS/MSD	No. of Containers	ADDITIONAL COMMENTS
~~9/23/2010~~		~~6P091023-5-~~	JDL					S	—	—	—	—		
9/23/10	1000	6P091023-4-9	X	X	X	X	Shelby Tube	S	—	—	—	—	1	**
	~~1300~~ JDL 1500	6P091023-5-7	X	X			16 oz Glass	S	—	—	—	—	2	
	1500	6P091023-5-7.5			X	X	Shelby Tube	S	—	—	—	—	1	
	1600	6P091023-5-20.5					16 oz glass	S	—	—	—	—	2	
	1600	6P091023-5-21			X	X	Shelby Tube	S	—	—	—	—	1	

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
SIGNATURE: [signature]	10/1/10	1700	SIGNATURE: [signature]	10/1/10	1700
PRINTED NAME: John D. Long			PRINTED NAME: Rich Hudson		
COMPANY: AMEC Geo.			COMPANY: ARI		
SIGNATURE:			SIGNATURE:		
PRINTED NAME:			PRINTED NAME:		
COMPANY:			COMPANY:		
SIGNATURE:			SIGNATURE:		
PRINTED NAME:			PRINTED NAME:		
COMPANY:			COMPANY:		

TOTAL NUMBER OF CONTAINERS:

SAMPLING COMMENTS: * Remolded Hydraulic Conductivity with confining pressure

** Shelby Tube has 70% sample from ~~7.5 to 9.6'~~ 9'-11.2' - Moisture/Sieve/Hydraulic Cond from this single tube. Call John Long @ 206 342-1779 if ?'s

One Union Square, 600 University Street, Suite 1020
Seattle, Washington 98101-4107
Tel 206.342.1760 Fax 206.342.1761

amec

RPSD : 09/09/2010

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Amec

Project Name: GPT

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: RP100

Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	(NO)
Were custody papers included with the cooler?	(YES)	NO
Were custody papers properly filled out (ink, signed, etc.)	(YES)	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... ___ ___ ___ ___ ___

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: N/A

Cooler Accepted by: _____ Date: 10/1/10 Time: 1730

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	(NO)
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: box			
Was sufficient ice used (if appropriate)?	(NA)	YES	NO
Were all bottles sealed in individual plastic bags?		YES	(NO)
Did all bottles arrive in good condition (unbroken)?		(YES)	NO
Were all bottle labels complete and legible?		(YES)	NO
Did the number of containers listed on COC match with the number of containers received?		(YES)	NO
Did all bottle labels and tags agree with custody papers?		(YES)	NO
Were all bottles used correct for the requested analyses?		(YES)	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	(NA)	YES	NO
Were all VOC vials free of air bubbles?	(NA)	YES	NO
Was sufficient amount of sample sent in each bottle?		(YES)	NO
Date VOC Trip Blank was made at ARI	(NA)	_____	

Was Sample Split by ARI : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

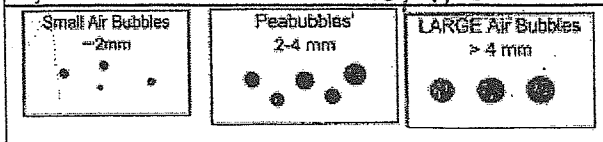
Samples Logged by: AV Date: 10/4/10 Time: 1115

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:
Shelby tubes were picked up at Amec on their sides.

By: AV Date: 10/4/10



Small → "sm"
Peabubbles → "pb"
Large → "lg"
Headspace → "hs"

RPS6 : 00004

ANALYTICAL RESOURCES INCORPORATED

GEOTECHNICAL ANALYSIS DATA SHEET
Moisture Content by Method ASTM D2216

Data Release Authorized: CR
Reported: 11/01/10
Date Received: 10/01/10

QC Report No: RP60-AMEC Geomatrix
Project: 6PT
091515338C.01.04

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
6P091023-4-9 RP60A 10-25217	09/23/10	Soil	11/01/10 15:42	21.76
6P091023-5-7 RP60B 10-25218	09/23/10	Soil	11/01/10 15:42	21.76

Reported in Percent

AMEC Geomatrix
091515338C.01.04 6PT

Test Results for Flexible Wall Hydraulic Conductivity Testing

Sample Identification	Depth (ft)	As Received Sample Parameters				After Test Sample Parameters				Gradient (h/l)	Hydraulic Conductivity (cm/s)
		Wet Density (lbs/ft^3)	Total Porosity	Saturation	Moisture Content (%)	Wet Density (lbs/ft^3)	Total Porosity	Saturation	Moisture Content (%)		
A	10	126.8	0.360	0.933	19.8	129.8	0.354	1.039	21.5	2.42	2.03E-06
C	8	125.7	0.374	0.947	21.3	127.3	0.381	1.043	24.2	0.16	8.54E-07
E	23	129.5	0.358	1.040	21.9	130.0	0.354	1.050	21.8	1.98	9.93E-08

Notes:

1. The samples were tested in accordance with ASTM D-5084.
2. The tests were performed using tap water for the permeant.
3. The porosity and the saturation were calculated using an assumed specific gravity value of 2.65.

Sample Description and Dimensions

Sample ID	Depth (ft)	Visual Description	Confining Pressure (psi)	Initial Average Length (cm)	Initial Average Diameter (cm)	Final Average Length (cm)	Final Average Diameter (cm)
A	10	Silty Clay with Gravel	8.8	5.82	7.13	5.80	7.12
C	8	Clay and Organic Debris with Gravel	7.9	11.50	7.12	11.55	7.14
E	23	Silty Clay with Gravel	20.7	10.61	7.24	10.55	7.24

RP60 : 000035

AMEC Geomatrix
091515338C.01.04
6PT

Percent Finer (Passing) Than the Indicated Size

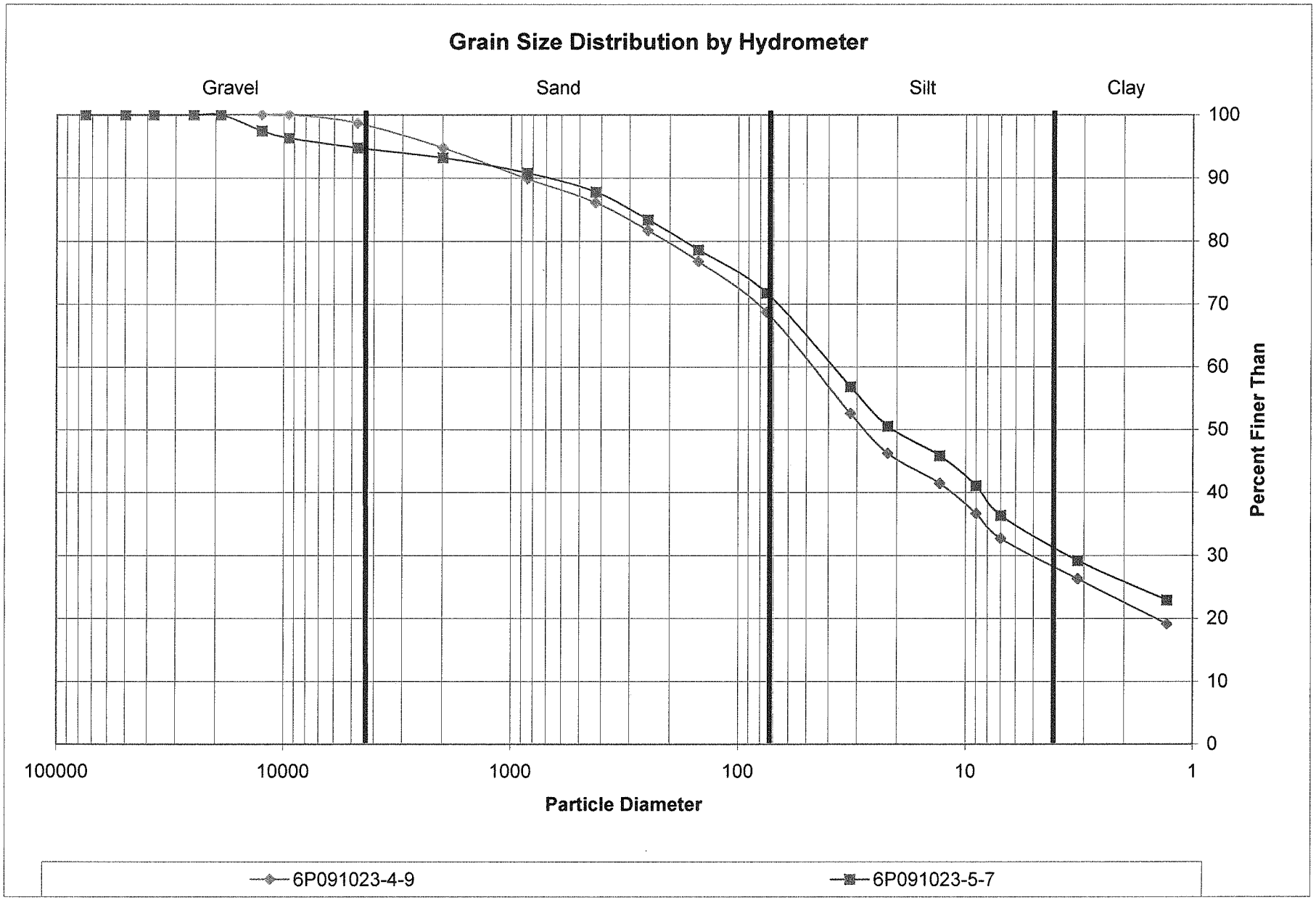
Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
BK01SD	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.8	93.7	86.6	77.7	65.9	50.8	44.1	39.3	36.4	33.6	29.7	23.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9	95.2	88.7	80.0	68.2	53.7	46.0	42.2	38.3	34.5	32.6	21.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	93.3	86.5	78.6	70.8	59.2	40.1	34.4	30.6	26.7	24.8	23.9	16.2
6P091023-4-9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7	94.7	89.8	86.0	81.6	76.7	68.7	52.5	46.1	41.4	36.6	32.6	26.3	19.1
6P091023-5-7	100.0	100.0	100.0	100.0	100.0	97.5	96.3	94.8	93.2	90.8	87.8	83.3	78.6	71.8	56.8	50.5	45.8	41.0	36.3	29.2	22.9

Testing performed according to ASTM D421/D422

AMEC Geomatrix
091515338C.01.04
6PT

Percent Retained in Each Size Fraction

Description	%Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
Particle Size (microns)	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
BK01SD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	3.2	7.0	9.0	11.8	15.1	6.7	4.8	2.9	2.9	3.8	29.7
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.8	6.5	8.7	11.8	14.5	7.7	3.8	3.8	3.8	1.9	32.6
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	6.7	6.7	8.0	7.7	11.6	19.1	5.7	3.8	3.8	1.9	1.0	23.9
6P091023-4-9	0.0	0.0	0.0	0.0	0.0	0.0	1.3	3.9	5.0	3.7	4.4	4.9	8.1	16.2	6.4	4.8	4.8	4.0	6.4	26.3
6P091023-5-7	0.0	0.0	0.0	0.0	2.5	1.2	1.6	1.6	2.4	3.0	4.4	4.7	6.8	14.9	6.3	4.7	4.7	4.7	7.1	29.2


Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
100
10
1
Particle Diameter
6P091023-4-9
6P091023-5-7

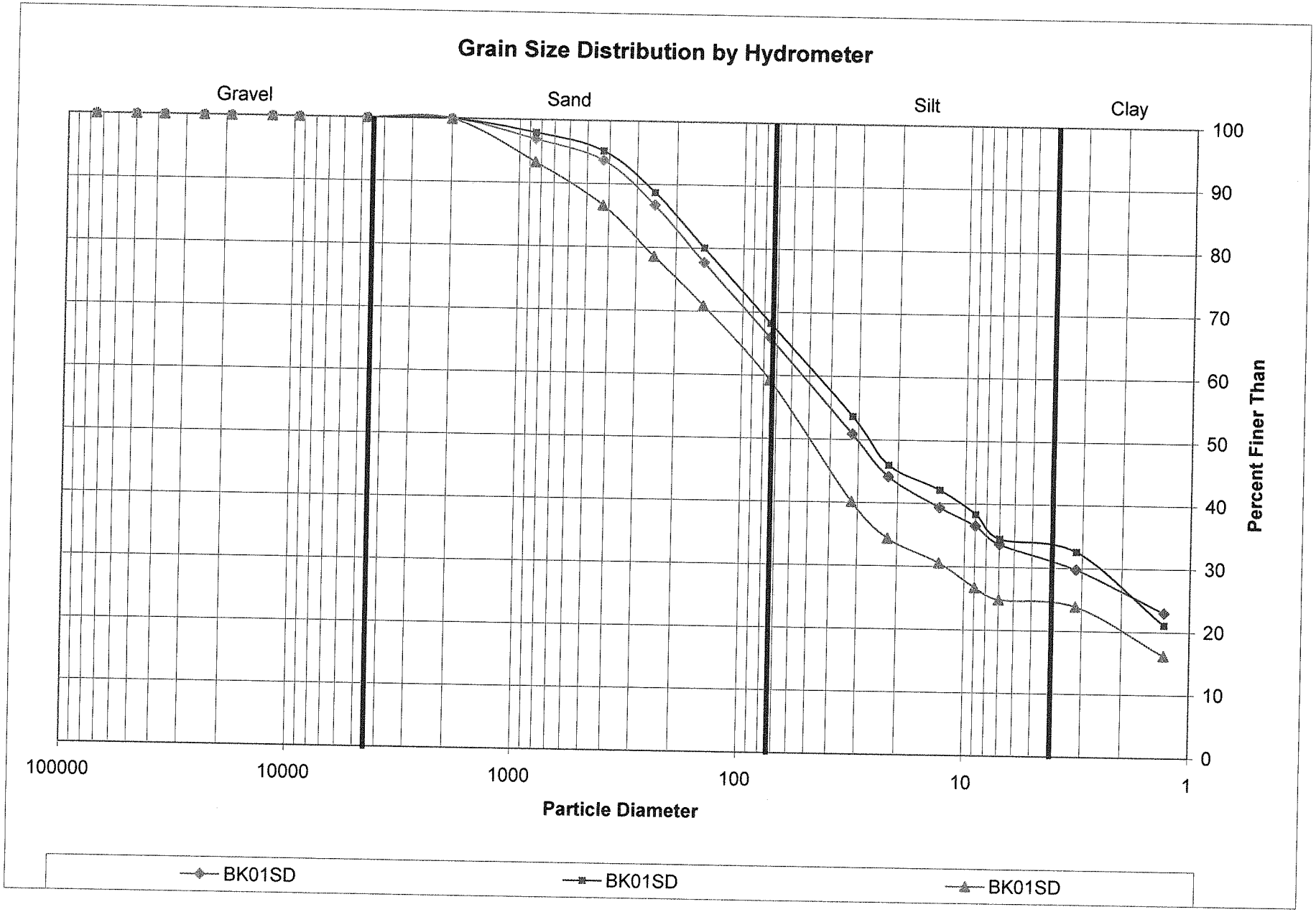
Client:	AMEC Geomatrix	Project No.:	091515338C.01.04
		Project:	6PT
ARI Triplicate Sample ID:	QV04 M	Batch No.:	RP60-01
Client Triplicate Sample ID:	BK01SD	Page:	1 of 1

Relative Standard Deviation, By Size

Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3.2	1.3
BK01SD	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.8	93.7	86.6	77.7	65.9	50.8	44.1	39.3	36.4	33.6	29.7	23.0
BK01SD	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9	95.2	88.7	80.0	68.2	53.7	46.0	42.2	38.3	34.5	32.6	21.1
BK01SD	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	93.3	86.5	78.6	70.8	59.2	40.1	34.4	30.6	26.7	24.8	23.9	16.2
AVE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.97	96.01	91.79	84.63	76.16	64.44	48.20	41.50	37.35	33.84	30.97	28.73	20.11
STDEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	2.45	4.61	5.35	4.77	4.66	7.14	6.23	6.04	6.22	5.33	4.44	3.49
%RSD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	2.55	5.03	6.32	6.26	7.24	14.82	15.02	16.18	18.37	17.22	15.44	17.37

This Triplicate applies to the Batch Containing the Following Samples

Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
BK01SD	5/1/2010	5/7/2010	5/13/2010	5/17/2010	
	5/1/2010	5/7/2010	5/13/2010	5/17/2010	
	5/1/2010	5/7/2010	5/13/2010	5/17/2010	
6P091023-4-9	10/1/2010	10/14/2010	10/19/2010	10/24/2010	
6P091023-5-7	10/1/2010	10/14/2010	10/19/2010	10/24/2010	


Grain Size Distribution by Hydrometer
Gravel
Sand
Silt
Clay
100
90
80
70
60
50
40
30
20
10
0
Percent Finer Than
100000
10000
1000
100
10
1
Particle Diameter
BK01SD
BK01SD
BK01SD