



BERNICE CREEK SURFACE WATER SAMPLING WORK PLAN
KENAI PIPE LINE COMPANY
TESORO ALASKA COMPANY, LLC
KENAI, ALASKA

April 26, 2024

Project #: TESAL-024-0005

PREPARED BY: Trihydro Corporation

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SUBMITTED BY: Tesoro Alaska Company, LLC

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**SOLUTIONS YOU CAN COUNT ON.
PEOPLE YOU CAN TRUST.**

CERTIFICATION STATEMENT
BERNICE CREEK SURFACE WATER SAMPLING WORK PLAN
KENAI PIPE LINE COMPANY – BERNICE CREEK
PREPARED FOR TESORO ALASKA COMPANY, LLC

I certify that the work presented in this report was performed under my supervision. To the best of my knowledge, the data contained herein are true and accurate and the work was performed in accordance with professional standards.

Brianna Force

04/26/2024

Brianna Force, P.G.

Date

Project Manager/Project Geologist

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List of Abbreviations and Acronyms

ADEC	Alaska Department of Environmental Conservation
ARCO	Atlantic Richfield Company Transportation Company
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	chain of custody
DI	deionized
DO	dissolved oxygen
DRO	diesel range organics
ft amsl	feet above mean sea level
GRO	gasoline range organics
KLNG	Kenai Liquid Natural Gas Plant
KPL	Kenai Pipe Line Terminal
LCS	laboratory control samples
LCSD	laboratory control sample duplicates
LNAPL	Light non-aqueous phase liquid
Marathon	Marathon Petroleum Company
MB	method blank
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
ORP	oxygen-reduction potential

List of Abbreviations and Acronyms (cont.)

QA	quality assurance
QC	quality control
ppm	parts per million
RPD	relative percent differences
SGS	SGS North America Inc.
SOP-SW	Standard Operating Procedures – Surface-Water Sampling
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
Tesoro	Tesoro Alaska Company, LLC
TPH	total petroleum hydrocarbons
Trihydro	Trihydro Corporation
Work Plan	Work Plan

1.0 INTRODUCTION

This work plan (Work Plan) was prepared by Trihydro Corporation (Trihydro) on behalf of Marathon Petroleum Company (Marathon) in response to the Alaska Department of Environmental Conservation (ADEC) letter “Kenai Pipeline Company 2022 Groundwater Monitoring Report ADEC Report Approval, Request for Work Plan” dated March 1, 2024, for the Tesoro Alaska Company, LLC (Tesoro) Kenai Pipe Line Terminal (KPL) located in Kenai, Alaska (Figure 1). In that letter, ADEC requested that Marathon provide surface water quality data, if collected, and develop a work plan to monitor current surface water condition in Bernice Creek at four locations: before the facility, at the source area downstream of the pipeline, within the facility, and at the creek outfall.

1.1 OBJECTIVES

Marathon proposes a one-time surface water sampling event of Bernice Creek to assess the current surface water quality and evaluate whether Bernice Creek is currently in compliance with ADEC Technical Memorandum 01-005 for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAQH). Surface water sampling results will be used to assess the overall surface water quality of Bernice Creek where it crosses the KPL site (Figure 4).

2.0 SITE HISTORY

2.1 PROPERTY DESCRIPTION

The KPL terminal is located in Nikiski, Alaska, bounded on the west by Cook Inlet and the Rig Tender's Dock (currently owned by Hilcorp); on the east by the Spur Highway; on the north by the former Chevron Refinery; and on the south by the Kenai Liquid Natural Gas (KLNG) plant. The KPL Terminal covers an area of approximately 160 acres. The Tesoro refinery is located southeast of the KPL terminal and on the east side of the Spur Highway. Tesoro purchased the KPL Terminal in March 1995 to receive and store crude oil and to ship refined products. The KPL Terminal facilities include a dock, pumping stations, crude oil and refined product pipelines, crude oil storage tanks, and office, warehouse, and ship buildings. Before 1995, the KPL Terminal was owned by a consortium of Chevron U.S.A. and Atlantic Richfield Company (ARCO) Transportation Company and operated by Chevron.

This Work Plan is focused on a subsection of the KPL Terminal referred to as the Bernice Creek Area. As shown in Figure 2, the Bernice Creek Area is located near the northern boundary of the KPL Terminal, south of Rig Tender's Road and is generally bound by monitoring wells TMW-02, TMW-04, MW-74, and MW-83. The Bernice Creek Area is defined by Bernice Creek which is the primary drainage channel located on the KPL Terminal Property.

2.2 HYDROGEOLOGIC FRAMEWORK

Geology in the vicinity of the KPL Terminal consists of unconsolidated Quaternary glacial, fluvial, lacustrine, and coastal plain sediments. The geology beneath the KPL Terminal is generally described as an unconsolidated sedimentary sequence of Quaternary pro-glacial deposits dominated by sand and gravel with interbedded clay, silt, and diatomaceous earth aquitards overlying a regionally extensive aquitard layer of clay and silt present at approximately 100 ft bgs (Karlstrom 1964). Groundwater presence and flow is controlled by the presence of the shallow discontinuous aquitards that create separate groundwater bearing zones. The regionally extensive aquitard serves as a confining unit between the regional unconfined aquifer and the upper confined aquifer. Aquifers at the site are separated into multiple shallow water bearing aquifer zones, a main unconfined aquifer, and an upper confined aquifer.

Soils beneath the Bernice Creek Area generally consist of a thick deposit of sand, gravelly sand, and sandy gravel with interbedded fine-grained layers. A discontinuous layer of silt to silty fine sand was encountered in borings TMW-01 through TMW-03, TMW-06 through TMW-08, and MW-24 at elevations of approximately 78 to 90 feet above mean sea level (ft amsl). Some thin, discontinuous silt layers were encountered at deeper elevations in borings TMW-02 and MW-24.

An upper and lower water bearing zone are present beneath the Bernice Creek Area. The saturated thickness of the shallow water bearing zone is seasonally variable, and flow is controlled by the topography and vertical permeability of the shallow water bearing layer.

2.2.1 SOIL IMPACTS

Soil impacts in the Bernice Creek Area appear to be limited to the approximate extent of hydrocarbons in the vadose zone as estimated based on data collected before 1995. Total benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected in a soil sample collected from monitoring well MW-24 during installation in 1993 at a concentration of 133,000 milligrams per kilogram (mg/kg) from 25 to 26.5 ft bgs. Benzene was detected in that sample at a concentration of 0.85 mg/kg. Additionally, total petroleum hydrocarbons (TPH) gasoline and diesel range organics (GRO and DRO) were found in soils from monitoring well MW-24 at concentrations of 2,700 mg/kg and 850 mg/kg, respectively (Dames & Moore 1995). Groundwater analytical data suggests that air sparging and vapor extraction remediation systems appear to have reduced concentrations by significantly. Light non-aqueous phase liquid (LNAPL) has been intermittently detected historically in monitoring well MW-24. Absorbent socks were deployed in MW-24 in 2018 and LNAPL has not been measurable since deployment.

2.2.2 GROUNDWATER IMPACTS

Residual soil impacts and LNAPL appear to be the primary source of impacts to groundwater in the Bernice Creek Area. A benzene concentration of 26 milligrams per liter (mg/L) was detected in a groundwater sample collected from monitoring well MW-24 after installation in 1993 (Dames & Moore 1995). The dissolved phase benzene plume over 1,000 micrograms per liter ($\mu\text{g/L}$) or 1 mg/L is limited to a small area around MW-24 and likely coincides with the LNAPL footprint. The plume has migrated to the southwest and its footprint is consistent with the general groundwater flow direction. Various attenuation mechanisms (dispersion, dilution, retardation, and decay) are likely limiting the overall footprint of the plume and along with sparging operations, appear to prevent it from leaving the site or reaching downgradient receptors. Current plume concentrations are discussed in the most recent 2023 Groundwater Monitoring Report (Trihydro 2024).

2.3 BERNICE CREEK DRAINAGE

Bernice Creek flows from Bernice Lake located approximately 1,000 feet east-northeast of the KPL terminal (Figure 2). The creek flows west, passes under the Spur Highway onto the Chevron property and then turns to flow generally southwest, towards Cook Inlet. After entering KPL, the creek flows through an area that was cleared and bladed in the early part of the construction of the terminal. About 350 to 400 feet downstream of Rig Tender's Road, the creek is channeled into a 10- to 15-foot wide ditch that carries stream flow around the lower tank farm containment

area (Figure 2). The creek is a losing stream on KPL, meaning water from the streambed flows out into the ground and may not be visible in the creek bed. Therefore, active surface water flow is dependent upon adequate precipitation and water may not always be observed in the creek.

2.4 BERNICE CREEK SPILL AREA

The Bernice Creek spill area is located in the north-central portion of KPL (Figure 2). A leak in a pipeline that parallels the Rig Tenders Road on the north side of the terminal released leaded gasoline near Bernice Creek in 1981. Free-phase product from this release has been identified in only one well, MW-24; however, the dissolved-phase plume in the unconfined aquifer is extensive as presented on Figure 3. LNAPL was discovered in well MW-24 during well installation and sampling activities on December 21, 1993. The LNAPL in well MW-24 was identified as leaded gasoline reportedly originating from a suspected release associated with a 1981 repair to the gasoline product pipeline located proximally to MW-24, along the north boundary of the KPL Terminal (Figure 2). The quantity of the suspected release is unknown (KSI 1997).

2.4.1 1996 FALL INVESTIGATION

Ten sediment samples (BC-SED-1 through BC-SED-10) and three surface water samples (BC-SW-1 through BC-SW-3) were collected from the Bernice Creek drainage at the approximate locations shown on Figure 3 in 1996. The creek was partially frozen at the time of sampling, and the water samples were collected from below ice. The sediment and surface water samples were analyzed for BTEX and lead (soil)/dissolved lead (water). The analytical data for the sediment and surface water samples are summarized on Tables 1 and 2 and benzene and GRO concentrations are presented on Figure 3.

The BTEX analytical data for BTEX, GRO, and DRO exceeded ADEC cleanup criteria in both the Bernice Creek sediments and surface water in 1996, as illustrated on Figure 3. Hydrocarbons were detected in higher levels near the source area and showed reducing concentrations downstream of the source area.

3.0 SURFACE WATER SAMPLING

Marathon proposes to analyze surface water at the following locations for TAH and TAqH: BC-SW-1, BC-SW-2, BC-SW-3, and BC-SW-4 (Figure 4). Proposed locations correspond as closely as possible with previous surface water sampling locations utilized in 1996, displayed on Figure 3 (KSI 1997).

- BC-SW-1: located north of Rig Tenders Dock Road, upgradient from the spill area, and north of the KPL facility
- BC-SW-2: located south of Rig Tenders Dock Road, at the source area downstream of the pipeline
- BC-SW-3: along Bernice Creek, downstream of the source area
- BC-SW-4: at the Bernice Creek outfall

TAH and TAqH analyses will be conducted by SGS North America Inc. (SGS), in Anchorage, AK.

3.1 SAMPLING PROCEDURE

Surface water samples will be collected from locations BC-SW-1, BC-SW-2, BC-SW-3, and BC-SW-4 shown on Figure 4. If proposed sample locations are found dry, the location will be modified in the field to the nearest location with enough water to collect a sample. Surface water will be collected using simple handheld containers in accordance with Standard Operating Procedure – Surface-Water Sampling (SOP-SW) presented in Appendix A and will not be field filtered. Water quality parameters will be recorded using a multi-probe water quality meter and will include pH, specific conductance, turbidity, temperature, oxygen-reduction potential (ORP), and dissolved oxygen (DO). Parameters will be collected directly prior to sample collection and recorded on field forms (Appendix B).

4.0 REPORTING AND SCHEDULE

Field work is planned for June or July of 2024, and when surface water is safely assessable. Field work outlined in this Work Plan is proposed to be conducted one time.

Marathon will prepare and submit finding of the Bernice Creek Surface Water sampling event to ADEC, including recommendations based on results, in conjunction with the 2024 Groundwater Monitoring Report, submitted in March of 2025.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

This section addresses the qualitative and quantitative criteria that will be used to evaluate the quality of the field and analytical data collected during the field activities.

5.1 FIELD QUALITY ASSURANCE AND QUALITY CONTROL SAMPLES

Four different kinds of field quality assurance and quality control samples (QA/QC) will be collected during the sampling event as described below.

1. Field Duplicate Samples. Duplicate samples will be collected to evaluate precision associated with the reproducibility of sampling techniques and the homogeneity of sample matrices. Duplicate samples will be collected at a minimum frequency of 10%, or one for every 10 samples. The duplicate sample will be “blind” to the laboratory; therefore, it will have a coded identity on its label and on the Chain of Custody (COC). The actual sampling location and identification will be recorded on the sampling log.
2. Trip Blanks. One trip blank will accompany each sample cooler. Experience has shown that cross-contamination at analytical laboratories can lead to spurious detections. The trip blanks prepared by the laboratory can point to the reagent water used by the laboratory as a source of contamination not related to field sampling procedures.
3. Field Blanks. Field blanks will be collected in the vicinity of the project area. Field blanks will be collected by pouring laboratory provided deionized water (DI) water into the appropriate containers and submitted for analysis. A minimum of one field blank will be collected per set of 20 tests.
4. Equipment Blanks. Equipment blanks will be prepared and submitted for laboratory analysis to assess sampling equipment decontamination procedures. Following ADEC guidance, Trihydro will take a minimum of one blank per set of 20 tests.

All QA/QC samples will be analyzed by SGS. The laboratory will follow proper QA/QC procedures, including laboratory blanks and duplicates. Data from the QC samples are used as a measure of performance and as an indicator of potential sources of cross-contamination. All QC data generated by the laboratory will be submitted with the report.

5.2 LABORATORY ASSURANCE AND QUALITY CONTROL SAMPLES

SGS will follow proper QA/QC procedures, including laboratory blanks, duplicates, and spiked samples for calibration and identification of potential matrix effects. Data from the QC samples are used as a measure of performance and as an indicator of potential sources of cross-contamination. These data are submitted in the data packages provided by SGS.

1. MS/MSD. MS/MSD are not planned to be collected during this sampling event. The lab will perform laboratory control samples (LCS) and laboratory control sample duplicates (LCSD).
2. Surrogate Spiking. Surrogate compounds are added before sample preparation for organics to all samples prior to extraction and analysis. The review for surrogate compounds can be used to assess method accuracy for each sample matrix.

5.3 DATA VALIDATION

All analytical data received from the laboratory will undergo Trihydro's data validation process. Minimally, data will be evaluated by the Tier I data validation process and the *ADEC Contaminated Sites Program Laboratory Data Review Checklist* data checklist and summary will be completed and attached to the report.

Precision, accuracy, method compliance, and completeness of the data packages will be assessed during the data validation process. Precision is determined by evaluating the calculated relative percent difference (RPD) values from: laboratory duplicate pairs and LCS/LCSD pairs. Laboratory accuracy is established by reviewing the demonstrated percent recoveries of the following items to identify potential biases in the analytical data: LCS/LCSD samples and organic system monitoring compounds (surrogates). Field accuracy is established by collecting and analyzing field QA/QC samples to monitor for possible ambient or cross-contamination during sampling and transportation. Method compliance is established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements. Completeness is evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness includes a review of the COC, laboratory analytical methods, and other laboratory and field documents associated with the analytical data set.

6.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2022. *Field Sampling Guidance*.

ADEC - Campbell, P. 2024. *Kenai Pipeline Company 2022 Groundwater Monitoring Report - ADEC Report Approval, Request for Work Plan Ltr. March 1, 2024*. ADEC File No. 2323.38.014.

Dames & Moore. 1995. *Report – Volume I, Phase II Investigation Bernice Creek Site Along Rig Tenders Road, Nikiski, Alaska, for Tesoro Alaska Petroleum Company*. September 27, 1995.

Karlstrom, T. 1964. *Quaternary Geology of the Kenai Lowland and Glacial History of the Cook Inlet Region, Alaska*. U.S. Geological Survey, 66p.

Kent and Sullivan, Inc. Environmental Consultants. 1997. *1996 Fall Investigation Report*. Kenai Pipeline Company. Prepared for Tesoro Alaska Company, LLC.

Trihydro. 2024. *2023 Groundwater Monitoring Report*. Kenai Pipeline Company. ADEC File No. 2323.38.014. Prepared for Tesoro Alaska Company, LLC.

TABLES

**TABLE 1. 1996 FALL INVESTIGATION SEDIMENT ANALYTICAL RESULTS
TESORO ALASKA COMPANY, KENAI PIPE LINE
KENAI, ALASKA**

Sample Location	OVM (ppm)	Benzene (mg/kg)	Total BTEX (mg/kg)	GRO (mg/kg)	Lead (mg/kg)
BC-SED-1	0.7	0.03 U	0.03 U	1.2 U	1.9
BC-SED-2	0.7	0.028 U	0.028 U	1.1 U	4.1
BC-SED-3	0.7	0.081 U	0.081 U	6.9	53
BC-SED-4	35	2	14	1,500	28
BC-SED-5	820	52	2,552	8,400	160
BC-SED-6	212	15	1,037	3,900	180
BC-SED-7	76	0.069 U	0.069 U	2.8 U	750
BC-SED-8	10	0.064 U	0.067	2.6 U	100
BC-SED-9	2.2	0.056 U	0.056 U	2.2 U	150
BC-SED-10	2.8	0.037 U	0.037 U	1.5 U	90

Notes:

U - Not detected. Value shown is detection level.

ppm - Parts per million

mg/kg - Milligram per kilogram

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes

GRO - Gasoline Range Organics

OVM - Organic Vapor Monitoring

**TABLE 2. 1996 FALL INVESTIGATION SURFACE WATER ANALYTICAL RESULTS
TESORO ALASKA COMPANY, KENAI PIPELINE
KENAI, ALASKA**

Sample No.	Sample Location	Benzene (mg/L)	Total BTEX (mg/L)	GRO (mg/L)	Lead (mg/L)
BC-SW-1	BC-SED-1	1 U	4.3 J	100 U	5.7
BC-SW-2	BC-SED-4	240	916	1,900	4.5
BC-SW-3	BC-SED-6	8,000	35,500	70,000	190

Notes:

U - Not detected. Value shown is detection level.

J - Estimated concentration

mg/L - Milligram per Liter

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes

GRO - Gasoline Range Organics

FIGURES

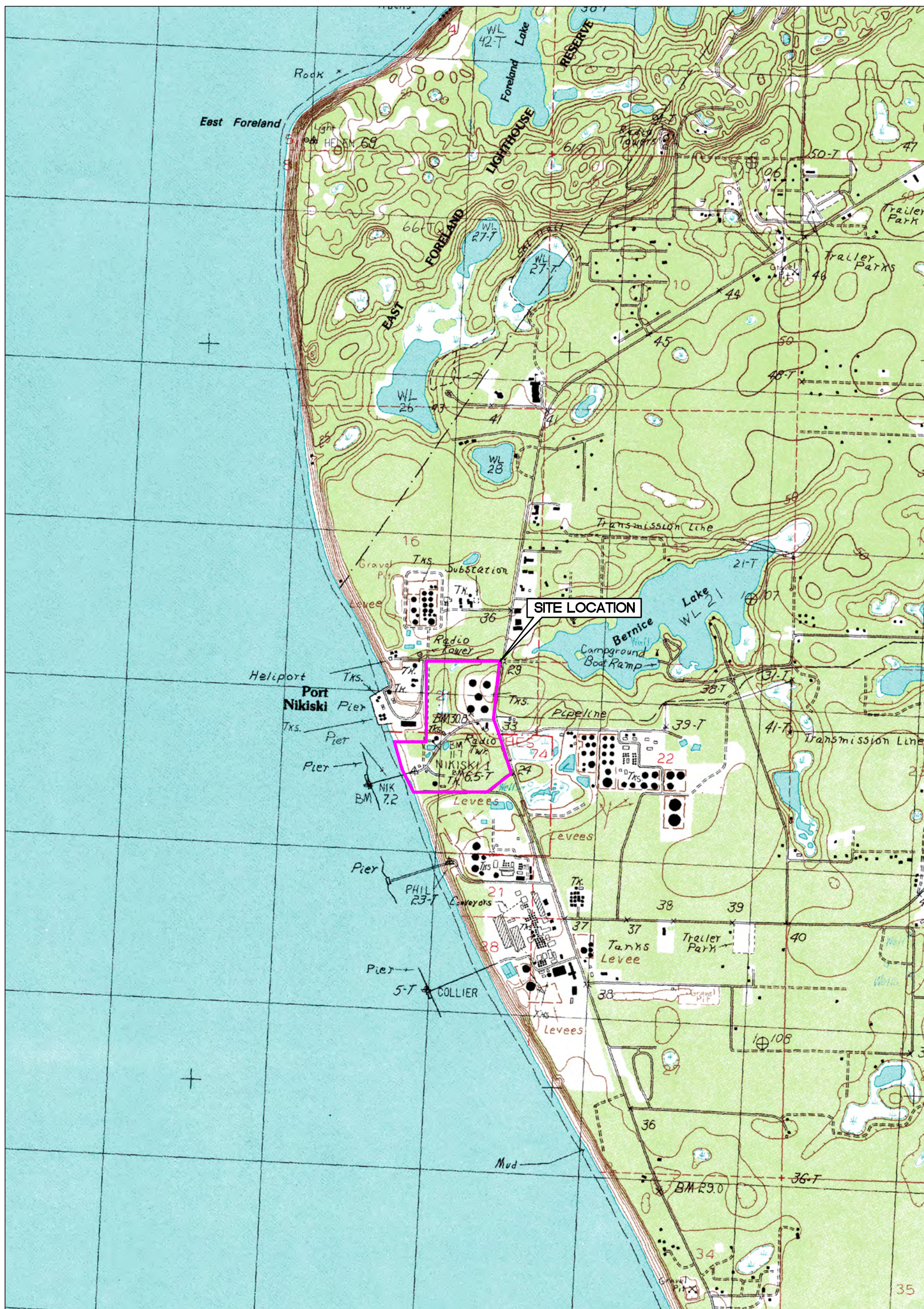


Image Cite: U.S. Geological Survey, Mosaic of 1:24,000-Scale Quadrangles, Kenai Peninsula Borough, Alaska, Publication: 1986



QUADRANGLE LOCATION



0 2,000'

Trihydro
CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
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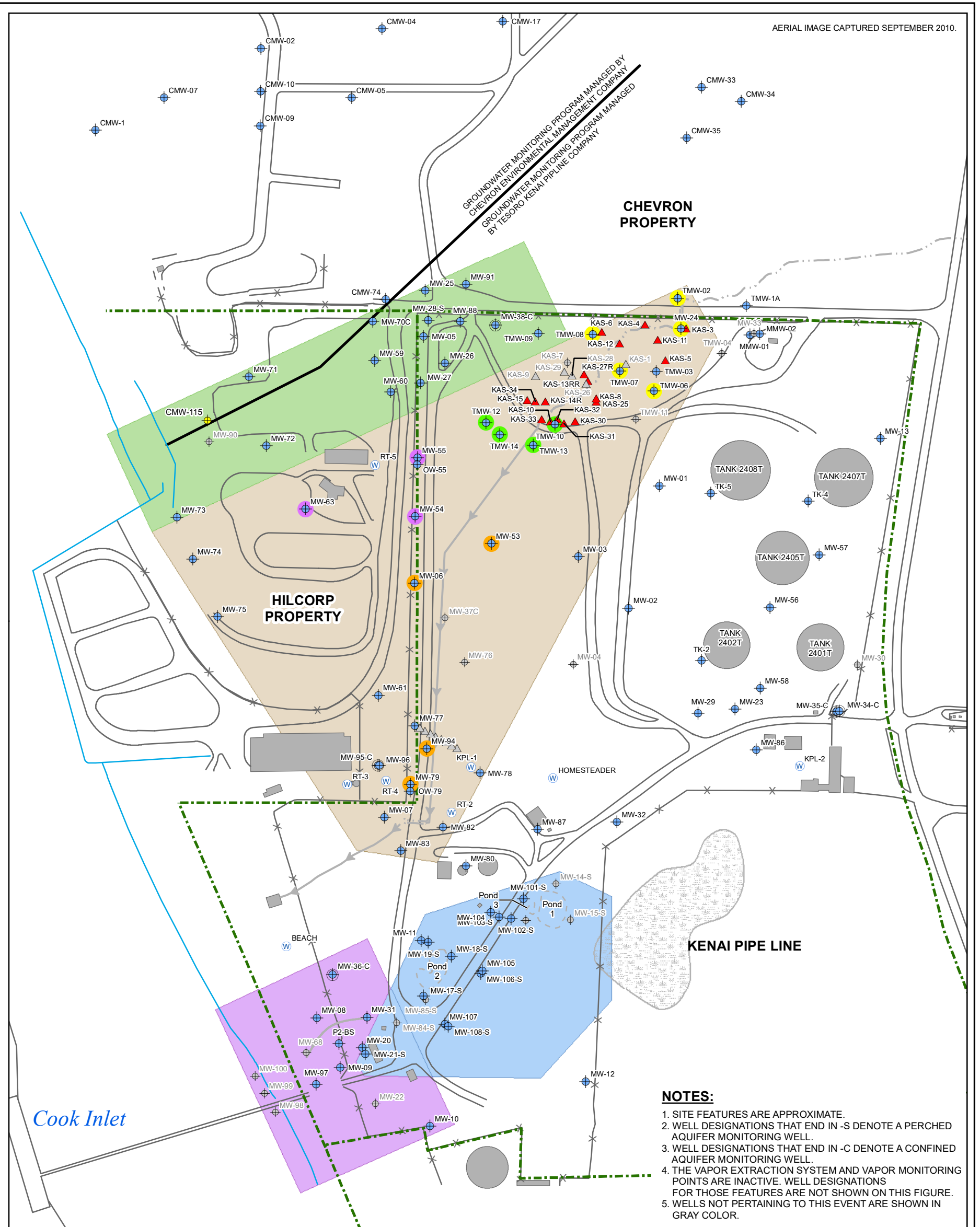
FIGURE 1

SITE LOCATION MAP

ANNUAL GROUNDWATER REPORT
TESORO ALASKA COMPANY
KENAI PIPELINE, KENAI, ALASKA

Drawn By: JLP Checked By: BF Scale: 1" = 2,000' Date: 1/15/2019 File: 39B-KPLAR_SITELOC-2018

M:\STOV\TESORO\CADD\KENAIPIPELINE\REMEDIATIONCONSULTING\GROUNDWATERMONITORING\ANNUALREPORTS\2018\39B-KPLAR_SITELOC-2018



NOTES:


1. SITE FEATURES ARE APPROXIMATE.
2. WELL DESIGNATIONS THAT END IN -S DENOTE A PERCHED AQUIFER MONITORING WELL.
3. WELL DESIGNATIONS THAT END IN -C DENOTE A CONFINED AQUIFER MONITORING WELL.
4. THE VAPOR EXTRACTION SYSTEM AND VAPOR MONITORING POINTS ARE INACTIVE. WELL DESIGNATIONS FOR THOSE FEATURES ARE NOT SHOWN ON THIS FIGURE.
5. WELLS NOT PERTAINING TO THIS EVENT ARE SHOWN IN GRAY COLOR.

EXPLANATION

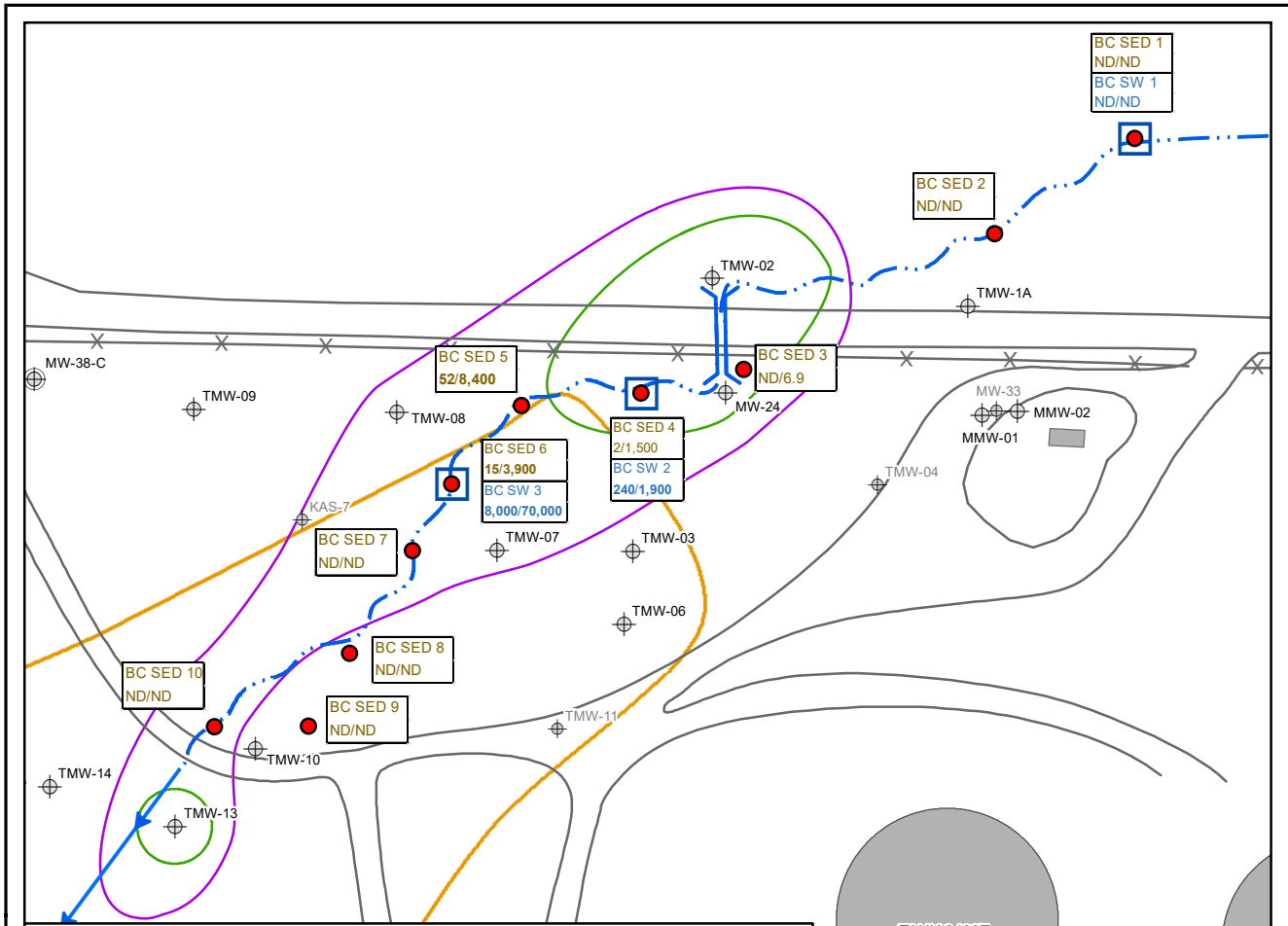
- | | | |
|--|--|---|
| <ul style="list-style-type: none"> ⊕ MONITORING WELL AND DESIGNATION; MW Perched Aquifer ⊕ CONFINED AQUIFER MONITORING WELL AND DESIGNATION ⊕ WATER SUPPLY WELL AND DESIGNATION ▲ AIR SPARGE WELL AND DESIGNATION ⊕ ABANDONED OR DECOMMISSIONED WELL ▲ VAPOR EXTRACTION WELL OR VAPOR MONITORING POINT (INACTIVE) ⊕ CHEVRON MONITORING WELL ● BERNICE CREEK SOURCE AREA ● BERNICE CREEK CENTRAL PLUME AREA ● BERNICE CREEK WEST LOBE AREA ● BERNICE CREEK SOUTH LOBE AREA | <ul style="list-style-type: none"> — SHORELINE --- CREEK ← DITCH SHOWING FLOW DIRECTION ⊗ FENCE --- PROPERTY BOUNDARY ■ SWAMP AREA | <ul style="list-style-type: none"> □ DETENTION POND ■ BEACH/DOCK AREA ■ BERNICE CREEK AREA ■ PERCHED AQUIFER AREA ■ PIPELINE MANIFOLD AREA ■ BUILDING, TANK, OR OTHER STRUCTURE |
|--|--|---|



0 300'

 1252 Commerce Drive Laramie, WY 82070 www.trihydro.com (P) 307/745.7474 (F) 307/745.7729	FIGURE 2
	AREA DESIGNATION MAP 2024
BERNICE CREEK SURFACE WATE SAMPLING WORK PLAN	
Drawn By: DH	Checked By: BF
Scale: 1" = 300'	Date: 4/25/24
File: KPL_AreaDesignation_Fig3.mxd	

M:\STOVTESOR\GIS\PROJECTS\KENAI PIPELINE\BERNICE CREEK\SW SAMPLING\WP202404_SWSAMPLING_WP\KPL_AreaDesignation_Fig3.mxd



EXPLANATION

- SURFACE WATER SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION
- ⊕ MONITORING WELL AND DESIGNATION
- ⊕ CONFINED AQUIFER MONITORING WELL AND DESIGNATION
- ⊕ ABANDONED OR DECOMMISSIONED WELL
- BENZENE PLUME (1996)
- BENZENE PLUME - 2023**
- 4.6 - 100 µg/L
- > 100 µg/L
- ND/6.9 ANALYTICAL RESULTS FOR BENZENE/GRO IN SEDIMENT IN MILLIGRAMS PER KILOGRAM (mg/kg)
- 240/1,900 ANALYTICAL RESULTS FOR BENZENE/GRO IN SURFACE WATER IN MICROGRAMS PER LITER (µg/L)

NOTES:

1. GRO = GASOLINE-RANGE ORGANICS
2. ND = NOT DETECTED AT OR ABOVE THE DETECTION LIMIT
3. BENZENE AND GRO CONCENTRATIONS EXCEEDING CLEANUP CRITERIA ARE BOLDED

FIGURE 3

**BERNICE CREEK SAMPLE LOCATION MAP
1996 FALL INVESTIGATION**

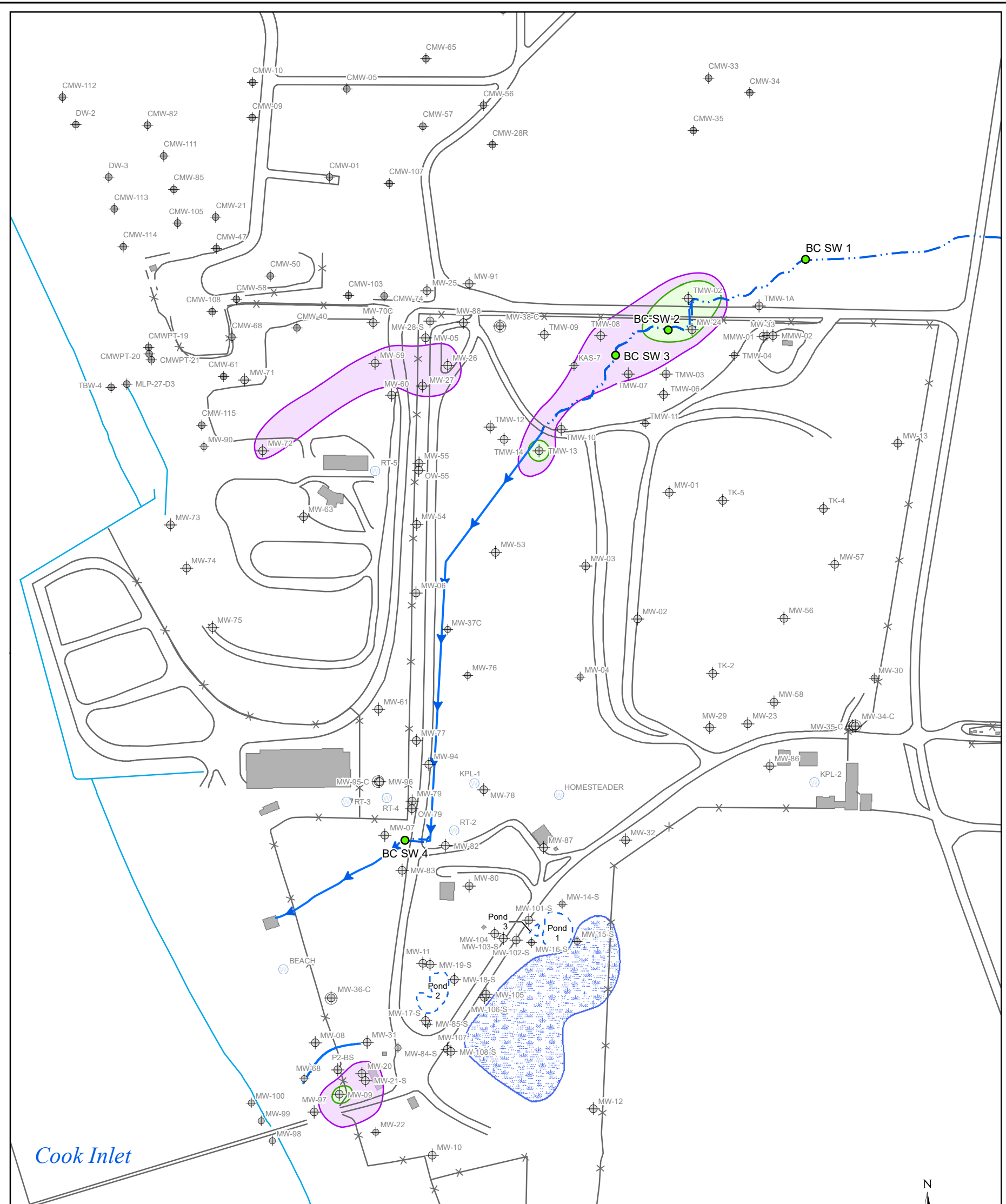
**TESORO ALASKA COMPANY
KENAI PIPELINE, KENAI, ALASKA**



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M:\STW\TESORO\GIS\PROJECTS\KENAI PIPELINE\BERNICE CREEK\SW_SAMPLING_WP\KPL_SAMPLELOCATIONS_FIG3.MXD

M:\STOVTESORO\GIS\PROJECTS\KENAI PIPELINE\BERNICE CREEK\SW_SAMPLING_WP\KPL_SITEPLAN_FIG4.MXD



EXPLANATION

- SURFACE WATER SAMPLE LOCATION
 - MONITORING WELL AND DESIGNATION
 - CONFINED AQUIFER MONITORING WELL AND DESIGNATION
 - WATER SUPPLY WELL AND DESIGNATION
 - ABANDONED OR DECOMMISSIONED WELL
 - CHEVRON MONITORING WELL
 - SHORELINE
 - CREEK
 - ← DITCH SHOWING FLOW DIRECTION
 - FENCE
 - BUILDING, TANK, OR OTHER STRUCTURE
 - SWAMP AREA
 - DETENTION POND
- BENZENE PLUME - 2023**
- 4.6 - 100 µg/L
 - > 100 µg/L

NOTES:

1. SITE FEATURES ARE APPROXIMATE.
2. WELL DESIGNATIONS THAT END IN -S DENOTE A PERCHED AQUIFER MONITORING WELL.
3. WELL DESIGNATIONS THAT END IN -C DENOTE A CONFINED AQUIFER MONITORING WELL.
4. THE VAPOR EXTRACTION SYSTEM AND VAPOR MONITORING POINTS ARE INACTIVE. WELL DESIGNATIONS FOR THOSE FEATURES ARE NOT SHOWN ON THIS FIGURE.

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FIGURE 4

BERNICE CREEK PROPOSED SURFACE WATER SAMPLE LOCATION MAP-2024

TESORO ALASKA COMPANY
KENAI PIPELINE, KENAI, ALASKA

APPENDIX A

STANDARD OPERATING PROCEDURE – SURFACE-WATER SAMPLING



memorandum

To: Trihydro Employees
From: OSE
Date: August 1, 2019
Standard Operating Procedure – Surface-Water
Re: Sampling

1.0 INTRODUCTION

This standard operating procedure (SOP) is intended to provide methods, procedures, and guidance for sampling surface waters or liquids in lakes, streams, pits, sumps, lagoons, and similar reservoirs for environmental analysis. The SOP presents two methods of sampling: direct immersion of sampling containers and use of a pond sampler.

This SOP applies to Trihydro Corporation (Trihydro) projects where surface-water sampling will be performed and no program- or client-specific procedure is in use.

2.0 PLANNING AND PROCEDURES

Surface-water sampling involves removing water directly from a water body with minimal interferences from bank effects, sediment, or other disturbances. The sample is collected from a representative area of the water body and transferred to appropriate sample containers for transport to the laboratory.

Monitoring of water-quality parameters (i.e., pH, specific conductivity, temperature, dissolved oxygen) is performed after a representative sample has been collected and the sample bottles have been filled and secured.

3.0 VARIABLES

The following variables should be considered in planning for surface-water sampling:

- **Current flow and direction:** Samples should be collected from a flowing stream moving into the sampling container. Sampling locations should be clear of stagnant water, eddies, backwater, reverse flows, and areas of faster than normal flows. In addition, identify confluences with other water bodies to select sampling locations that are either isolated from mixing or within the mixing zone, depending on the sampling and analysis plan.
- **Water-body width and depth:** The width and depth of the sampling body determine sampling location. The sample should be collected from a representative location near the center of the water body to avoid stagnant near-shore water and bank-material effects. The water-body depth should be determined to assess if it is safe to enter the water or if a pond sampler should instead be used.
- **Pond sampler (Attachment A, Photo 1):** This long-handled device allows a sample to be collected from a limited-access location. Compared to wading, pond samplers cause minimal bottom-sediment disturbance.



- **Water quality, including type and concentration of chemical compounds present:** Surface-water sampling methods can be used for aqueous-phase contamination, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, pesticides, polychlorinated biphenyls, radionuclides, and microbiological constituents. Sampling-equipment composition should be compatible with the constituents of concern.

4.0 EQUIPMENT

The following equipment is recommended for surface-water sampling:

- Required personal protective equipment (PPE), listed in the site-specific health and safety plan (HASP) (generally nitrile gloves, waders, and safety glasses)
- Water-quality meter (for pH, specific conductance, temperature, dissolved oxygen, or redox potential) calibrated daily per the manufacturer's specifications (**Attachment A, Photo 2**)
- Swabbing materials
- Pond (or dip) sampler
- Nephelometer (for turbidity measurements; calibrated if required by the manufacturer) (**Attachment A, Photo 3**)
- Plastic sheeting
- Sampling vessel
- Sample containers and preservatives
- Photoionization detector (PID) (**Attachment A, Photo 4**)
(calibrated, if screening for VOCs is required)
- Ice and resealable plastic bags
- Field logbook
- Wrist watch (with digital display)



5.0 PRE-SAMPLING

To prevent cross contaminating other samples, upstream and background sites should be sampled first. The procedure for pre-sampling is as follows:

1. Don a pair of clean nitrile gloves, safety glasses, and other required PPE (as listed in the HASP).
2. Prepare an area on the bank by placing plastic sheeting on the ground surface to minimize the potential to cross contaminate the sampling equipment and materials.
3. If performing VOC screening, measure and record the background organic vapors in the ambient air using a PID (in accordance with manufacturer specifications and recommendations).
4. Record general weather conditions in the field logbook.

6.0 SAMPLE COLLECTION

The sample-collection procedure is listed below:

1. Don a pair of clean nitrile gloves, safety glasses, and other required PPE (listed in the HASP). Don waders, if necessary.
2. Prepare sample bottles and preservatives for sampling.
3. If wading, avoid disturbing the substrate as much as possible and allow any disturbed sediment to settle before sampling.
4. While keeping the sampling vessel upstream of the sampler and pointed upstream, collect the sample from just under the water surface (Attachment A, **Photo 5**).
5. Return to the prepared area and from the sampling vessel, fill volatile organic analysis (VOA) vials first, allowing the liquid to slowly fill the container without agitation. While filling the VOA vial, obtain a meniscus slightly above the top of the vial.
6. Place cap on VOA and check for entrained air by slowly tipping, tapping against the palm of one hand, and observing for bubbles. If bubbles are present, discard the sample and collect again, as described above.
7. Continue filling sample bottles (Attachment A, **Photo 6**).
8. Monitor and record the pH, conductivity, dissolved oxygen, and turbidity in the water remaining in the sampling vessel.
9. Add preservatives to the samples as needed, and place the sample bottles on ice. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles. If a sample bottle containing preservatives is overfilled, discard the overfilled bottle and collect again, as described above.
10. Record the sampling information.



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11. Secure the area by removing equipment and materials; properly dispose of plastic sheeting and other sampling materials.
12. Decontaminate the sampling equipment using Simple Green or similar cleaning solution.

7.0 BIBLIOGRAPHY

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ATTACHMENT A. PHOTOGRAPHS



Photo 1: Pond Sampler (2013)



Photo 2: Hanna Multi-parameter Portable Water-Quality Meter (2013)



Photo 3: Nephelometer (2013)



Photo 4: Photoionization Detector (PID) (2013)



Photo 5: Collecting samples upstream (Trihydro 2005)



Photo 6: Filling VOA vials (TriHydro 2003)

APPENDIX B

SURFACE WATER SAMPLING FIELD FORM TEMPLATE



Surface Water Sampling Form

Sample ID: _____

Date: _____

Client: _____

Project: _____

Project No.: _____

Site: _____

Condition/Weather: _____

Sample Collection Method: _____

Method: _____

Field Personnel: (print) _____ (sign) _____

Time	Temperature (deg C)	Dissolved Oxygen (DO)	Specific Conductivity (mS/cm)	pH	Oxygen Reduction Potential (ORP)	Turbidity (NTU)

Sampling Information

Sample Collection Time: _____

Analytical Suite Collected: _____

Duplicate Sample Yes No

If Yes, Duplicate ID: _____ Duplicate Time: _____

Notes/Comments (odor, color, sheen, etc.): _____
