2110.38.007
ADEC File No.

SUBSURFACE INVESTIGATION REPORT

FORMER CHEVRON SERVICE STATION
CHEVRON SITE 9-2609
MILE 79 SEWARD HIGHWAY
GIRDWOOD, ALASKA
ADEC FILE ID: 2110.38.007

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NOVEMBER 17, 2009
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1.0 INTRODUCTION

Conestoga-Rovers & Associates is submitting this Subsurface Investigation Report to the Alaska Department of Environmental Conservation (ADEC) on behalf of Chevron Environmental Management Company (Chevron) for the site referenced above. CRA advanced two soil borings north and west of monitoring well MW-3 to delineate the downgradient extent of petroleum hydrocarbons in soil and groundwater (Figure 2). , The soil borings were completed as 2-inch groundwater monitoring wells MW-15 and MW-16. The site background, investigation details and conclusions are presented below.

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION

The site is a former Texaco-branded service station located at Mile 79 along the southbound lane of Seward Highway in Girdwood, Alaska (Figure 1). The site operated as a Texaco-branded service station from 1971 to 1979. Former site facilities consisted of seven underground storage tanks (USTs), dispenser islands, and associated product piping. Three USTs and associated piping were removed in 1980. Four USTs, two log cribs, dispenser islands, product piping, and a septic tank were removed in 2000. The site is currently vacant with the exception of an abandoned kiosk. Fourteen groundwater monitoring wells are located on and offsite and 10 are sampled semiannually (Figure 2). The site environmental history is presented in Appendix A.

2.2 HYDROGEOLOGY

The site is located in south central Alaska, at the eastern-most extent of the Turnagain Arm between Twenty Mile River and Portage Creek. No major principal aquifer system underlies the site, however the southern/southeastern extent of the Cook Inlet Aquifer System is slightly northwest/west of the site. The Cook Inlet Aquifer System consists of boulders, cobbles, and unconsolidated gravels, sands, silts, and clays deposited by glacial, alluvial, and colluvial processes. Historical static groundwater levels have ranged between 1.31 and 11.21 feet below grade (fbg) with groundwater flowing southwest. Local tidal influence can be as great as 37 feet (ft) which likely produces groundwater fluctuations in site monitoring wells. Long-term groundwater monitoring and sampling has been conducted at the site since 1995.

2.3 REGIONAL GEOLOGY

Bedrock in Girdwood, Alaska consists of Cretaceous to Upper Jurassic slate, greywacke, argillite, conglomerate, and volcanic units. The site subsurface sediments consist primarily of sand, sandy gravel, and silt, deposited by glaciofluvial and marine processes from tidal mud flats around Cook Inlet and glaciers, such as the retreating Portage glacier.

3.0 2009 SUBSURFACE INVESTIGATION

CRA conducted the event in accordance with ADEC's *Monitoring Well Guidance, February 2009,* and CRA's Chevron approved *Health and Safety Plan,* and *Journey Management Plan*. Details of the subsurface investigation are presented below.

3.1 SOIL SAMPLE LOCATION RATIONALE

DRO has been detected in groundwater near MW-3 since 1995, additional delineation is necessary downgradient of well MW-3. Groundwater sample MW-3 contained 19 milligrams per Liter (mg/L) DRO in August 2008. Historical groundwater flow direction near MW-3 is to the northwest. CRA advanced two soil borings approximately 60 feet north and northwest of groundwater monitoring well MW-3 to delineate the downgradient extent of petroleum hydrocarbons in soil and groundwater.

3.2 INVESTIGATION DETAILS

CRA prepared a site health and safety plan to inform site workers of known hazards and to provide health and safety guidance. The plans were onsite at all times and signed daily by all onsite personnel. Alaska Digline was notified prior to drilling to clear locations with utility companies. CRA used ground penetrating radar (GPR) and an electromagnetic buried metal detector (EM61) to locate underground structures throughout the drilling area. The geophysical survey results are presented in Appendix B. CRA personnel Eric Purcell and Susan Lear conducted all sampling and soil logging. Discovery Drilling advanced the borings and installed the groundwater monitoring wells under the direction of CRA. Soil sample locations with analytical results are presented on Figure 3.

3.2.1 SOIL BORING INSTALLATION

Two soil borings were advanced to 18 fbg and completed as groundwater monitoring wells MW-15 and MW-16 (Figure 2). Soil borings were advanced to first encountered groundwater using a CME 75 drill rig equipped with 8-inch outer diameter hollow-stem augers. Soil samples were collected with a 2 ft core barrel advanced by a 300 pound slide hammer at approximately 5 ft intervals between 5 fbg and 17 fbg. Soil was logged and field screened by a trained geologist and Alaska Qualified Person during drilling. Soil samples were screened for petroleum hydrocarbon constituents using a photo ionization detector (PID). Soil samples were submitted for laboratory analysis based on PID screening results and depth.

Subsurface sediments consist primarily of sand with organic material at the surface transitioning to very fine to medium grained sand from approximately 5 fbg to the total explored depth of 18 fbg. Soil boring logs are presented as Appendix C. CRA's standard operating procedures for soil borings are presented as Appendix D. Department of Natural Resources water well logs are presented as Appendix E.

3.2.2 GROUNDWATER MONITORING WELL INSTALLATION

Monitoring wells MW-15 and MW-16 were constructed of 2-inch diameter, schedule 40 PVC pipe with 0.020-inch screen and clean #10/20 silica sand. The wells are screened from 3 fbg to 18 fbg. The well was set in a stand up well vault and graded with concrete. CRA developed groundwater monitoring wells MW-15 and MW-16 on July 17, 2009 by agitating the water column for approximately ten minutes with a surge block, followed by purging to remove silt and draw in formation water. Well development forms are presented as Appendix F. CRA's standard operating procedures for well development are presented as Appendix G.

3.2.3 LABORATORY ANALYSIS

Soil samples collected on site were analyzed for the following:

- DRO by Alaska Series Method AK102,
- GRO by Alaska Series Method AK101,
- RRO by Alaska Series Method AK103, and
- BTEX by Method SW-846 8021B.

3.2.4 WASTE DISPOSAL

Soil cuttings produced during this investigation were temporarily stored onsite in two 55-gallon U.S. Department of Transportation (DOT) approved drums. Water produced during groundwater monitoring well development was temporarily stored onsite in one 55-gallon U.S. DOT approved drum. The ADEC approved soil cutting transportation and disposal in an August 20, 2009 e-mail to CRA.

3.3 SOIL SAMPLING RESULTS

No DRO, GRO, RRO, or BTEX concentrations exceeded the *ADEC Method II-Soil Cleanup Levels, Tables B1 and B2, Over 40-Inch Zone, Migration to Groundwater, ADEC 18 AAC 75.341* (ADEC Method II Soil Cleanup Levels). DRO was detected below laboratory detection limits in soil sample SB09-1 and SB09-2. The maximum RRO (15 mg/kg) and benzene (0.02 mg/kg) was detected in soil sample SB09-02. The Lancaster Laboratories Analytical Report is presented in Appendix H. The ADEC laboratory data review and checklist is presented in Appendix I.

4.0 CONCLUSIONS

Subsurface sediments consist primarily of sand with organic matter at the surface transitioning to very fine to medium grained sand with trace silt from approximately 5 fbg to the total explored depth of 17 fbg. Groundwater was encountered at approximately 8 fbg in both soil borings.

No DRO, GRO, or RRO or BTEX was detected above ADEC Method II Soil Cleanup Levels in any collected samples. The extent of petroleum hydrocarbons in soil has been delineated downgradient of groundwater monitoring well MW-3.

5.0 RECOMMENDATIONS

CRA is preparing a corrective action plan to address petroleum hydrocarbon concentrations in soil and groundwater. CRA will continue groundwater monitoring and sampling in 2010.

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6.0 CLOSING

We appreciate the opportunity to work with Chevron and the ADEC on this project. Alaska Qualified Personnel in accordance with *18 Alaska Administrative Code (AAC) 75, Article 3 and 18 AAC 78, Article 2, 6, and 9,* conducted and/or supervised all project work. Please call Brian Duggan at (720) 975-9128 with any questions regarding this report.

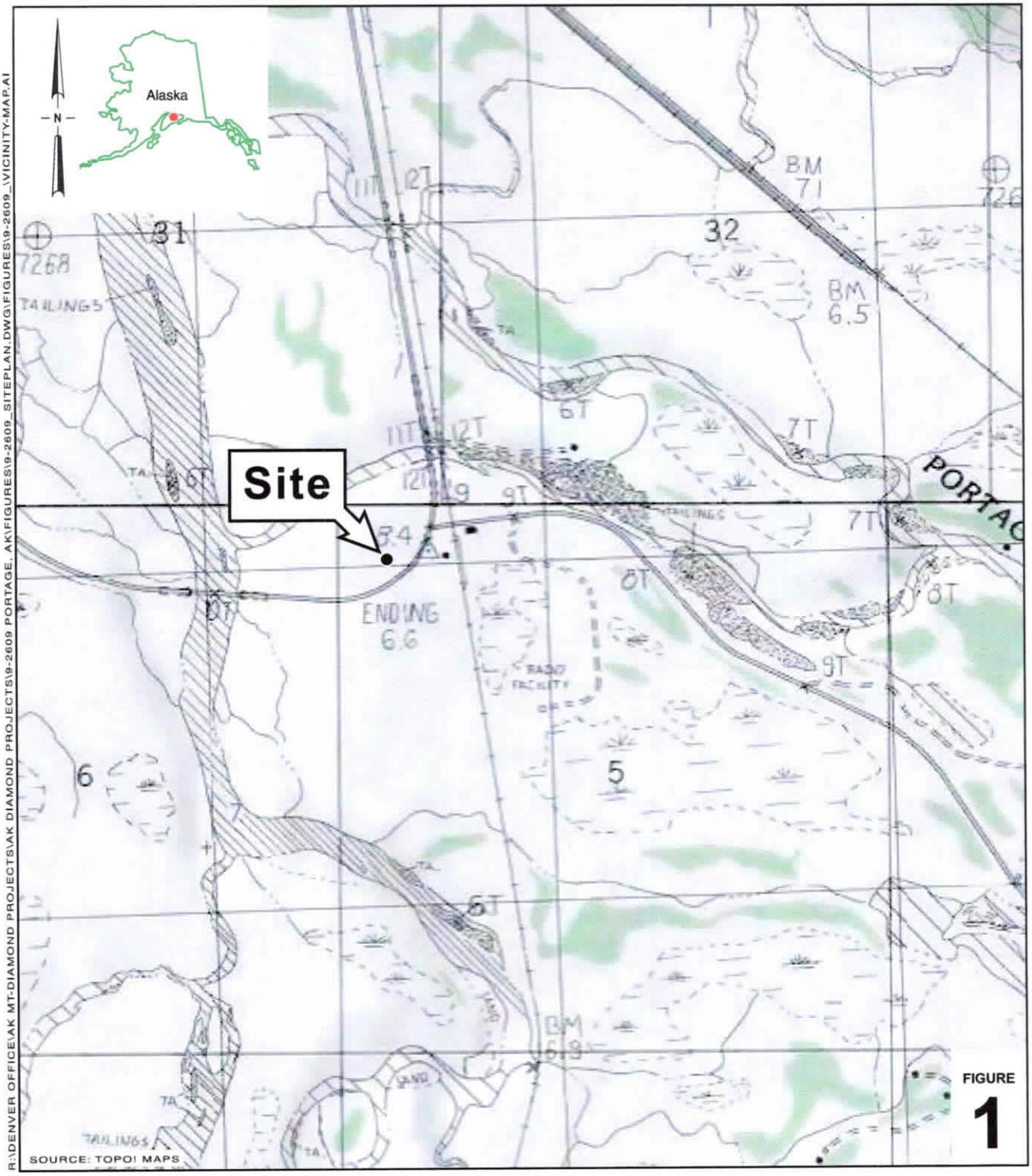
FIGURES

FIGURE 1: VICINITY MAP

FIGURE 2: SITE PLAN

FIGURE 3: PETROLEUM HYDROCARBON CONCENTRATIONS IN SOIL

07/23/07



0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

FIGURE
1

Former Chevron Station 9-2609

Seward Highway Mile 79

Portage, Alaska

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Vicinity Map

TABLES

TABLE 1: SOIL ANALYTICAL DATA

Table 1
Soil Analytical Results
Former Chevron Station 9-2609
Mile 79 Seward Highway
Girdwood, Alaska

Location	Date	Sample Depth	HYDROCARBONS			PRIMARY VOCS			
			DRO	GRO	RRO	Benzene	Toluene	Ethyl-benzene	Total Xylenes
	Units	fbg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ADEC Method II Cleanup Levels*			230	260	9700	0.025	6.5	6.9	63
SB09-1	07/16/2009	5.0	<5.8 / <5.4	<0.9 / <0.8	57 / 53	<0.009 UJ / <0.008 UJ	<0.009 UJ / 0.02 J	<0.009 UJ / <0.008 UJ	<0.03 UJ / <0.02 UJ
SB09-2	07/16/2009	5.0	<5.1	<0.7	15 J	0.02 J	0.03 J	<0.006 UJ	<0.02 UJ
Trip Blank	07/16/2009	-	-	<0.5	-	<0.005	<0.005	<0.005	<0.02
Trip Blank**	07/16/2009	-	-	<0.010	-	<0.0005	<0.0005	<0.0005	<0.0015
Equipment Blank**	07/16/2009	-	<0.048	<0.010	<0.048	<0.0005	<0.0005	<0.0005	<0.0015

Abbreviations and Methods:
RRO = Residual range organics by Alaska Series Method AK103
DRO = Diesel range organics by Alaska Series Method AK102
GRO = Gasoline range organics by Alaska Series Method AK101
BTEX = Benzene, toluene, ethylbenzene, and xylenes by EPA Method 8021B
fbg = Feet below grade
mg/kg = Milligrams per kilogram
-- = Not analyzed / applicable
J = Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL).
UJ = Estimated value below the MDL.
<x = Constituent not detected above x milligrams per kilogram
ADEC = Alaska Department of Environmental Conservation
* = Levels established in ADEC Method II - Soil Cleanup Levels, Tables B1 and B2, Over 40-Inch Zone, Migration to Groundwater, (ADEC, 18 AAC 75.341)
** = Concentrations in milligrams per liter
EPA = Environmental Protection Agency

APPENDIX A

ENVIRONMENTAL HISTORY

ENVIRONMENTAL HISTORY

1993 Site Assessment: In 1993, eight borings were advanced as part of an Alaska Department of Transportation investigation. Five borings were advanced onsite and three borings were advanced offsite. Soil sample TB-8-1 contained the maximum concentration of diesel range organics (DRO) at 870 milligrams per kilogram (mg/kg) and gasoline range organics (GRO) at 2,300 mg/kg.

1995 Well Installation: Three groundwater monitoring wells MW-1 through MW-3 were installed in 1995. Sampling indicated DRO is the primary constituent of concern, although results were not available at the time of this report.

1998 Subsurface Investigation and Well Installation: Eleven soil borings were advanced and five completed as monitoring wells MW-4 through MW-8 during a 1998 subsurface investigation to delineate the lateral extent of petroleum hydrocarbons in the soil and groundwater. Soil sample B-6 contained the maximum concentration of DRO at 2,490 mg/kg and benzene at 8.09 mg/kg. GRO was detected at a maximum concentration of 5,970 mg/kg (soil) and 80,500 milligrams per liter (mg/L) in sample B-7.

2000 UST Removal and Excavation: Four USTs, two log cribs, a dispenser island, associated product piping, and a septic tank were removed in 2000. Approximately 3,500 cubic yards of soil was excavated and removed from the site. DRO was detected at a maximum concentration of 4,500 mg/kg in sample Crib 1. Soil sample S-12-5 contained the maximum concentration of GRO (7,090 mg/kg) and benzene (32.9 mg/kg).

2001 Subsurface Investigation and Well Installation: Four soil borings were advanced and completed as groundwater monitoring wells MW-9 through MW-12 in September 2001. No DRO or benzene was detected above ADEC Method II Soil Cleanup Levels (ADEC, 18 Alaska Administrative Code (AAC) 75.341). GRO was detected in soil sample MW-11-10 at a maximum concentration of 464 mg/kg.

2001 Well Reinstallation: In October 2001 a water production well SW-1 was reinstalled to provide non-potable water to the site. No soil samples were analyzed. No petroleum hydrocarbons were detected above ADEC Table C Groundwater Cleanup Levels (ADEC, 18 AAC 75.345) in the groundwater sample.

2005 Well Installation: One soil boring was advanced and completed as groundwater monitoring well MW-13 in 2005. DRO was detected at a maximum concentration from soil sample MW-13-6 at 3,900 mg/kg. The maximum concentration of GRO was detected in soil sample MW-13-6 at 1,000 mg/kg.

2008 Subsurface Investigation and Well Installation: Seven soil borings were advanced and one completed as groundwater monitoring well MW-14 in 2008 to further assess the vertical and horizontal extent of hydrocarbons in soil and groundwater. DRO was detected at a maximum concentration in soil sample CB-6-5 at 3,900 mg/kg. Soil sample MW-14-10 contained the maximum GRO concentration of 3,800 mg/kg. The maximum concentration of benzene was detected in soil sample CB-1-10 at 2.20 mg/kg.

APPENDIX B

GEOPHYSICAL SURVEY

CONESTOGA-ROVERS & ASSOCIATES

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DRAFT MEMORANDUM

TO:	Brian Duggan	REF. NO.:	620911-2009
FROM:	Sandy Serena/ck/1	DATE:	June 19, 2009
C.C.:	Andy Ellsmore, Joe Rothfischer		
RE:	**Ground Penetrating Radar Survey - Borehole Clearance** **Former Chevron Station Site 9-2609** **Portage, AK**		

1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) conducted a geophysical investigation on behalf of Chevron at the former Chevron Station 9-2609 (Site) located on Old Seward Highway in Portage, Alaska on May 13, 2009. The objective of the investigation was to verify the absence of potential utilities in the shallow subsurface (to a depth of 8 feet) at two proposed borehole locations (SB1 and SB2). The approximate location of SB1 and SB2 are presented on Figure 1.1. CRA conducted the investigation using a Ground Penetrating Radar (GPR) system. The investigation consisted of establishing a reference grid over the proposed boreholes, data collection, processing, and plotting.

GPR surveys are considered the industry-accepted standards for underground utility investigations. However, limitations to GPR surveys include signal attenuation (i.e., dissipation) in conductive soils and/or fill, and also conductive groundwater or seawater. In addition, surficial metal objects can potentially be sources of interference which mask subsurface responses.

2.0 REFERENCE GRID

A Cartesian coordinate system was adopted and applied to the two proposed borehole locations. The survey coverage measured approximately 16 feet by 16 feet. Survey lines were established at 2-foot spaced intervals over the proposed borehole locations approximately oriented in both the north-south and east-west directions, as presented on Figure 1.1. The center of each grid marked the proposed borehole location. The corners of the grids were staked with wooden stakes, and the proposed borehole locations were marked with metal rods. Due to heavy brush surrounding the two grid locations (SB1 and SB2), the survey grids were tied into two trees located on-Site. As such, each tree was marked with a metal pin, flagged with flagging tape and painted for future reference should the grids need to be re-established. A photo log of the survey grids for proposed borehole locations SB1 and SB2 is provided in Attachment A.

3.0 DATA COLLECTION

The GPR survey was conducted using a Noggin 250 Smart Cart System, which utilizes high frequency (MHz range) electromagnetic (EM) signals to investigate subsurface conditions. Pulsed EM waves emitted from a transmitting antenna are propagated into the ground, and travel at velocities determined by the electrical properties of earth materials. If a wave hits a buried object or boundary with different electrical properties as it moves downward, part of the wave energy is reflected back to the surface and is detected by a receiving antenna. The reflected wave is stored digitally, and processed as a trace of signal versus amplitude. As the antennas are moved along a survey line, a series of traces are recorded at discrete points. When presented collectively, these traces display a profile of the subsurface. The GPR data were collected using 2 foot spaced lines in each of the survey grids. Data traces were collected at equidistant intervals specified by the GPR operating system along the survey lines, and tracked by an attached odometer.

4.0 DATA PROCESSING AND RESULTS

The GPR data were processed as trace plots for each survey line, for each of the proposed borehole locations. The plots were examined for arc-shaped signatures indicative of buried utility responses. Typically, arc-shaped responses (ie. hyperbolic reflectors) that are delineated on three or more adjacent survey lines or display a linear trend are potentially indicative of buried utilities. Conversely, reflectors that are only delineated on single survey lines and not on adjacent lines do not indicate a linear trend. As such, these single responses likely do not represent buried utilities, and may be attributed to boulders or tree roots.

The GPR results for each of the survey locations (SB1 and SB2) are discussed in detail below.

SB1

Review of the GPR trace plots for SB1 indicates that the survey results yielded a depth of signal penetration of approximately 11 feet below ground surface (ft bgs). Figure 4.1 presents trace plots of the GPR responses in closest proximity and coincident with proposed boring location SB1. Review of the trace plots for all survey lines indicate that no distinct arc-shaped responses indicative of buried utilities were delineated in the surveyed area surrounding SB1, to a depth of approximately 11 ft bgs. However, two suspected boulders were delineated during review of the trace plots. These suspected boulders appear as strong, irregular arc-shaped features in the trace plots. The first suspected boulder was delineated north of proposed borehole SB1 (Lines 8E, 10E and 14N) along the north central edge of the grid, at an approximate depth of 3 ft bgs. The second suspected boulder was delineated south-west of proposed borehole SB1 (Lines 4E, 6E, 4Nand 6N) at an approximate depth of 4.5 ft bgs.

SB2

Review of the GPR trace plots for SB2 indicates that the survey results yielded a depth of signal penetration of approximately 10 ft bgs. Figure 4.2 presents trace plots of GPR responses in closest proximity and coincident with proposed boring location SB2. Review of the trace plots for all survey lines indicate that no distinct arc-shaped responses indicative of buried utilities were delineated in the surveyed area surrounding SB2 to a depth of approximately 10 ft bgs. However, two suspected boulders were delineated during review of the trace plots. These suspected boulders appear as strong, irregular arc-shaped features in the trace plots. The first suspected boulder was delineated beneath proposed borehole location SB2

(Lines 8E, 10E, 6N and 8N at the center of the survey grid) at an approximate depth of 6.25 ft bgs. The second suspected boulder was delineated south-east of proposed borehole SB2 (Lines 2N and 4N) along the south east edge of the grid, at an approximate depth of 5.25 ft bgs.

5.0 CONCLUSIONS

As part of the health and safety procedures, Chevron requires that all proposed borehole locations be cleared up to 8 ft bgs for underground utilities prior borehole advancement. As such, the GPR results for proposed boreholes SB1 and SB2 yielded adequate depths of signal penetration beyond 8 ft bgs. Based on the GPR results presented, it is evident that no distinct arc-shaped responses indicative of buried utilities were delineated in any of the trace plots collected at the two proposed borehole locations. However, the survey results for both proposed borehole locations delineated suspected boulders within the surveyed areas. Of significance are the results for SB2, where one boulder was delineated beneath this proposed borehole location. Thus, it is recommended that proposed borehole location SB2 be moved four feet to the west along grid line 8N to avoid drilling through the suspected boulder.

Photo 1 Grid SB1 – View to the north

Photo 2 Grid SB1 – view to the east

Photo 3 Grid SB1 – View to the west

Photo 4 Grid SB1 – View to the south

Photo 5 Grid SB2 – View to the north

Photo 6 Grid SB2 – View to the west

Photo 7 Grid SB2 – view to the south

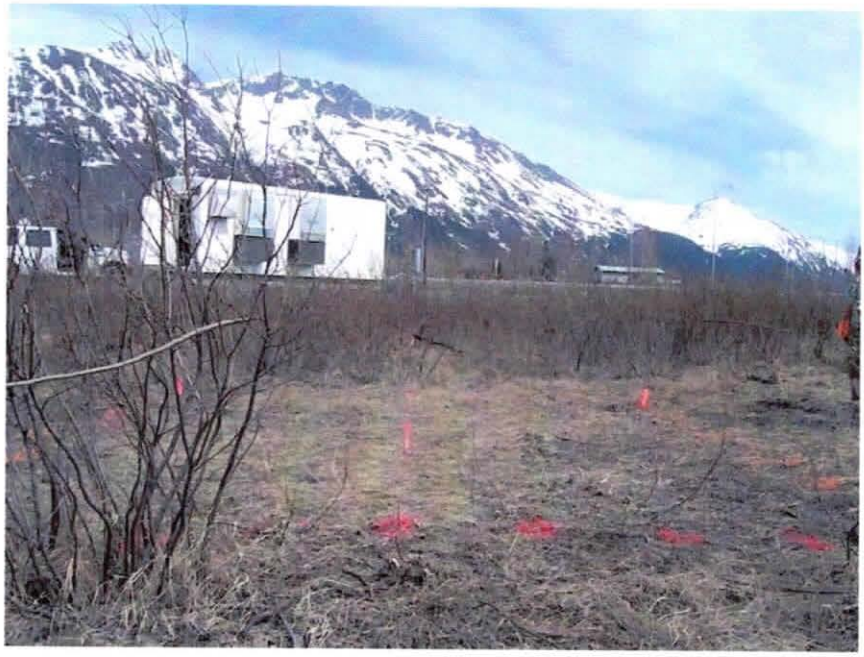

Photo 8 Grid SB2 – View to the east

Photo 9 Grid SB2 – View to the south

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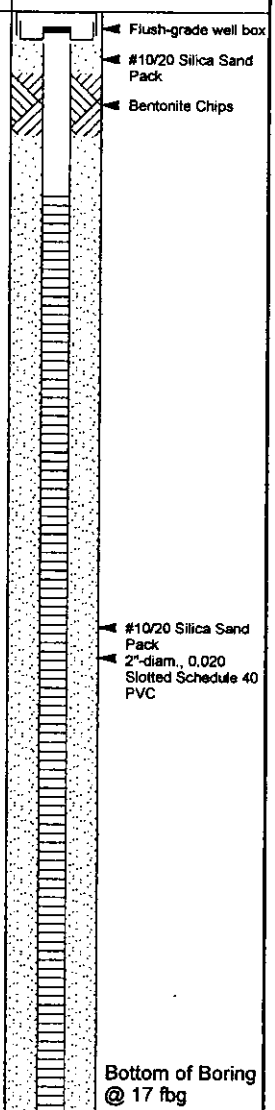
BORING / WELL LOG

CLIENT NAME	Chevron EMC	**BORING/WELL NAME**	MW-15
JOB/SITE NAME	9-2609	**DRILLING STARTED**	16-Jul-09
LOCATION	Mile 79 Seward Hwy, Girdwood Alaska	**DRILLING COMPLETED**	16-Jul-09
PROJECT NUMBER	620911	**WELL DEVELOPMENT DATE (YIELD)**	17-Jul-09 (21 gallons)
DRILLER	Discovery (Tim, Bruce)	**GROUND SURFACE ELEVATION**	NA
DRILLING METHOD	Hollow Stem Auger	**TOP OF CASING ELEVATION**	24.25 ft above msl
BORING DIAMETER	8-inches	**SCREENED INTERVALS**	3 to 18 fbg
LOGGED BY	E. Purcell	**DEPTH TO WATER (First Encountered)**	7.80 fbg (16-Jul-09) ▽
REVIEWED BY	B. Duggan, Colorado P.E. # 40693	**DEPTH TO WATER (Static)**	NA ▼
REMARKS			

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)
					SP		**SAND** Very fine to fine grained; Olive grey; Damp; Trace organic material	
0.3	1 1	SB09- 1-5		5	SP		**SAND** Very fine to fine grained; Olive grey; Very loose; Moist; Trace silt	5.0
					SP		**SAND** Very fine to fine grained; Grey; Very loose; Moist; Trace silt	6.0
					SP		**SAND** Very fine to fine grained; Grey; Very loose; Moist; Trace silt ▽	7.0
				10	SP			
					SP		**SAND** Very fine to medium grained; Grey; Compact; Wet; Trace silt	12.0
				15	SP			
					SP		**SAND** Very fine to fine grained; Grey; Compact; Wet; Trace silt	16.0
					SP		**SAND** Fine to coarse grained; Grey; Compact; Wet; Trace silt	16.5
								17.0

WELL DIAGRAM



WELL LOG (PID) U:\DENVER\LOGS\620911 MW-15,16.GPJ DEFAULT.GDT 10/2/09

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BORING / WELL LOG

CLIENT NAME	Chevron EMC	**BORING/WELL NAME**	MW-16
JOB/SITE NAME	9-2609	**DRILLING STARTED**	16-Jul-09
LOCATION	Mile 79 Seward Hwy, Girdwood Alaska	**DRILLING COMPLETED**	16-Jul-09
PROJECT NUMBER	620911	**WELL DEVELOPMENT DATE (YIELD)**	17-Jul-09 (20 gallons)
DRILLER	Discovery (Tim, Bruce)	**GROUND SURFACE ELEVATION**	NA
DRILLING METHOD	Hollow Stem Auger	**TOP OF CASING ELEVATION**	23.61 ft above msl
BORING DIAMETER	8-inches	**SCREENED INTERVALS**	3 to 18 fbg
LOGGED BY	E. Purcell	**DEPTH TO WATER (First Encountered)**	8.20 fbg (16-Jul-09) ▽
REVIEWED BY	B. Duggan, Colorado P.E. # 40693	**DEPTH TO WATER (Static)**	NA ▼
REMARKS			

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
					SP		**SAND:** Very fine grained; Olive-gray; Damp; Trace organic material		Flush-grade well box; #10/20 Silica Sand Pack; Bentonite Chips
0.3	4 5 5 5	SB09- 2-5		5	SP		**SAND:** Very fine grained; Olive-gray; Compact; Damp; Trace silt	5.0	
					SP		**SAND:** Very fine grained; Gray; Compact; Damp; Trace silt	6.0	
					SP		**SAND:** Fine to medium grained; Gray; Compact; Damp; Trace silt ▽	6.5	
	2 4 3 5			10	SP		**SAND:** Very fine grained; Gray; Medium dense; Wet; Trace silt	10.0	#10/20 Silica Sand Pack; 2"-diam., 0.020 Slotted Schedule 40 PVC
					SP		**SAND:** Fine to medium grained; Gray; Medium dense; Wet; Trace silt	11.0	
	1 1 2 1			15	SP		**SAND:** Very fine to fine grained; Gray; Loose; Wet; Trace silt	15.0	
								18.0	Bottom of Boring @ 18 fbg

WELL LOG (PID) U:\DENVER LOGS\620911 MW-15,16.GPJ DEFAULT.GDT 10/2/09

APPENDIX D

CRA'S STANDARD OPERATING PROCEDURES FOR SOIL BORINGS

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& ASSOCIATES

STANDARD FIELD PROCEDURES FOR SOIL BORINGS

This document describes Conestoga-Rovers & Associates' standard field methods for drilling and sampling soil borings. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate groundwater depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of an Alaska Qualified Person (AQP). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel),
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or hydraulic push technologies. Prior to drilling, the first 8 ft of the boring are cleared using an air or water knife and vacuum extraction. This minimizes the potential for impacting utilities.

At least one and one half feet of the soil column is collected for every five ft of drilled depth. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the borehole. The vertical location of each soil sample is determined by measuring the distance from the middle of the soil sample tube to the end of the drive rod used to advance the split barrel sampler. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Drilling and sampling equipment is decontaminated per Alaska Department of Environmental Conservation regulations prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

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Sample Storage, Handling and Transport

Single use plastic sterile-scoops are used to transfer approximately 20 to 40 grams of soil sample from the split-spoon sampler to 4 oz. amber glass jars with Teflon lined screw cap lids containing methanol preservative such that the entire vial of methanol covers the matrix. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

The some of the remaining soil from the split-spoon sampler is collected in a plastic bag and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the bag headspace, extracting the vapor through a slit in the bag. PID measurements are used along with the field observations, odors, stratigraphy and groundwater depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are collected from the open borehole using bailers. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are collected at a rate of one blind sample for every 10 soil samples. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

11/17/09

APPENDIX E

DEPARTMENT OF NATURAL RESOURCES WATER WELL LOGS

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINING, LAND & WATER
WATER WELL LOG

Drilling Started: 07 / 16 / 2009, Completed: 07 / 16 / 2009

City/Borough:	Subdivision:	BLOCK	LOT

Property Owner Name & Address:

Robert Hall
Mile 79 Seward Highway, Portage, Alaska

Meridian Seward Township 8N Range 3W Section 5 , ____ 1/4 of ____ 1/4 of ____ 1/4 of ____ 1/4

BOREHOLE DATA: (from ground surface) **Depth**

Material: Type, Color & wetness	From	To
SAND; olive gray; moist; trace organic	0	5
SAND; olive gray, moist; trace silt	5	6
SAND; gray; moist; trace silt	6	12
SAND; gray; wet; trace silt	12	17

Drilling method: ☐ Air rotary, ☐ Cable tool ☒ Other HSA
Well use: ☐ Public supply, ☐ Domestic, ☒ Other Environmental

Depth of hole: 18 ft, Casing stickup: ____ ft
Casing type: PVC Thickness ____ inches
Casing diameter: 2 inches Casing depth 18 ft
Liner type: ____ Diameter: ____ inches Depth: ____ ft
Note: .....

Static water (from top of casing): 7.80 ft on 7 / 16 / 2009
Pumping level & yield: ____ feet after ____ hours at ____ gpm
Recovery rate: ____ gpm, Method of testing: ____
Development method: Purge and surge Duration: ____

Well intake opening type: ☐ Open end ☐ Open hole, Other ☐
☒ Screened; Start: 3 ft, Stopped 18 ft
Screen type: 0.020 Slot/mesh size ____
☐ Perforated; Start: ____ ft, Stopped ____ ft
Start: ____ ft, Stopped ____ ft
Gravel packed ☐ Yes ☒ No From 3 ft to 18 ft
Note: #10/20 sand pack

Grout type: Bentonite Volume ____
Depth; from ____ ft, to ____ ft

Pump intake depth: ____ ft
Pump size ____ hp Brand name ____

Was well disinfected upon completion? ☐ Yes ☒ No
Method of disinfection: .....

Driller comments/ disclaimers: Well installation

Well driller name: Tim Beckner
Company name: Discovery Drilling
Mailing address: 11341 Olive Land
City: Anchorage State: AK Zip 99501
Phone number: (907) 344 - 6431

Drillers signature: [signature] for Discovery Drilling
Date: 11 / 03 / 2009

Alaska state law requires that a copy of this well log be forwarded to the Department of Natural Resources within 45 days (AK statutes 38.05.020, 38.05.035, 41.08.020, 46.15.020 and AK regulations 11 AAC 93.140). Faxes are acceptable.

Alaska DNR, Division of Mining, Land and Water,
550 W 7th Avenue, Suite 1020
Anchorage, AK 99501-3562

Phone (907)269-8639 and fax (907)269-8947

If the well is within city limits, the City of Anchorage requires that a copy of this well log be forwarded to the city within 60 days and another copy of this log be forwarded to the owner of the property, on which the well is located, within 30 days.

City Permit Number: ____
Date of Issue: ____ / ____ / ____

Parcel Identification Number: ____ - ____ - ____

Is well located at approved permit location? Yes ☐ or No ☐

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINING, LAND & WATER
WATER WELL LOG

Drilling Started: 07 / 16 / 2009, Completed: 07 / 16 / 2009

City/Borough:	Subdivision:	BLOCK	LOT

Property Owner Name & Address:

Robert Hall
Mile 79 Seward Highway, Portage, Alaska

Meridian Seward Township 8N Range 3W Section 5 , ____ 1/4 of ____ 1/4 of ____ 1/4 of ____ 1/4

BOREHOLE DATA: (from ground surface) **Depth**

Material: Type, Color & wetness	From	To
SAND; olive gray; damp; trace organic	0	5
SAND; olive gray; damp; trace silt	5	6
SAND; gray; damp; trace silt	6	6.5
SAND; gray; damp; trace silt	6.5	10
SAND; gray; wet; trace silt	10	17

Drilling method: ☐ Air rotary, ☐ Cable tool ☒ Other HSA
Well use: ☐ Public supply, ☐ Domestic, ☒ Other Environmental

Depth of hole: 18 ft, Casing stickup: ____ ft
Casing type: PVC Thickness ____ inches
Casing diameter: 2 inches Casing depth 18 ft
Liner type: ____ Diameter: ____ inches Depth: ____ ft
Note: .....

Static water (from top of casing): 8.20 ft on 7 / 16 / 2009
Pumping level & yield: ____ feet after ____ hours at ____ gpm
Recovery rate: ____ gpm, Method of testing: ____
Development method: Purge and surge Duration: ____

Well intake opening type: ☐ Open end ☐ Open hole, Other ☐
☒ Screened; Start: 3 ft, Stopped 18 ft
Screen type: 0.020 Slot/mesh size ____
☐ Perforated; Start: ____ ft, Stopped ____ ft
Start: ____ ft, Stopped ____ ft
Gravel packed ☐ Yes ☒ No From 3 ft to 18 ft
Note: #10/20 sand pack

Grout type: Bentonite Volume ____
Depth; from ____ ft, to ____ ft

Pump intake depth: ____ ft
Pump size ____ hp Brand name ____

Was well disinfected upon completion? ☐ Yes ☒ No
Method of disinfection: .....

Driller comments/ disclaimers: Well installation
.....
.....

Well driller name: Tim Beckner
Company name: Discovery Drilling
Mailing address: 11341 Olive Land
City: Anchorage State: AK Zip 99501
Phone number: (907) 344 - 6431

Drillers signature: [signature] for Discovery Drilling
Date: 11 / 05 / 2009

Alaska state law requires that a copy of this well log be forwarded to the Department of Natural Resources within 45 days (AK statutes 38.05.020, 38.05.035, 41.08.020, 46.15.020 and AK regulations 11 AAC 93.140). Faxes are acceptable.

Alaska DNR, Division of Mining, Land and Water,
550 W 7th Avenue, Suite 1020
Anchorage, AK 99501-3562

Phone (907)269-8639 and fax (907)269-8947

If the well is within city limits, the City of Anchorage requires that a copy of this well log be forwarded to the city within 60 days and another copy of this log be forwarded to the owner of the property, on which the well is located, within 30 days.

City Permit Number: ____
Date of Issue: ____/____/____

Parcel Identification Number: ____-____-____

Is well located at approved permit location? Yes ☐ or No ☐

APPENDIX F

WELL DEVELOPMENT FORMS

CONESTOGA-ROVERS & ASSOCIATES

WELL DEVELOPMENT FORM

Project Name: 9-2009	CRA Mgr: B. DUGGAN	Well ID: MW-15
Project Number: 020911	Date: 7/17/09	Well Yield:
Site Address: MILE 79.5 SEWARD HWY GIRDWOOD, AK	Development Method: SURGE BLOCK, RODS	Well Diameter: 2"
		Technician(s): EP / SL
Initial Depth to Water: 9.55	Total Well Depth: 21.55	Water Column Height: 12.00
Volume/ft: 0.16	1 Casing Volume: 1.92	10 Casing Volumes: 19.2
Purging Device: PUMP	Did Well Dewater?: NO	Total Gallons Purged: ~20

1 Casing Volume = Water column height x Volume/ ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Activity	Water Depth	Gallons Purged	Comments
1105	SURGE	9.55	—	
1122	PURGE	—	~5	
1126	SURGE	11.31	—	DTB 22.18
1135	Purge	—	5	
1141	Surge	10.36	—	
1147	purge	—	10	purge water became clear; very slight sheen
1155	SURGE	9.70	—	DTB: 22.20

CONESTOGA-ROVERS & ASSOCIATES

WELL DEVELOPMENT FORM

Project Name: 9-2009	CRA Mgr: B. DUGGAN	Well ID: MW-16
Project Number: 020911	Date: 7/17/09	Well Yield:
Site Address: MILE 79.5 SEWARD HWY GIRDWOOD, AK	Development Method: SURGE BLOCK, ROOS	Well Diameter: 2"
		Technician(s): EP / SL
Initial Depth to Water: 8.88	Total Well Depth: 21.12	Water Column Height: 12.24
Volume/ft: 0.16	1 Casing Volume: ~2.00	10 Casing Volumes: ~20.00
Purging Device: PUMP	Did Well Dewater?: NO	Total Gallons Purged: 20.00

1 Casing Volume = Water column height x Volume/ ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Activity	Water Depth	Gallons Purged	Comments
1205	Surge	8.88	—	
1210	purge	—	5	
1217	Surge	8.99	—	DTB - 21.72; hard bottom / minimal sediment
1222	purge	8.91	15	DTB - 21.84; HARD BOTTOM; WATER BECAME CLEAR

APPENDIX G

CRA'S STANDARD OPERATING PROCEDURES FOR WELL DEVELOPMENT

CONESTOGA-ROVERS
& ASSOCIATES

STANDARD FIELD PROCEDURES FOR MONITORING WELL DEVELOPMENT

This document presents standard field methods for developing groundwater monitoring wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

MONITORING WELL DEVELOPMENT

Objectives

Monitoring well development objectives include removal of sediments that may have accumulated in the water column during drilling operations, stabilize the filter pack and formation materials opposite the well screen, and ensure the well produces water free of suspended solids. All development activities are conducted by a trained geologist working under the supervision of an Alaska Qualified Personnel in accordance with *18 Alaska Administrative Code (AAC) 75, Article 3 and 18 AAC 78, Article 2, 6, and 9*. Monitoring wells are developed no less than 24 hours post-installation as to allow the well seals and grout to set.

Well Development

Wells are developed using a combination of groundwater surging and purging. Surging includes the entire submerged portion of the screened interval with the use of surge blocks, bailers, or other equipment that frequently and repeatedly reverses the flow of water through the well screen. It is important that surging activities be started slowly and be increased in vigor as to free the fine particles from the sand pack, allowing them to be drawn into the water column, settling the coarser particles around the well screen and enhancing contact with the aquifer.

Purging is accomplished with the use of a bailer, submersible pump, or other equipment that adequately extracts groundwater from the water column. Development consists of a cycle of surging for several minutes followed by several minutes of purging to remove the fine sediments collecting in the well. This cycle is repeated for a minimum of 30 minutes. Purging continues until 10 well volumes of groundwater are removed or the extracted groundwater is free of suspended solids.

In the event the well is purged dry, an alternate development method is used. Following purging the well dry, one well casing volume of potable water is added to the well. The well is then surged vigorously for 10 minutes and purged dry again to complete the process. Additional water may be added to the well as necessary to properly develop the well, but should only be done as a

CONESTOGA-ROVERS
& ASSOCIATES

last resort. If the well does recover, continued development should occur only with formation water.

Groundwater Sampling

Following completion of well development activities, groundwater samples are collected for characterization using disposable bailers or the effluent portion of the pumping apparatus and decanted into the appropriate containers supplied by the analytical laboratory. Samples are labeled, placed in protective foam sleeves, stored on ice or other approved artificial cooling substance at $4^{o} \pm 2\ ^{o}C$, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples per matrix, analysis, and cooler and are analyzed to check for cross-contamination. A duplicate sample is collected and submitted per matrix, analysis, and 10 project samples for quality assurance purposes. An equipment blank will be submitted for analysis if non-dedicated sampling equipment is used.

Waste Handling and Disposal

Groundwater removed during development is typically stored onsite in sealed 55-gallon steel drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification, and consultant contact. Upon receipt of analytical results, the water is either pumped out using a vacuum truck for transport or the individual drums are picked up and transported by licensed waste haulers to a licensed waste treatment/disposal facility where the drum contents are removed and appropriately disposed.

APPENDIX H

LANCASTER LABORATORIES ANALYTICAL REPORT

APPENDIX I

ADEC LABORATORY DATA REVIEW AND CHECKLIST

CONESTOGA-ROVERS & ASSOCIATES

1420 80th St. SW., Suite A
Everett, WA 98203
Telephone: (425) 212-5100 Fax: (425) 212-5199
www.CRAworld.com

MEMORANDUM

TO: ADEC

REF. NO.: 620911

FROM: Jeffrey Cloud

DATE: August 5, 2009

CC: John Riggi

Send via E-Mail and U.S. Mail

RE: **QA/QC Review**
ChevronTexaco Site # 9-2609
Job #1154032
July 2009

INTRODUCTION

Groundwater samples were submitted to Lancaster Laboratories, located in Lancaster, Pennsylvania. Samples were analyzed for the methods requested on the Chain of Custody.

A full Level III data package was received from Lancaster Laboratories. The final results and supporting quality assurance/quality control (QA/QC) data were reviewed. Evaluation of the data was based on information obtained from the Chain of Custody forms, finished report forms, blank data, and spike recoveries.

QA/QC REVIEW

All samples were prepared and/or analyzed within the required holding times. All samples were properly preserved and maintained at 4°C (±2°C).

All appropriate samples and blanks were spiked with surrogate compounds prior to sample preparation and/or analysis in accordance with the organic methods. All surrogate spike recoveries met the associated method criteria indicating adequate analytical efficiency with a few exceptions. Samples SB09-1-5, SB09-2-5 and DUP-1 had low 8021 surrogate recoveries. All 8021 results for samples SB09-1-5, SB09-2-5 and DUP-1 should be considered estimated due to an implied low bias.

Method blanks were prepared and analyzed with the samples for all parameters. All blank results were non-detect for the analytes of interest.

Laboratory control samples (LCS) were analyzed in duplicate for all parameters. All recoveries were within required control limits showing adequate analytical accuracy and precision.

Matrix spikes (MS) were prepared and analyzed for all parameters. The MS for DRO was analyzed in duplicate. All recoveries were within required control limits showing adequate analytical accuracy and precision.

Trip blanks were collected and analyzed with the investigative samples for all parameters. All trip blank results were non-detect for the compounds of interest.

A field duplicate was collected and submitted blind to the laboratory. The sample ID was SB09-1-5 and its duplicate was DUP-1. A comparison of the results showed good analytical and sampling precision with one exception. The toluene RPD was 86%. The toluene results for samples SB09-1-5 and DUP-1 should be considered estimated due to variability.

CONCLUSION

Based on the QA/QC review, the data submitted were judged to be acceptable for use with the qualifications noted.

Laboratory Data Review Checklist

Completed by:	Jeffrey Cloud
Title:	Project Chemist
Date:	8/5/09
CS Report Name:	Subsurface Investigation Report
Report Date:	7/28/09
Consultant Firm:	Conestoga-Rovers & Associates
Laboratory Name:	Lancaster Laboratories
Laboratory Report Number:	1154032
ADEC File Number:	
ADEC RecKey Number:	

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ☑ Yes ☐ No Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

   ☐ Yes ☐ No Comments:

   NA

2. Chain of Custody (COC)

   a. COC information completed, signed, and dated (including released/received by)?

   ☑ Yes ☐ No Comments:

   b. Correct analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

☒ Yes ☐ No Comments:

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☐ Yes ☐ No Comments:

NA

e. Data quality or usability affected? Explain.

Comments:

NA

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☒ Yes ☐ No Comments:

c. Were all corrective actions documented?

☐ Yes ☐ No Comments:

NA

d. What is the effect on data quality/usability according to the case narrative?

Comments:

NA

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☒ Yes ☐ No Comments:

b. All applicable holding times met?

☒ Yes ☐ No Comments:

c. All soils reported on a dry weight basis?

☒ Yes ☐ No Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☒ Yes ☐ No Comments:

e. Data quality or usability affected?

Comments:

NA

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☒ Yes ☐ No Comments:

ii. All method blank results less than PQL?

☒ Yes ☐ No Comments:

iii. If above PQL, what samples are affected?

Comments:

NA

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No Comments:

NA

v. Data quality or usability affected? Explain.

Comments:

NA

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☑ Yes ☐ No Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐ Yes ☐ No Comments:

NA

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☑ Yes ☐ No Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☑ Yes ☐ No Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No Comments:

NA

vii. Data quality or usability affected? (Use comment box to explain)
Comments:

NA

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☑ Yes ☐ No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☐ Yes ☑ No Comments:

Samples SB09-1-5, SB09-2-5 and DUP-1 had low 8021 surrogate recovery.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☑ Yes ☐ No Comments:

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

All 8021 results for samples SB09-1-5, SB09-2-5 and DUP-1 should be considered estimated due to an implied low bias.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (if not, enter explanation below.)

☑ Yes ☐ No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☐ Yes ☐ No Comments:

iii. All results less than PQL?

☑ Yes ☐ No Comments:

iv. If above PQL, what samples are affected?

Comments:

NA

v. Data quality or usability affected? Explain.

Comments:

NA

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒ Yes ☐ No Comments:

ii. Submitted blind to lab?

☒ Yes ☐ No Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

☐ Yes ☒ No Comments:

SB09-1-5/DUP toluene RPD was 86%.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

The toluene results for samples SB09-1-5 and DUP-1 should be considered estimated due to variability.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

☐ Yes ☐ No ☒ Not Applicable

i. All results less than PQL?

☐ Yes ☐ No Comments:

NA

ii. If above PQL, what samples are affected?

Comments:

NA

iii. Data quality or usability affected? Explain.

Comments:

NA

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

☐ Yes ☐ No Comments:

NA

2100.38.007

Laboratory Data Review Checklist

Completed by:	Jeffrey Cloud
Title:	Project Chemist
Date:	8/5/09
CS Report Name:	Subsurface Investigation Report
Report Date:	7/28/09
Consultant Firm:	Conestoga-Rovers & Associates
Laboratory Name:	Lancaster Laboratories
Laboratory Report Number:	1154032
ADEC File Number:	2110.38.007
ADEC RecKey Number:	

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ☒ Yes ☐ No Comments:

   Lancaster Labs

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

   ☒ Yes ☐ No Comments:

   NA

2. Chain of Custody (COC)

   a. COC information completed, signed, and dated (including released/received by)?

   ☒ Yes ☐ No Comments:

   b. Correct analyses requested?

   ☒ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

☒ Yes ☐ No Comments:

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☐ Yes ☐ No Comments:

NA

e. Data quality or usability affected? Explain.

Comments:

NA 100

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☒ Yes ☐ No Comments:

c. Were all corrective actions documented?

☐ Yes ☐ No Comments:

NA

d. What is the effect on data quality/usability according to the case narrative?

Comments:

NA / No

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☒ Yes ☐ No Comments:

b. All applicable holding times met?

☒ Yes ☐ No Comments:

c. All soils reported on a dry weight basis?

☒ Yes ☐ No Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☒ Yes ☐ No Comments:

e. Data quality or usability affected?

Comments:

NA / No

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☒ Yes ☐ No Comments:

ii. All method blank results less than PQL?

☒ Yes ☐ No Comments:

iii. If above PQL, what samples are affected?

Comments:

NA

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No Comments:

NA

v. Data quality or usability affected? Explain.

Comments:

NA NO

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☑ Yes ☐ No Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☑ Yes ☐ No Comments:

NA

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☑ Yes ☐ No Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☑ Yes ☐ No Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No Comments:

NA

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

NA (No)

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☑ Yes ☐ No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☐ Yes ☑ No Comments:

Samples SB09-1-5, SB09-2-5 and DUP-1 had low 8021 surrogate recovery.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☑ Yes ☐ No Comments:

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

All 8021 results for samples SB09-1-5, SB09-2-5 and DUP-1 should be considered estimated due to an implied low bias.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (if not, enter explanation below.)

☑ Yes ☐ No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☑ Yes ☐ No Comments:

iii. All results less than PQL?

☑ Yes ☐ No Comments:

iv. If above PQL, what samples are affected?

Comments:

NA

v. Data quality or usability affected? Explain.

Comments:

NA NO

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒ Yes ☐ No Comments:

ii. Submitted blind to lab?

☒ Yes ☐ No Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

☐ Yes ☒ No Comments:

SB09-1-5/DUP toluene RPD was 86%.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

The toluene results for samples SB09-1-5 and DUP-1 should be considered estimated due to variability.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

☐ Yes ☐ No ☒ Not Applicable

i. All results less than PQL?

☐ Yes ☐ No Comments:

NA

ii. If above PQL, what samples are affected?

Comments:

NA

iii. Data quality or usability affected? Explain.

Comments:

NA

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

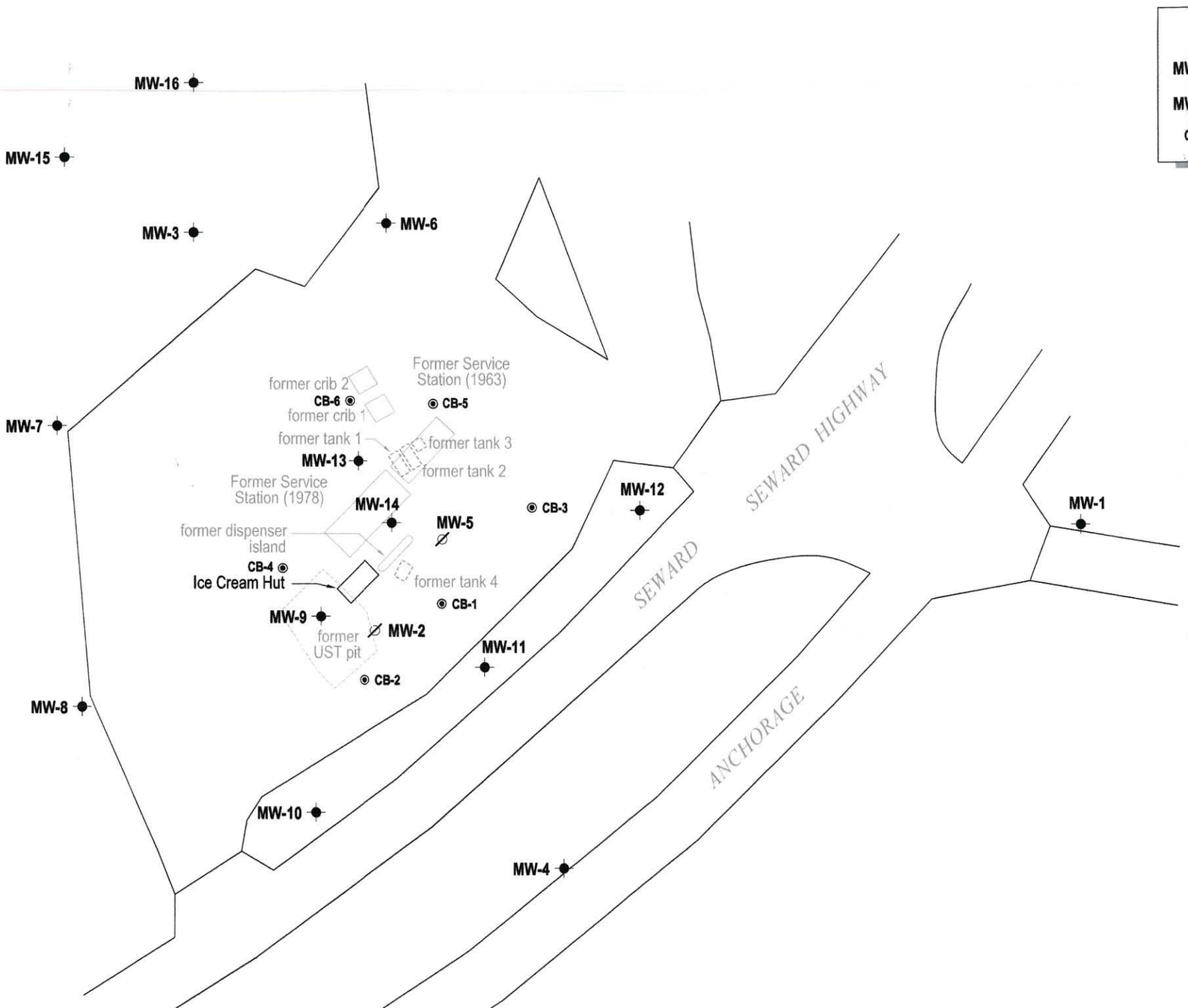
a. Defined and appropriate?

☒ Yes ☐ No Comments:

NA

Checked by Robert Weimer – ADEC 2/3/10

08/18/09



Site Plan

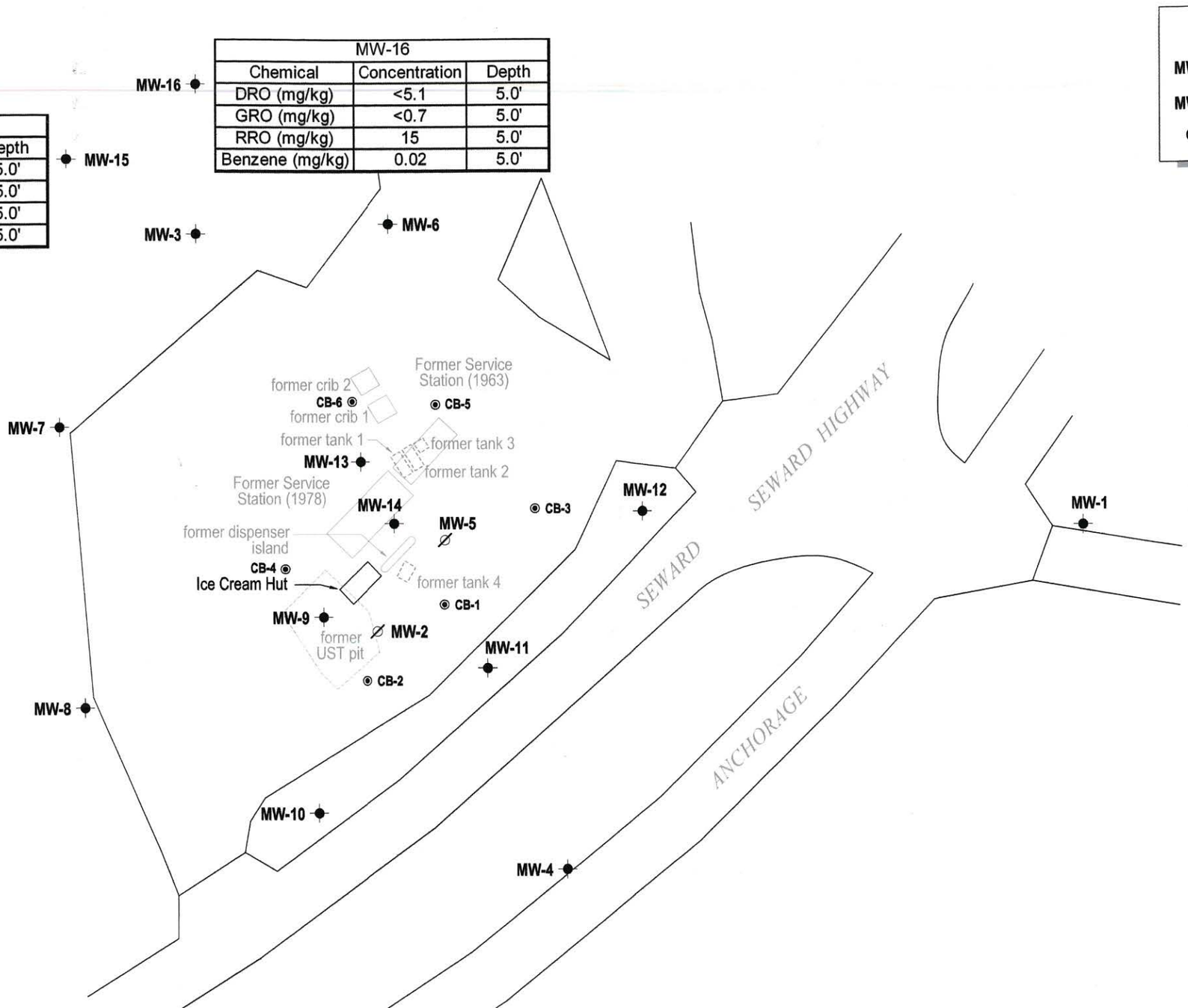
CONESTOGA-ROVERS & ASSOCIATES

tion 9-2609

08/13/09

MW-16		
Chemical	Concentration	Depth
DRO (mg/kg)	<5.1	5.0'
GRO (mg/kg)	<0.7	5.0'
RRO (mg/kg)	15	5.0'
Benzene (mg/kg)	0.02	5.0'

ntration	Depth
5.8	5.0'
0.9	5.0'
7	5.0'
009	5.0'



EXPLANATION

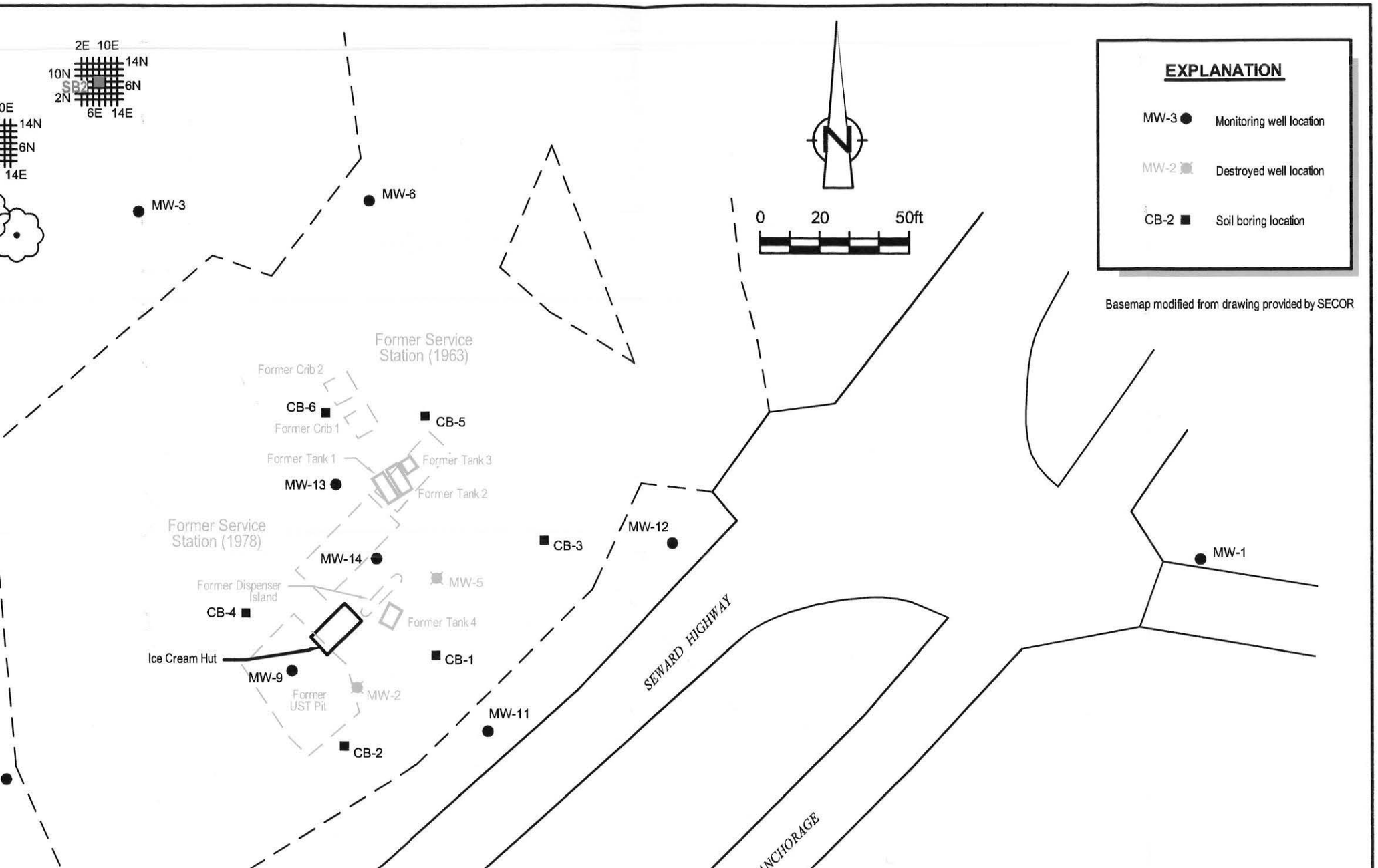
- MW-1 ⊕ Monitoring well location
- MW-2 ⌀ Destroyed well location
- CB-1 ◉ Soil boring location

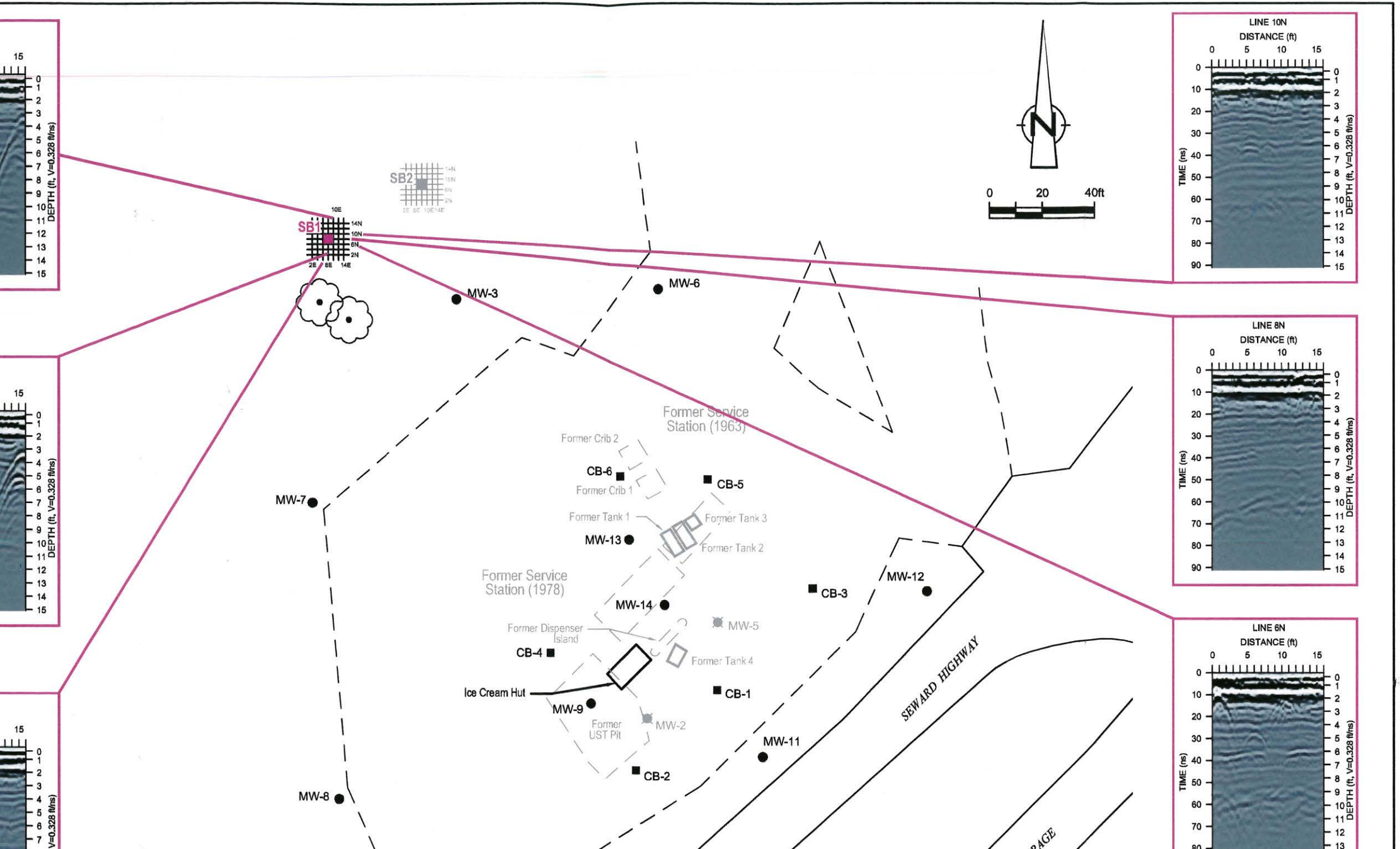
Petroleum Hydrocarbon Concentrations in Soil

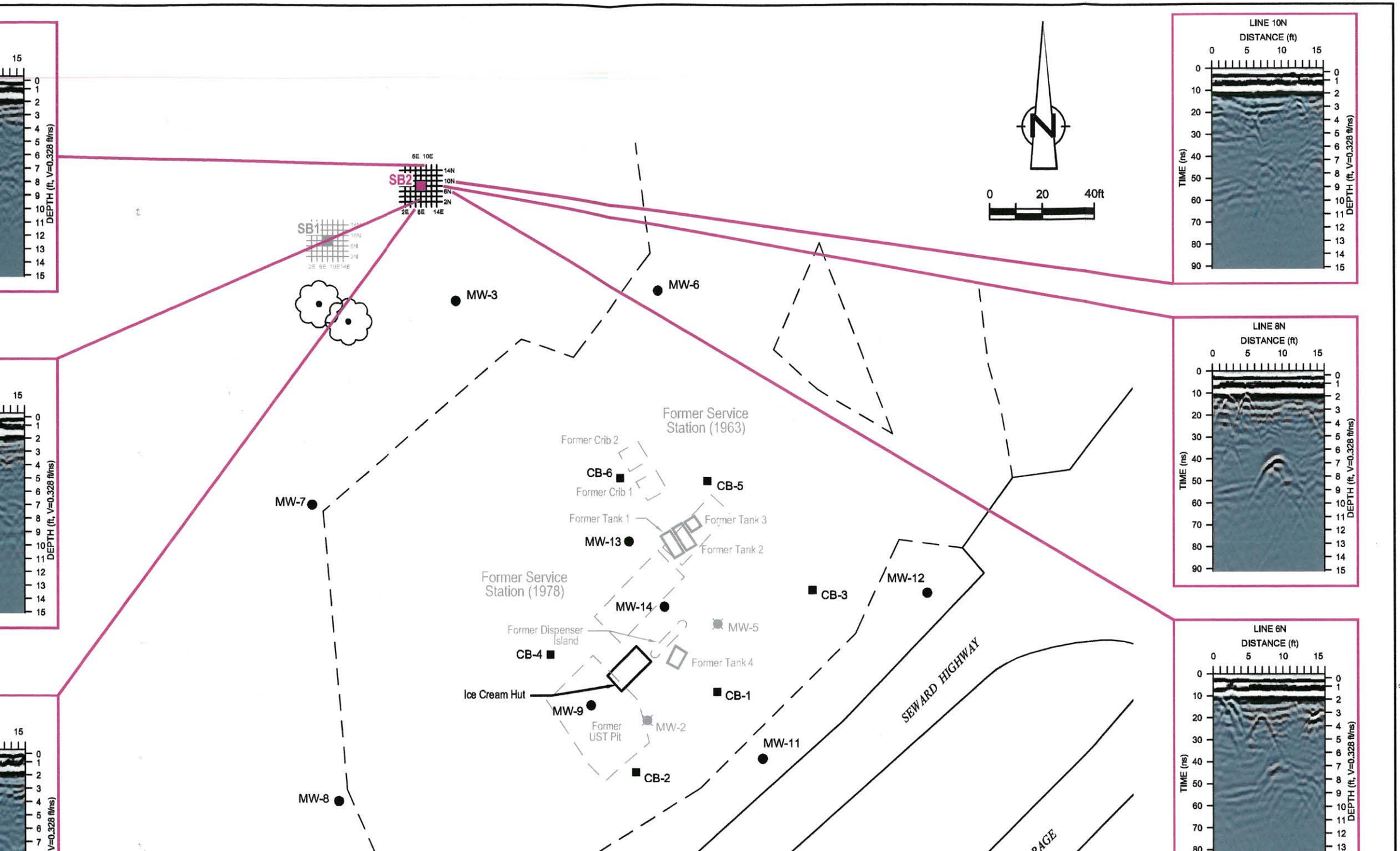
July 16, 2009

CONESTOGA-ROVERS & ASSOCIATES

tion 9-2609


2E 10E
14N
10N
SB2
6N
2N
6E 14E
14N
6N
14E
MW-3
MW-6
N
0 20 50ft
EXPLANATION
MW-3 Monitoring well location
MW-2 Destroyed well location
CB-2 Soil boring location
Basemap modified from drawing provided by SECOR
Former Service Station (1963)
Former Crib 2
CB-6
Former Crib 1
CB-5
Former Tank 1
Former Tank 3
MW-13
Former Tank 2
Former Service Station (1978)
MW-14
CB-3
MW-12
MW-1
Former Dispenser Island
MW-5
CB-4
Former Tank 4
Ice Cream Hut
CB-1
MW-9
Former UST Pit
MW-2
MW-11
CB-2
SEWARD HIGHWAY
ANCHORAGE


SB2
SB1
10E
14N
10N
6N
2N
2E
6E
14E
MW-3
MW-6
MW-7
MW-8
MW-9
MW-11
MW-12
MW-13
MW-14
MW-5
MW-2
CB-1
CB-2
CB-3
CB-4
CB-5
CB-6
Former Service Station (1963)
Former Service Station (1978)
Former Crib 2
Former Crib 1
Former Tank 1
Former Tank 2
Former Tank 3
Former Tank 4
Former Dispenser Island
Former UST Pit
Ice Cream Hut
SEWARD HIGHWAY
N
0
20
40ft
LINE 10N
DISTANCE (ft)
LINE 8N
DISTANCE (ft)
LINE 6N
DISTANCE (ft)
TIME (ns)
DEPTH (ft, V=0.328 ft/ns)


SB2
SB1
6E 10E
14N
10N
6N
2N
2E 6E 14E
0 20 40ft
MW-3
MW-6
MW-7
MW-8
MW-9
MW-11
MW-12
MW-13
MW-14
MW-5
MW-2
CB-1
CB-2
CB-3
CB-4
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Former Service Station (1963)
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Former Crib 2
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Former Tank 2
Former Tank 3
Former Tank 4
Former Dispenser Island
Former UST Pit
Ice Cream Hut
SEWARD HIGHWAY
LINE 10N
DISTANCE (ft)
LINE 8N
DISTANCE (ft)
LINE 6N
DISTANCE (ft)
TIME (ns)
DEPTH (ft, V=0.328 ft/ns)