US Army Corps of Engineers
Alaska District

2015 ANNUAL GROUNDWATER SAMPLING REPORT

Final

Northeast Cape Formerly Used Defense Site
Northeast Cape, St. Lawrence Island, Alaska

Contract No. W911KB-14-D-0006
Task Order 0002

FUDS Nos. F10AK0969-03

April 2016

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Prepared for

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All services have been performed in accordance with the terms and conditions of the contract.

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Tyler Ellingboe
Project Manager

26 April 2016
Date

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ACRONYMS AND ABBREVIATIONS

°F	Degrees Fahrenheit
µg/L	micrograms per liter
AAC	Alaska Administrative Code
AC&WS	Aircraft Control and Warning Station
ADEC	Alaska Department of Environmental Conservation
AK	Alaska Test Method
ANCSA	Alaska Native Claims Settlement Act
APP	Accident Prevention Plan
AST	aboveground storage tank
Bristol	Bristol Environmental Remediation Services, LLC
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain-of-custody
DO	dissolved oxygen
DRO	diesel range organics
FUDS	formerly used defense site
GRO	Gasoline Range Organics
HSM	health and safety manager
HTRW	hazardous, toxic, and radioactive waste
J	analyte result is an estimate
LOQ	limit of quantitation
MB	method blank
mg/L	milligrams per liter
mL/min	milliliters per minute
MNA	monitored natural attenuation
MOC	Main Operations Complex
msl	mean sea level
mV	millivolts
MWH	Montgomery Watson Harza Americas, Inc.
NE Cape	Northeast Cape
NTU	nephelometric turbidity units

ACRONYMS AND ABBREVIATIONS (continued)

ORP	oxidation-reduction potential
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PM	Project Manager
POL	petroleum, oil, and lubricants
PPE	personal protective equipment
ppm	parts per million
QC	quality control
QL	analyte result is considered an estimated value with potential low bias due to laboratory control failure
QN	analyte result is considered an estimated value due to uncertain laboratory control failure
RI	remedial investigation
RRO	residual range organics
SOP	Standard Operating Procedure
SOW	Scope of Work
SS	site superintendent
SSHO	site safety and health officer
SSHP	site safety and health plan
TestAmerica	TestAmerica Laboratories, Inc.
USACE	US Army Corps of Engineers
USAF	U.S. Air Force
UST	underground storage tank
UTV	utility terrain vehicle
UVOST	Ultra-Violet Optical Screening Tool
VOC	volatile organic compound

EXECUTIVE SUMMARY

This *2015 Annual Groundwater Sampling Report* presents the results of monitored natural attenuation (MNA) groundwater sampling performed at the Northeast Cape (NE Cape) Formerly Used Defense Site (FUDS) on Saint Lawrence Island, Alaska. Bristol Environmental Remediation Services, LLC (Bristol) performed the work for the US Army Corps of Engineers (USACE), Alaska District, under Contract Modification No. 03 to Contract No. W911KB-14-D-0006, Task Order 0002.

Bristol was scoped to complete several tasks under Contract Modification No. 03 to Contract No. W911KB-14-D-0006, Task Order 0002 including:

- Preparation of a work plan addendum to the *2014 Work Plan* (Bristol, 2014).
- Mobilization/demobilization to and from the NE Cape site.
- Collection and laboratory analysis of groundwater samples and MNA parameters from 15 identified groundwater monitoring wells located at the NE Cape Main Operations Complex (MOC)
- Preparation of a 2015 Annual Groundwater MNA Sampling Report including the evaluation of groundwater sampling results including an MNA discussion

A total of 15 groundwater monitoring wells were sampled during the annual 2015 sampling event at the NE Cape MOC. Sample analyses included gasoline range organics (GRO), benzene, toluene, ethylbenzene, and xylenes (BTEX), diesel range organics (DRO), residual range organics (RRO), total and dissolved metals (Resource Conservation and Recovery Act [RCRA]-regulated 8 [arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver] plus nickel, vanadium and zinc), polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs); in addition well MW10-1 was sampled for volatile organic compounds (VOCs) and glycols. HACH® field testing kits were used to collect MNA parameters for manganese, ferrous iron, sulfate, nitrate, and alkalinity.

In 2015, monitoring wells 14MW02, 14MW04, 14MW05, and 14MW06 contained concentrations of DRO exceeding the groundwater cleanup level of 1.5 milligrams per liter (mg/L) identified in both Table 1 of the *2009 NE Cape Decision Document, Hazardous, Toxic, and Radioactive Waste (HTRW)* (USACE, 2009) and in Table C of *Title 18 of the Alaska Administrative Code (AAC), Chapter 75 – Oil and Other Hazardous Substances Pollution Control, Section 345 [18 AAC 75.345]* (Alaska Department of Environmental Conservation [ADEC], 2014). Well 14MW02, installed in 2014, did not exhibit a concentration of DRO (1.2 and 1.3 mg/L – field duplicates) in exceedance of groundwater cleanup criteria in 2014, but did exceed the site-specific/*18 AAC 75.345* groundwater cleanup level in 2015 (1.6 mg/L). It should also be noted that well 14MW03 exhibited a DRO concentration in 2014 of 2.4 mg/L, but the concentration of DRO exhibited in 2015 was 1.3 mg/L, which was below the site-specific/*18 AAC 75.345* groundwater cleanup level.

All groundwater samples collected in 2015 contained detectable quantities of hydrocarbons in the DRO range. DRO had been detected in wells 22MW2 and 26MW1 in previous years of MNA sampling; however, DRO was not detected in these two wells in 2014. Based on the review of 2015 analytical data, it is believed that the DRO detections reported in wells 26MW1, 22MW2, 20MW1, 17MW1, 14MW07, and MW88-1, were due to laboratory contamination/artifact introduction during sample extraction or analysis. The chromatograms of these wells were atypical of DRO signatures. Bristol/USACE chemist correspondence and backup documents regarding the interpretation of chromatograms are further discussed in Section 2.5 and Attachment 3 of the Chemical Data Quality Review (CDQR) in Appendix G. The DRO results in wells 26MW1, 22MW2, 20MW1, 17MW1, and 14MW07 have been reported as non-detect (ND) at the limit of quantitation (LOQ) with "QN" flags since the DRO results are considered estimated values due to uncertain laboratory control failure.

Monitoring well 14MW03 exhibited a concentration of total lead at the site-specific/ADEC groundwater cleanup level of 0.015 mg/L. Dissolved lead was not detected in the groundwater sample collected from well 14MW03 above the LOQ of 0.002 mg/L.

No other analytes were present in concentrations exceeding either site-specific groundwater cleanup levels identified in Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009) or ADEC Table C Groundwater Cleanup Levels identified in *18 AAC 75.345* (ADEC, 2014).

MNA results indicate that wells with three plus years of data, which are impacted by presence of petroleum, are undergoing natural attenuation. In wells with less than three years of data, a determination of whether or not petroleum constituents are being degraded by naturally occurring microbes will be made after at least three years of annual groundwater data has been collected.

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1.0 INTRODUCTION

This *2015 Annual Groundwater Sampling Report* presents the results of monitored natural attenuation (MNA) groundwater sampling performed at the Northeast Cape (NE Cape) Formerly Used Defense Site (FUDS) on Saint Lawrence Island, Alaska. Bristol Environmental Remediation Services, LLC (Bristol) performed the work for the US Army Corps of Engineers (USACE), Alaska District, under Contract Modification No. 03 to Contract No. W911KB-14-D-0006, Task Order 0002.

Tasks to be completed under Contract Modification No. 03 included preparation of planning and reporting documentation, groundwater sampling at NE Cape Main Operations Complex (MOC), and the performance of landfill cap visual inspections at the Site 7 and Site 9 landfills, which included surface water sampling at Site 9. The landfill cap visual inspections and surface water sampling results are discussed in a separate *2015 Landfill Periodic Visual Inspection Report* that has been prepared and submitted under separate cover.

The focus of this report is to document and discuss the results of the annual 2015 groundwater sampling event conducted in August 2015 and to evaluate and discuss MNA of groundwater near the MOC at the site.

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2.0 SITE DESCRIPTION

2.1 LOCATION

Saint Lawrence Island is located in the northern Bering Sea off the western coast of Alaska. NE Cape lies approximately 135 air miles southwest of Nome, Alaska (Figure 1). The project site, which originally encompassed 4,800 acres, falls between Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south (Figure 2). The site is located at 63 degrees 20 minutes north latitude and 168 degrees 59 minutes west longitude, in Township 25 South, Range 54 West, Kateel River Meridian. The site is not connected to the surrounding communities by road and is only accessible via air, water, or all-terrain vehicle (USACE, 2009).

Figure 3 shows the location of the work sites discussed in this report. All of the groundwater monitoring wells are located in what is known as the MOC, an area located approximately 1 mile south of the airstrip. NE Cape MOC groundwater monitoring well locations are shown on Figures 4, 5, and 6.

2.2 CLIMATE

Saint Lawrence Island has a cool, moist, subarctic maritime climate, with some continental influences during winter when much of the Bering Sea is capped with ice pack. Winds and fog are common, and precipitation occurs approximately 300 days per year as light rain, mist, or snow. Annual snowfall is approximately 80 inches per year. Total annual precipitation is about 16 inches per year, and more than half falls as light rain between June and September. Summer temperatures average between 34 degrees Fahrenheit (°F) and 48°F, with a record high of 65°F. Winter temperatures range from -2°F to 10°F, with an extreme low of -30°F (Montgomery Watson Harza Americas, Inc. [MWH], 2003). Freeze-up normally occurs in October or November, and breakup normally occurs in June.

Winds are generally northerly to northeasterly from September to June and southwesterly in July and August. Winds exceed 11 miles per hour 70 percent of the time and the average wind speed is 18 miles per hour. Gusts in the NE Cape area have measured as high as 110 miles per hour (USACE, 2002).

2.2.1 Weather Conditions during the Project Field Season

Weather conditions during the 2015 field season were typical of a summer/fall subarctic maritime climate. Variable winds, light precipitation or fog, and temperatures ranging from 35 - 45°F were typical of the daily weather in lowland and lower mountain areas.

2.3 TOPOGRAPHY

The lower mountain area consists mainly of flat coastal plains that gradually turn into rolling tundra toward the base of the Kinipaghulghat Mountains. The mountains rise abruptly to a maximum elevation of approximately 1,850 feet above mean sea level (msl). Elevations across the work areas ranged from sea level to approximately 300 feet above msl.

2.4 GEOLOGY

Saint Lawrence Island consists of isolated bedrock highlands of igneous, metamorphic, and older sedimentary rocks surrounded by unconsolidated surficial deposits overlying a relatively shallow erosional bedrock surface. In the immediate vicinity of the lower mountain area south of the MOC, shallow, unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton. The pluton forms the mountainous work area south of the MOC, including Kangukhsam Mountain. The Suqitughneq River drainage in the Kinipaghulghat Pluton has created an erosional valley and alluvial fan of unconsolidated sediments. Granitic bedrock materials are exposed at the coast north of Kitnagak Bay, suggesting that quartz monzonitic bedrock underlies the unconsolidated materials at a relatively shallow depth on a wave-cut erosional platform (USACE, 2009).

The unconsolidated materials exhibit an alluvial soil profile in areas that have not been disturbed by man. In general, silts near the surface, which overlie more sand-dominated soils, characterize the soil stratigraphy at the site. The silt may contain varying quantities of clay, sand, and gravel and may vary from zero to 10 feet in thickness. The silt is dark brown to dark green and sometimes exhibits a mottled texture. In some areas, the silt exhibits an aqua green or blue color. Dark brown silts were observed in outcrops. The sand at depth contains varying degrees of silt, gravel, and cobbles and it varies from 2 feet to more than 20 feet in thickness. Deeper, coarse-grained materials are generally unsorted and are likely to be of glaciofluvial origin. The depth to bedrock at the lower elevation areas of the site is unknown (USACE, 2009). Beach material is primarily cobble (1-inch stones), with some sand and intermittent large boulders and rocks (USACE, 2002).

2.5 SURFACE WATER AND GROUNDWATER

Because Saint Lawrence Island is relatively remote and undeveloped, regional-groundwater data is limited (MWH, 2003). Bedrock materials south of the site (and underlying the unconsolidated deposits) are not expected to store and transmit significant quantities of groundwater. Typically, these types of granitic rocks are impermeable and transmit groundwater only through localized fractures and weathered soil zones at the surface. However, historical reports concerning water supply wells suggest that this deep, fractured bedrock aquifer supplied sufficient water to sustain the installation during operation (MWH, 2003). Multiple production wells accompanied by storage tanks used to supply the installation during its operation and were drilled to depths of 50 to 70 feet into a fractured bedrock aquifer. It is noted in the MWH report (MWH, 2003) that the use of multiple water supply wells may indicate that groundwater availability was inconsistent and variable throughout the aquifer during different times of the year and that there are insufficient data to determine the aquifer’s extent across the site.

The primary potential aquifer at the NE Cape site is the unconsolidated alluvial material that underlies the area. Regions where blocks of the bedrock are breaking off to form the talus fields that flank the Kinipaghulghat Mountains are likely capable of transmitting large volumes of groundwater (MWH, 2003). The mountainous area to the south of the former installation provides an ideal recharge area for these unconsolidated materials, providing runoff from rain and snowmelt during the summer that permeates the broken bedrock, alluvial, and glacial deposits. Based on the topography and geology of the site, the regional groundwater flow direction is expected to be from the mountainous recharge area south of the site, flowing north, eventually discharging to the Bering Sea (MWH, 2003).

The shallow, subsurface groundwater observed and encountered across the MOC (and across the former installation) likely consists of seasonally thawed water that is both spatially and temporally intermittent (MWH, 2003). Groundwater elevations observed in monitoring wells at the MOC in 2013 ranged from approximately 60 to 71 feet above msl, exhibited depths to water measurements ranging from approximately 5 to 39 feet below ground surface (bgs), and indicated a groundwater flow direction to the northwest. Groundwater elevations, depths to water and flow directions were similar in 2015 (Figure 6). Water depths at the MOC are greatest to the south and become shallower as they progress north.

Groundwater elevations fluctuate both from year to year and throughout the course of the field season. Water elevations for late July/ early August at the F/G plume were 4 feet higher in 2012 than 2013. In 2011, 2012 and 2013 groundwater elevations at the MOC increased by several feet from late July to early September. In August 2011, the groundwater elevation at the H plume excavation rose 3 feet in 3 days during a precipitation event. Groundwater elevations in excavations may also demonstrate large spatial variability: on 23 July 2012 water levels taken from the Site 13 excavation and the F plume excavation 25 feet away varied by 3.2 feet.

Key factors influencing the flow of groundwater at the site are the permafrost and frozen soils, which render the unconsolidated materials effectively impermeable in some areas (MWH, 2003). The U.S. Geological Survey has classified Saint Lawrence Island as an area of moderately thick to thin permafrost (Ferrians, 1965). Although the depth of permafrost at Saint Lawrence Island is unknown, the base of permafrost on the mainland at Nome (135 air miles northeast) is estimated to be at a depth of 120 feet. The deeper, unconsolidated deposits at the site are probably permanently frozen, and the shallow soils represent the active layer where soils thaw during portions of the year. Frozen soils have an effect in retarding groundwater flow most of the year.

In addition to the Bering Sea north of the NE Cape facility, surface water in the vicinity of the work area consists of small streams, small- to moderate-sized lakes, and marshy areas (MWH, 2003). Surface water generally flows northward from the more southerly located highland areas of the Kinipaghulghat Mountains. Small surface water bodies are common throughout the area. The primary stream drainage in the area, the Suqitughneq River, is fed by runoff from the Kinipaghulghat Mountain valley in the lower mountain area, south of the former installation. Several smaller tributaries, originating from two small, unnamed lakes (MWH, 2003), feed this stream drainage as it flows north to Kitnagak Point. Surface water flow in the area is highly dynamic; these changes occur over short and long periods of time and have been observed over the life of remedial activity (MWH, 2003). Bristol observed significant changes in surface water characteristics at multiple locations across the site, most notably at a location directly south (uphill) from Site 26 where surface water runs through a culvert underneath the road that runs from the MOC to the borrow source. This drainage originated in the Kinipaghulghat Mountain valley and exhibited variable flow in late spring/early summer in previous years. The drainage would flow for days at a time but would run dry later into the summer during drier periods.

2.6 AIR QUALITY

Air quality in the area is good. There are minimal sources of air emissions at the site because of its remote nature. The occasional boat motor, vehicle engine, or fire has a negligible effect. In the past air emissions at the site increased during remedial action work because more equipment and vehicles were operating at the site; in 2015 vehicle use was minimized to the charter planes and a small utility terrain vehicle (UTV). Winds typical of the area aid in dispersing emissions (USACE, 2002).

2.7 VEGETATION

The NE Cape area has several major habitat types, including moist tundra dominated by heaths, grasses, sedges, mosses, and lichens, with shrubs that include bearberry, dwarf birch, narrow-leaf Labrador tea, and willow. These plants typically grow in 1 to 3 feet of undecayed organic mat over saturated and frozen soil. Alpine tundra plants (dwarf, prostrate plants that include heaths and tundra species adapted to dry, thin soil conditions) grow on the slopes and exposed ridges of nearby mountains. The NE Cape area has many low-lying areas with lakes, bogs, and poorly drained soils (USACE, 2002).

2.8 FISH AND WILDLIFE

Large mammals are generally not abundant on Saint Lawrence Island. Polar bears may be on the island any time during the year but are most often present when the ice pack is near shore. Some years, polar bears become stranded on the island throughout the summer when the ice pack moves out earlier than usual. There have been no polar bear sightings in the past seven seasons of operations.

A population of approximately 1,000 reindeer inhabits the island. Arctic foxes, cross foxes, red foxes (less common), wolves (rarely), and several small mammals (tundra shrews, arctic ground squirrels, Greenland collared lemmings, red-backed voles, and tundra voles) also inhabit the island (MWH, 2003). Animals usually seen in or around the work sites are small mammals such as ground squirrels and foxes.

Marine mammals are present in the vicinity of the NE Cape area as seasonal migrants in the offshore and near shore marine waters, at haul-out sites, and in association with the advancing and retreating ice pack. No haul-out sites are within the work area. During the summer, walrus, sea lions, and spotted seals may be present in offshore waters. During the ice season, ringed seals, bearded seals, walrus, and spotted seals can be found in nearshore and offshore leads and open water. Bowhead, gray, minke, killer, right, humpback, blue, and beluga whales inhabit offshore waters (MWH, 2003).

The only breeding seabird colony known to exist at the NE Cape facility consists of about 60 glaucous gulls and 60 herring gulls at Seevookhan Mountain, approximately 5 miles southeast of the NE Cape site. Several other species of birds have been sighted in the vicinity of the NE Cape site, including common ravens, snow buntings, snowy owls, whistling swans, Lapland longspurs, jaegers, sand hill cranes, and emperor geese.

Ten primary species of fish reside in the streams and tundra ponds of Saint Lawrence Island. These include blackfish, nine-spined stickleback, grayling, whitefish, and Dolly Varden trout. Five of the six species of Pacific salmon occur around the island and rear in many of the larger drainages (MWH, 2003).

2.9 COMMUNITY PROFILE AND LAND USE

The nearest community on Saint Lawrence Island to the project site is the Village of Savoonga, approximately 60 miles northwest of the site, with an estimated population of 671 people, according to the United States Census Bureau (USCB) Website (accessed 5 January 2016) (USCB, 2016). Savoonga locals estimate that the population exceeds 800 people. There are no permanent residents at the NE Cape site, but there is a small subsistence hunting and fishing camp near Cargo Beach that is frequently inhabited in the summer by residents of Savoonga and Gambell. Snow machine travel during the winter months provides residents of Gambell and Savoonga relatively easy access to the site. The NE Cape site property is currently owned jointly by the two local native corporations, Sivuqaq, Inc., in Gambell and Kukulget, Inc., in Savoonga. The island is accessible by boat, regularly scheduled airlines (to Gambell and Savoonga), and chartered air flights out of Nome. There is no regularly scheduled commercial access to the project site.

2.9.1 Subsistence Activities

Savoonga is a traditional St. Lawrence Island Yup'ik village, with a subsistence lifestyle. Whale, seal, walrus, and reindeer compose 80 percent of islanders' diets. The economy is largely based upon subsistence hunting of walrus, seal, fish, and whale, with some cash income. Berries, edible and medicinal plants are also harvested. Savoonga residents fish for halibut in the vicinity of NE Cape for subsistence and commercial purposes.

2.10 HISTORY

Saint Lawrence Island was established as a reindeer reserve by Executive Order on 7 January 1903. The U.S. Air Force (USAF) constructed an aircraft control and warning station (AC&WS) at NE Cape during 1950 and 1951 (USACE, 2009). The present project site was acquired by the USAF on 16 January 1952, under Public Land Order 970, which removed 21,013 acres from the reserve. In 1952, the USAF AC&WS was formally activated by assignment of the 712th AC&WS Squadron and the 698th Security Squadron. The original site was designed to support 212 personnel. Throughout its existence, the NE Cape facility has been a surveillance station, providing radar coverage for the Alaskan Air Command and, later, for the North American Air Defense Command, as part of an Alaska-wide system constructed to reduce potential vulnerability to bomber attacks across the polar regions.

The White Alice Station area remained in operation with minimal military staff until 1972. All lands were then withdrawn from the military under Public Land Order 5187 for classification under Section 17(d)(1) of the Alaska Native Claims Settlement Act (ANCSA) of 1971, which entitled local community village corporations to select and receive specific tracts of federal land. Interim Conveyance No. 203 (June 1979) conveyed unsurveyed lands of Saint Lawrence Island to Sivuqaq, Inc., and Savoonga Native Corporation, known today as Kukulget, Inc. Surveyed land, easements, and land-use permits effective before conveyance were excluded from the transfer.

In 1982, transfer of the White Alice Station area, south of the MOC, to the U.S. Department of the Navy was initiated. However, this transaction was not formally completed and was superseded by ANCSA. The Navy conducted remedial actions under its Comprehensive Long-Term Environmental Action Navy program. The action included removal of specified hazardous items and containerized hazardous and toxic waste.

In 2000, the White Alice Station was reclassified as a FUDS-eligible property. In response, the USACE included the area in the ongoing cleanup program for NE Cape (USACE, 2002).

2.10.1 Previous Studies and Actions

Environmental investigations and cleanup activities at NE Cape began in the mid-1980s, with the goal of locating and identifying areas of contamination and gathering enough information to develop a cleanup plan. The URS Corporation conducted preliminary assessments in 1985, and Ecology and Environment, Inc. did follow-up assessments in 1991, 1992, and 1993.

Remedial investigations (RIs) were initiated at NE Cape during the summer of 1994, when MWH, performed a Phase I RI. Soil, sediment, groundwater, and surface water samples were collected during the Phase I RI. Additional sampling was performed during subsequent investigations: MWH conducted Phase II RI in 1996, 1998, and 1999; MWH conducted Phase III RI in 2001 and 2002; and Shannon &Wilson, Inc., conducted Phase IV RI in 2004. A feasibility study was conducted by USACE in March 2007, which summarized historical sampling results and removal actions and evaluated a range of alternatives for complying with the criteria prescribed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The studies divided the concerns among 34 separate sites. The results of the RIs showed that contaminants were present at some, but not all, sites (USACE, 2009).

Several removal and remedial actions have taken place at the NE Cape FUDS:

- URS Corporation, 1990: Removal of transformers, drums, tanks, and other containerized hazardous wastes
- Northwest Enviro Service, Inc., 1994: Removal of 16 electrical transformers and their contents
- MWH, 1997: Removal of communication wires and cables from the tundra
- Nugget Construction Inc., 2000: Removal of building demolition and debris, drums, antenna poles, and a fuel pipeline
- Nugget Construction Inc., 2001: Removal of building demolition debris, polychlorinated biphenyl- (PCB-) contaminated soil, petroleum, oil, and lubricants-(POL-) contaminated soil, and miscellaneous debris
- Bristol Environmental & Engineering Services Corporation (Bristol Environmental and Engineering Services Corporation), 2003: Removal of building demolition debris, other miscellaneous debris, drums, tanks, communications poles, wires, cables, and fuel lines
- Bristol Environmental and Engineering Services Corporation, 2005: Demolition and removal of tramway towers, wires, and cables, metal poles, communications wire and cable
- Bristol Environmental Remediation Services, LLC, 2009: Removal of POL-containing drums, landfill cap construction at Site 7, trial study of in-situ chemical oxidation treatment of POL-contaminated soils at the MOC
- Bristol Environmental Remediation Services, LLC, 2010: Removal of POL-contaminated soils from Sites 1, 3, 6, and 32; PCB-contaminated soils from

Sites 13, 16, 21, and 31; and arsenic-contaminated soils from Site 21; landfill cap construction at Site 9; and MNA at Site 8

- Bristol Environmental and Engineering Services Corporation, 2011: Removal of POL-contaminated soil from the MOC and PCB-contaminated soil from Sites 13 and 31; MNA at Site 8 and in groundwater wells at the MOC; debris removal; and roofing tar removal
- Bristol Environmental Remediation Services, 2012: Removal of 8,594.91 tons of POL-contaminated soil from the MOC; 4,884.73 tons of PCB-contaminated soil from Sites 13 and 31; 102.72 tons of arsenic-contaminated soil from Site 21; 59.40 tons of ethylene glycol- and tetrachloroethene- (PCE-) contaminated soil and over 1,000 gallons of liquid from Site 10; 20.6 bank cubic yards of sediment from Site 28; 15 tons of debris from areas across the site; 158 poles from across the site; continuation of MNA at Site 8 and in groundwater wells at the MOC; abandonment/decommissioning of six monitoring wells across the site; and collection of soil samples along the road leading to the radar dome
- Bristol Environmental Remediation Services, 2013: Removal of 10,601.24 tons of POL-contaminated soil from the MOC; 243.8 bank cubic yards of sediment from Site 28; 305.13 tons of arsenic-contaminated soil from Site 21; 290.4 tons of contaminated soil from Site 10; 0.29 tons of drums from Site 10; 28.45 tons of debris from areas across the site; 1 ton of drums from areas across the site; 30 pole stumps from areas across the site; continuation of MNA sampling; abandonment of twelve monitoring wells across the site.
- Bristol Environmental Remediation Services, 2014: Excavated 4,489.92 tons of petroleum-contaminated soil; collected soil samples from 40 soil borings at Site 21 and excavated 107.35 tons of arsenic-contaminated soil; sampled and installed seven new monitoring wells at the MOC; abandoned two monitoring wells at the MOC; reconditioned eight monitoring wells at the MOC; removed 10.97 tons of debris from across the NE Cape site and the vicinity of the Site 7 landfill; removed tar and tar-contaminated soil from Site 10's buried drums and shipped the material off site for disposal; loaded 1.27 tons of material into two 85-gallon drums and shipped them off site for disposal; excavated two test pits at Site 6 corresponding to historical sample locations and analyzed soil samples for PCB concentrations; collected two surface water samples at Site 8; collected soil samples corresponding with Site 10's historical sample locations and analyzed the samples for contaminants; subsequently excavated, containerized, and shipped 265.6 tons of contaminated soil from Site 10; collected soil samples from Site 27 to test for naphthalene and had the samples analyzed by a fixed laboratory; investigated Site 32 for petroleum-contaminated soil; encountered diesel range organic (DRO)-

contamination resulting in the excavation of 53.13 tons of soil; removed an open grate at Site 31 concrete foundation and backfilled the resulting concrete void with clean material, as it posed a safety risk.

In 2009, the USACE produced the *NE Cape Decision Document*, which presented the selected remedies for NE Cape in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act and the National Oil and Hazardous Substances Pollution Contingency Plan. Remedial actions were determined for each site of concern at NE Cape. Table 2-1 lists the selected remedies and their current status. A second decision document was also developed that was specific to the Site 7 landfill.

Table 2-1 Decision Document Selected Remedies for Northeast Cape Sites

Decision Document Site Remedy	Status[1]
No Further Action at sites 2, 4, 5, 12, 14, 17, 18, 20, 22, 23, 24, 25, 26, 33, and 34	Complete
Excavation and removal of petroleum-contaminated soils at Site 1 Airstrip	Completed in 2010
Excavation and removal of petroleum-contaminated soils at Site 3 Fuel Pumphouse	Completed in 2010
Excavation and removal of petroleum-contaminated soils at Site 6 Former Drum Field	Completed in 2010
Excavation and removal of petroleum-contaminated soils at Site 32 Lower Tramway	Completed in 2014
Excavation and removal of PCB-contaminated soils at sites 13, 16, 21, and 31	Completed in 2013
Excavation and removal of arsenic-contaminated soil at Site 21 Wastewater Treatment Tank	Conducted in 2011, 2012, 2013 and 2014; Under review
Removal of partially submerged debris	Conducted in 2014
Excavation and removal of petroleum, metals, and PCB-contaminated sediment at Site 28 Drainage Basin, including removal of near-surface sediments from the narrow channel upgradient of the Suqitughneq River	Under review
Construction of sedimentation pond or other appropriate controls at Site 28 Drainage Basin	Under review
MNA of petroleum-contaminated sediment at Site 8 POL Spill Site	Under review
Capping of the Site 9 Housing and Operations Landfill	Completed in 2010

Table 2-1 Decision Document Selected Remedies for Northeast Cape Sites (continued)

Decision Document Site Remedy	Status[1]
Chemical oxidation at the Main Operations Complex, with remedy of MNA for groundwater, excavation and removal of petroleum-contaminated soils to a depth of 15 feet at sites 10, 11, 13, 15, 19, and 27, and land use controls	Chemical oxidation was initiated in 2009 for the purposes of treating POL-contaminated soils and was unsuccessful; MNA is in progress for groundwater; POL-contaminated soils that could be removed without causing a release of POL contaminated water into the Site 28 wetland and/or Suqitughneq River were completed in 2014
Land use controls to limit future drinking water uses for groundwater at the MOC (Sites 10–22, 26, 27), designate areas not suitable for drinking water (Sites 3, 4, 6, 7, 9), prevent construction of buildings on top of landfills	In progress
5-Year Reviews at sites with hazardous substances remaining above cleanup levels, as necessary until cleanup levels are met. Periodic reviews of POL-contaminated sites (e.g., Site 8) with residual contamination will be included in conjunction with evaluation of the MOC	In progress
Periodic visual monitoring for 5 years of the capped area at the Site 9 Housing and Operations Landfill and Site 7 Cargo Beach Road Landfill for settlement and erosion	In progress
Additional visual monitoring, up to 30 years, may be conducted if deemed necessary based on the results of 5 Year or Periodic Reviews	To be determined - The site(s) will be determined by the results of 5 Year or Periodic Reviews, and are therefore undetermined
Removal of dangerous poles, wires, and other miscellaneous debris from tundra areas site-wide, where identified	Pole removal conducted in 2009, 2010, 2011, 2012 and 2013. Wire and miscellaneous debris removal in 2009, 2010, 2011, 2012, 2013 and 2014. All identified wire and debris has been removed from the site.
Removal of partially submerged debris from streams in the vicinity of Site 9 Housing and Operations Landfill and Site 29 Suqitughneq River	Completed in 2010

Notes:

[1]Alaska Department of Environmental Conservation (ADEC) has not issued formal decisions regarding completion of work and/or cleanup complete status for any of the subject sites.

MNA = monitored natural attenuation
PCB = polychlorinated biphenyl
MOC = Main Operations Complex
POL = petroleum, oil, and lubricants

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3.0 CONTRACT SPECIFICATIONS

3.1 SCOPE OF WORK

The 2015 Scope of Work (SOW) was established under Contract Modification No. 03 to Contract No. W911KB-14-D-0006, Task Order 0002 and included the following tasks:

- Preparation of a *NE Cape Hazardous, Toxic, and Radioactive Waste (HTRW) Remedial Action Work Plan Addendum* (Bristol, 2015) to the 2014 *NE Cape HTRW Remedial Action Work Plan* (Bristol, 2014).
- Mobilization/demobilization to and from the NE Cape site.
- Collection and laboratory analysis of groundwater samples and MNA parameters from 15 identified groundwater monitoring wells located at the NE Cape MOC
- Preparation of a *2015 Annual Groundwater MNA Sampling Report* including the evaluation of groundwater sampling results including an MNA discussion

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4.0 PROJECT PLANNING, KEY PERSONNEL, AND SUBCONTRACTORS

Section 4.0 describes the planning documents prepared for this project and key personnel.

4.1 PROJECT PLANNING

Bristol received the contract amendment from USACE on 31 March 2015 and submitted a draft addendum to the *2014 Work Plan* (Bristol, 2014) to the USACE on 23 June 2015. The USACE provided work-plan comments on 26 June 2015. The final *2015 NE Cape HTRW Remedial Actions Work Plan Addendum* (Bristol, 2015) was submitted on 7 August 2015.

4.1.1 Planning Documents

Bristol prepared one planning document that was accepted by the USACE: *NE Cape HTRW Remedial Actions Work Plan Addendum* (Bristol, 2015).

4.1.2 Right-of-Entry Permit and Daily Quality Control Reports

Federal and state permits required for this project were included in the *NE Cape HTRW Remedial Actions Work Plan* (Bristol, 2014). A copy of the current Right-of-Entry permit that covered access for the 2015 annual groundwater monitoring effort is provided in Appendix A. Copies of Daily Quality Control Reports completed during the 2015 field effort are also included in Appendix A.

4.2 KEY OFFICE PERSONNEL

4.2.1 Project Manager Tyler Ellingboe

Tyler Ellingboe, the Project Manager (PM), ensured that project tasks were completed on schedule and within budget, implemented methods of tracking materials and resources, coordinated work with subcontractors, and complied with normal safety procedures and regulatory requirements. The PM submitted monthly status reports (Appendix B) to the USACE to keep the project team informed about work progress.

4.2.2 Health and Safety Manager Wayne McDaniel

Wayne McDaniel served as the Health and Safety Manager (HSM) and reviewed Bristol's Safety and Health Program for this project. As the HSM, he monitored project compliance with Bristol's Corporate Safety and Health Program. Mr. McDaniel helped Bristol's site safety and health officers (SSHOs) develop and implement an effective Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP). He is based in Bristol's San Antonio, Texas, office. For this project, Mr. McDaniel was responsible for key health and safety tasks:

- Reviewed and edited the APP and SSHP
- Remained available for emergencies
- Provided consultation as needed to ensure that the APP and SSHP were fully implemented
- Coordinated any modification to the APP and SSHP with the site superintendent (SS) and SSHO

4.2.3 Project Chemist Marty Hannah

Marty Hannah had responsibility for project quality aspects related to sample collection and chemical analysis. Mr. Hannah oversaw data development, the data review process, and all subcontracted laboratories.

4.2.4 Regulatory Compliance Manager/Transportation and Disposal Coordinator Tyler Ellingboe

Tyler Ellingboe served as the regulatory compliance manager and transportation disposal coordinator. He oversaw the air shipment of hazardous materials to and from the site that were required during the 2015 field effort.

4.2.5 Occupational Physician Alexander T. Baskous

Bristol designated Occupational Physician Alexander T. Baskous for the NE Cape FUDS project. Dr. Baskous was familiar with the project hazards and scope. He determined medical surveillance protocols and reviewed examination and test results in a manner that complied with Title 29 of the *Code of Federal Regulations* (CFR) (Medical Surveillance). Dr. Baskous is board certified in occupational medicine, with an M.D. and Master of Public Health from Harvard University. He is the director of the Northwest Segment of the American College of Occupational and Environmental Medicine, a diplomate of the American Board of Family Practice, and is on the active staff of both Providence Alaska Medical Center and Alaska Regional Hospital in Anchorage.

4.3 KEY FIELD PERSONNEL

4.3.1 Site Superintendent Eric Barnhill

Eric Barnhill served as the SS and was responsible for the scheduling, coordination, and execution of Bristol's onsite activities in accordance with the contract specifications. He reported directly to the PM.

4.3.2 Site Safety and Health Officer Eric Barnhill

Eric Barnhill also served as the SSHO and was responsible for overall planning and compliance with safety and health requirements. He conducted daily safety meetings and addressed worker safety concerns. As SSHO, Mr. Barnhill was responsible for communicating safety issues and concerns, reporting safety incidents to the PM, and other safety-related duties:

- Remained on site on a full-time basis for the duration of field activities
- Assisted with onsite training and represented the HSM during the day-to-day onsite implementation and enforcement of the APP and the SSHP
- Performed a daily safety and health inspection and documenting results on the Daily Safety Inspection Log
- Ensured site compliance with federal, state, USACE Engineer Manual 385-1-1, and Occupational Safety & Health Administration (OSHA) safety and health requirements; also ensured compliance with all aspects of the APP and SSHP, including but not limited to activity hazard analyses, air monitoring, use of personal protective equipment (PPE), decontamination, site control, Standard Operating Procedures (SOPs), and the safe use of engineering controls

- Maintained the emergency response plan, confined space entry procedures, and the spill containment program
- Prepared all safety-related records
- Stopped work if unacceptable health or safety conditions existed and took necessary action to reestablish and maintain safe working conditions
- Consulted with and coordinated any modifications to the APP and SSHP with the HSM, the SS, and the contracting officer or the contracting officer's representative
- Served as a member of Bristol's quality control (QC) staff on matters relating to safety and health, conducted accident investigations, and prepared accident reports
- Reviewed results of safety QC inspections and documented safety and health findings in the Daily Safety Inspection Log
- Recommended and oversaw corrective actions for identified deficiencies, in coordination with site management and the HSM

4.3.3 Contractor Quality Control System Manager Eric Barnhill

Eric Barnhill managed contractor quality control and had the authority to act in all contractor quality control matters for the project.

4.3.4 Subcontractors

Two subcontractors were used during the course of work and are listed in Table 4-1. Planning and safety documents were available to all site workers, including subcontractor. Field scientists were supplied with the information, instructions, and emergency response actions contained in the APP and SSHP, and they were responsible for complying with the rules, regulations, and procedures therein.

Table 4-1 Major Subcontractors

Subcontractor	Assignment
Bering Air	Charter flights to and from the island
TestAmerica Laboratories, Inc. (TestAmerica)	Fixed-based analytical testing laboratory and field laboratory

4.3.5 Site Visitors

Visitors arrived periodically throughout the duration of the project in 2015. Site visitors were limited to one family from Savoonga. The family would come to the site to get fresh water from a spring in the mountains and to retrieve personal supplies and fuel that were stored at the site.

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5.0 LOGISTICS AND FIELD INVESTIGATION METHODS

Section 5.0 discusses project logistics and field investigation methods.

5.1 MOBILIZATION / DEMOBILIZATION

The 2015 annual groundwater sampling event was performed in conjunction with the performance of landfill cap visual inspections at the Site 7 and Site 9 landfills, which included surface water sampling at Site 9. The landfill cap visual inspections and surface water sampling results are discussed in a separate *2015 Landfill Periodic Visual Inspection Report* that has been prepared and submitted under separate cover.

Equipment and materials for the 2015 effort were collected and staged at the Bristol equipment yard located in Anchorage, Alaska prior to air shipment (Northern Air Cargo) to Bering Air located in Nome, Alaska. All materials were shipped to Bering Air in August of 2015.

Three Bristol personnel mobilized to and from the NE Cape site on Bering Air charter flights on the 11th and 13th through 15th of August 2015.

The three person crew demobilized back to Anchorage on 16 - 17 August 2015.

5.2 AIR SUPPORT

Bering Air, of Nome, Alaska, provided air support services during the 2015 season. A total of four roundtrip flights were chartered during the 2015 field effort.

5.3 EQUIPMENT

No heavy equipment was used during the 2015 field season. Motorized vehicle use was limited to one Arctic Cat "Wildcat" side by side UTV.

5.4 SITE ACCESS

Approximately 5.5 miles of gravel roads connect the various work areas at the site and have, in the past, required a small amount of maintenance each year, generally consisting of grading and adding minor amounts of fill. The roads are beginning to show the wear and tear of the freeze/thaw action that occurs annually but are still useable. There are four stream crossings (three culverts and one bridge) within the work areas at NE Cape. Bristol did not perform any maintenance on the road, bridge or culverts during 2015 operations.

In prior years Bristol maintained the runway with a grader. The last maintenance on the runway was performed during the 2014 season. The runway seemed to be in good condition at the time of the 2015 field effort.

5.5 HEALTH AND SAFETY

Health and Safety plays a fundamental role in all of Bristol's jobs, without exception. The three man crew carried with them, at all times, a satellite phone and first aid kits. Bristol conducted safety meetings on a daily basis, and all onsite personnel were encouraged to take a proactive role in addressing safety concerns and questions.

The SS/SSHO briefed field personnel daily on general site hazards. Part of Bristol's safety routine involved the daily Toolbox Safety Meetings, held each morning before work began. These meetings were about project-related work on the NE Cape site. Safety topics were chosen based on the day's activities or general project safety. Topics included weather conditions, footing conditions, UTV safety, housekeeping, and PPE.

Minimum safety gear for all personnel included hard hat, reflective vest, steel-toe boots, safety glasses, and work gloves.

The Bristol SSHO performed safety and health walk-through inspections each day at the various work sites. These inspections enabled the SSHO to remain aware of site activities and conditions, look for existing or potential site safety issues/concerns, ensure appropriate use of PPE, and reinforce safe work practices. The daily safety inspections also provided material for the daily Toolbox Safety Meetings (Appendix C).

No lost-time accidents occurred during the 2015 season.

5.6 Decontamination

Decontamination procedures are instituted to protect the environment and personnel and to maintain the quality and integrity of environmental samples. Bristol incorporated decontamination procedures during all sampling events.

Bristol used new tubing for each monitoring well location. The tubing was discarded following each sample collection. Field personnel decontaminated submersible pumps prior to and between each well sampling event by disassembling the pumps and cleaning them in an Alconox solution and then rinsing it with filtered water and deionized water. The YSI water quality meter and accessory flow-through cell were cleaned in a similar fashion with Alconox and a double rinse.

Sampling personnel donned new nitrile gloves for every sample collected.

5.7 Investigation-Derived Waste Management

Investigation-derived waste (IDW) generated during the 2015 groundwater sampling event at the MOC included equipment decontamination water, groundwater monitoring well purge water, disposable sampling equipment, and PPE. Equipment decontamination and well purge water were treated using a 5-gallon granulated activated carbon (GAC) filter unit prior to discharge onto the ground surface at the same site location at which the waters were generated. Disposal sampling equipment (tubing) and PPE were collected into garbage bags, transported back to Nome, Alaska, and disposed of as municipal solid waste.

5.8 Groundwater Sampling

Sample collection during the 2015 field effort was limited to the collection of groundwater samples and physical parameters from 15 groundwater monitoring wells located at the MOC. Groundwater monitoring wells were sampled starting with the historically least contaminated and proceeding to the most contaminated in order to limit the potential for cross-contamination. Groundwater sample collection was performed using two field teams (using two separate pumps) led by Ms. Lyndsey Kleppin and Mr. Eric Barnhill, who meet the definition of "qualified persons" as defined in *Title 18 of the Alaska Administrative Code (AAC), Chapter 75 - Oil and Other Hazardous Substances Pollution Control, Section 990 – Definitions (18 AAC 75.990)* (Alaska Department of Environmental Conservation [ADEC], 2014).

All samples were collected in accordance with the ADEC *Draft Field Sampling Guidance* document (ADEC, 2010), the *Northeast Cape HTRW Remedial Actions Work Plan Addendum* (Bristol, 2015), and Bristol SOPs. A photograph log has been prepared to document the groundwater sampling field effort (Appendix D) and Bristol's SOP for groundwater sampling is included in Appendix E.

Groundwater sampling activities are further discussed in Section 6.0. Groundwater sampling and MNA results are discussed in Section 7.0.

6.0 TASK-ORIENTED FIELD ACTIVITIES

As part of the SOW, Bristol collected groundwater samples from 15 groundwater monitoring wells within the MOC area. Groundwater monitoring data collected during the 2015 monitoring event was compared to historical data to determine whether natural attenuation is occurring in groundwater at the site. Groundwater sampling and MNA results are discussed in Section 7.0. Pertinent field-personnel notes and other field documentation are included in Appendix C. The following subsections include a description and discussion of the history of the MOC site and briefly describe groundwater monitoring well sampling activities.

6.1 DESCRIPTION AND HISTORY

The MOC at the NE Cape installation contained the majority of the site's infrastructure and was partitioned into various sites throughout its history. Sites 10, 11, 13, 15, 16, 19, and 27 are within or near the MOC. Site 11 historically contained three 400,000-gallon aboveground storage tanks (ASTs), one of which was punctured in the late 1960s, leading to a large release of diesel fuel. Other potential contaminant sources came from Site 13, the former Heat and Power Plant, which contained a variety of ASTs and underground storage tanks (USTs), diesel generators, and power transformers; Site 15, where a fuel pipeline break resulted in a diesel fuel spill; the Site 16 Paint and Dope Storage building, originally a flammable liquids storage facility with an AST; Site 19, which once contained an auto maintenance building; and Site 27, an equipment and vehicle refueling area consisting of a small shed and a concrete valve box attached to a buried fuel pipeline that was connected to the large ASTs at Site 11 (USACE, 2009). The MOC's infrastructure, including buildings, tanks, and piping, had been demolished and transported off site during 2000 through 2005 removal actions (USACE, 2009). Primary contamination sources included the ASTs, USTs, and all associated piping that contained fuel products; secondary sources included residual subsurface fuel-contaminated soil caused by historical spills. Electrical transformers, 55-gallon drums, and miscellaneous activities contributed to site contamination (USACE, 2009). Historically, contaminants of concern observed in soil at the MOC above site-specific cleanup levels are DRO, PCBs, and naphthalene and DRO, benzene and arsenic in groundwater. Soil and groundwater have previously been tested for residual range organics (RRO), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and pesticides. USACE initiated a program in 2010 to monitor natural attenuation in groundwater at the MOC. Ten wells were initially selected for the monitoring program based on historical results, physical proximity to the MOC, and ability to monitor groundwater that intersects with the MOC and other known contaminant areas, but a physical evaluation determined that only nine wells were suitable for the MNA sampling program. The nine monitoring wells selected by the USACE for sampling and monitoring in 2010 included MW88-1, MW88-4, MW88-5, MW88-10, MW10-1, 17MW1, 22MW2, 20MW1, and 26MW1.

In 2010, wells MW88-4, MW88-5, and MW88-10 contained contaminant concentrations exceeding groundwater cleanup levels. All three wells exceeded the site-specific and *18 AAC 75.345* groundwater cleanup level of 1.5 milligrams per liter (mg/L) for DRO at 3.3 mg/L, 12.0 mg/L, and 1.6 mg/L, respectively. Well MW88-5 also contained concentrations of benzene and RRO at 0.0093 mg/L and 1.6 mg/L, respectively, which exceeded the site-specific and *18 AAC 75.345* groundwater cleanup criteria of 0.005 mg/L and 1.1 mg/L, respectively.

In 2011, monitoring wells MW88-4 and MW88-5 contained DRO concentrations of 2.3 mg/L and 7.5 mg/L, respectively. MW88-4 contained benzene and arsenic concentrations of 0.0094 mg/L and 0.011 mg/L, respectively. MW88-5 contained benzene and RRO concentrations of 0.020 mg/L and 2 mg/L, respectively. DRO in MW88-10, which exhibited concentrations in excess of the site-specific/*18 AAC 75.345* groundwater cleanup level in 2010 at 1.6 mg/L, did not exceed established groundwater cleanup levels in 2011.

In 2012, monitoring wells MW88-4, MW88-5, and MW88-1 contained contaminant concentrations that exceeded established groundwater cleanup levels. The wells contained concentrations of DRO at 2.0 mg/L, 4.6 mg/L, and 1.9 mg/L, respectively. MW88-5 contained a benzene concentration of 0.02 mg/L in 2011 and 0.0064 mg/L in 2012. The 2010 benzene concentration was 0.0093 mg/L. MW88-4 contained dissolved arsenic at 0.011 mg/L, the same concentration as the 2011 sampling event. MW88-4 and MW88-5 were located within the footprint of excavation and removal activities associated with the E plume and were decommissioned, including removal and demolition after sampling was completed in 2012 (Bristol, 2013).

In 2013, none of the sampled wells contained contaminants of concern in concentrations exceeding either site-specific groundwater cleanup levels identified in Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009) or ADEC Table C Groundwater Cleanup Levels identified in *18 AAC 75.345* (ADEC, 2014).

In 2014, Bristol sampled eight existing monitoring wells and seven new monitoring wells at the MOC. Monitoring wells 14MW03, 14MW04, 14MW05, and 14MW06 contained concentrations of DRO, exceeding both the site-specific and *18 AAC 75.345* groundwater cleanup level of 1.5 mg/L, at 2.4 mg/L, 2.5 mg/L, 4.9 mg/L and 5.2 mg/L (QL-flagged), respectively. Monitoring wells 14MW03 and 14MW07 contained concentrations of total lead exceeding the site-specific/*18 AAC 75.345* groundwater cleanup level of 0.015 mg/L at 0.062 mg/L and 0.13 mg/L, respectively. However, these wells contained concentrations of dissolved lead below the site-specific/*18 AAC 75.345* groundwater cleanup level. Dissolved lead was not detected in well 14MW03 at the limit of detection (0.00025 mg/L). Dissolved lead was detected in well 14MW07 at a concentration of 0.0015 J mg/L. No other analytes were present, in any other groundwater samples collected, at concentrations that exceeded groundwater cleanup levels identified in either Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009) or in Table C of *18 AAC 75.345* (ADEC, 2014). In 2015, Bristol sampled the same 15 monitoring wells.

6.2 2015 Groundwater Sampling Activities

In 2015, a total of 15 groundwater monitoring wells were sampled using two Monsoon positive pressure submersible pumps and using a low-flow sampling protocol, in accordance with Section IV of the ADEC *Draft Field Sampling Guidance* document (ADEC, 2010). Parameters including temperature, pH, dissolved oxygen (DO), conductivity, and oxygen-reduction potential, were collected using YSI 556 meter with flow-through cells; turbidity was measured with HACH® portable turbidimeters; and water levels were measured using water level meters. HACH® kits were used in the field to collect the natural attenuation parameters for manganese, ferrous iron, sulfate, nitrate, and alkalinity. A full list of MNA groundwater parameters collected during the 2015 field effort are listed in Table 6-1.

Table 6-1 MNA Groundwater Parameters

Parameter	Unit of Measure
Ferrous Iron	mg/L
Manganese	mg/L
Nitrate	mg/L
Sulfate	mg/L
Alkalinity	mg/L
Temperature	°C
Scecific Conductivity	µS/cm
pH	NA
Oxidation-Reduction Potential (ORP)	mV
Dissolved Oxygen (DO)	mg/L
Methane	µg/L

Notes:
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolt

During the low-flow purge procedure, water quality parameters were measured, recorded, and allowed to stabilize for up to one hour prior to sample collection. Groundwater samples were collected directly from 0.125-inch, Teflon-lined, high-density polyethylene tubing into the appropriate collection vessels. Purge water was collected into 5-gallon buckets and treated with granular activated carbon prior to being discharged onto the ground surface. Purge water was treated and discharged within 20 feet of the monitoring well's location. Copies of the groundwater purging and sampling field forms are provided in Appendix C.

In addition to MNA parameters measured in the field, groundwater samples were collected and submitted to TestAmerica Laboratories, Inc. (TestAmerica), located in Tacoma, Washington. Fixed-based laboratory analyses and analytical methods included the following:

- Gasoline range organics (GRO) by Alaska Test Method (AK) 101
- DRO and RRO by AK 102/AK 103
- VOCs by including benzene, toluene, ethylbenzene, and xylenes (BTEX) by U.S. Environmental Protection Agency (EPA) publication *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* 846 (SW-846) Method 5030B and 8260C
- Polynuclear aromatic hydrocarbons (PAHs) by SW 3520C/8270D in selected ion mode (SIM)
- PCBs by SW8082A
- Total and dissolved metals by SW3005A/6020A
- Total and dissolved mercury by SW7470A
- Methane analysis by Method RSK-175 was performed by TestAmerica-Denver, Colorado
- Glycol analysis by SW8015C-direct aqueous injection (DAI)-TestAmerica-Denver, Colorado

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7.0 GROUNDWATER SAMPLING AND MNA RESULTS

The following sections discuss applicable groundwater cleanup levels, groundwater sampling results, and provide a MNA discussion.

7.1 APPLICABLE GROUNDWATER CLEANUP CRITERIA

Groundwater analytical sampling results were compared to the applicable contaminant cleanup levels established for the NE Cape FUDS site. Groundwater sampling results were compared to site-specific groundwater cleanup levels listed in Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009). In addition, groundwater sampling results were compared to groundwater cleanup levels listed in Table C of *18 AAC 75.345* (ADEC, 2014).

7.2 GROUNDWATER SAMPLING RESULTS

A total of 15 primary groundwater samples and two field duplicate (QC) samples were collected from designated monitoring wells at the MOC during the period of 13 – 15 August 2015. Groundwater samples were submitted for analysis of BTEX, PCB, GRO, DRO, RRO, metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, nickel, selenium, silver, vanadium, zinc, and mercury), PAHs, and methane. One groundwater sample, collected from well MW10-1 and located downgradient from Site 10, was also analyzed for glycols and VOCs. Samples were shipped under chain-of-custody (CoC) to TestAmerica in Tacoma, Washington, for analysis. The natural attenuation parameters and results from 2010 through 2015 are presented in Table F1 (Appendix F). Figure 6 shows the potentiometric groundwater surface and the locations of the monitoring wells sampled at the MOC. Groundwater levels were measured on 11 August 2015 with groundwater flow predominantly to the northwest.

Figure 5 depicts the locations of all monitoring wells that were sampled in 2015, along with select analytical results for wells where contaminant concentrations have historically exceeded established groundwater cleanup levels.

The complete laboratory analytical results for the 2015 MOC groundwater monitoring event are presented in Table F2 (Appendix F). Table F2 also includes a comparison of sampling results to applicable site-specific and ADEC groundwater cleanup levels. Monitoring wells 14MW02, 14MW04, 14MW05, and 14MW06 exhibited concentrations of DRO at 1.6 mg/L, 2.8 mg/L (QN-flagged), 12 mg/L and 2.3 mg/L, respectively; which exceed the site-specific/*18 AAC 75.345* groundwater cleanup level of 1.5 mg/L.

All groundwater samples collected in 2015, including samples from wells which did not have DRO detections during the previous sampling event in 2014 (wells 26MW1 and 22MW2), contained detectable quantities of hydrocarbons in the DRO range; however, it is believed that the DRO detections in some of the wells were due to laboratory contamination/artifact introduction during sample extraction and analysis. Chromatograms for the DRO detections in some of the project wells were atypical of DRO signatures. Method blank (MB) 199084 exhibited a concentration of hydrocarbons in the DRO range of 0.0334 mg/L. Based on the interpretation of chromatograms performed by the Bristol Chemist, with input from the USACE Chemist, the DRO chromatograms for wells 26MW1, 22MW2, 20MW1, 17MW1, 14MW07, and MW88-1 exhibit detection patterns very similar to the chromatographic patterns for DRO observed in MB 199084. As a result, the DRO results for wells 26MW1, 22MW2, 20MW1, 17MW1, and 14MW07 have been reported as non-detect (ND) at the limit of quantitation (LOQ) with “QN” flags since the DRO results are considered estimated values due to uncertain laboratory control failure. The DRO result for MW88-1 was reported, but “B” flagged with potential high bias since the result was above the LOQ. All other DRO results were not believed to be impacted by laboratory contamination/artifact introduction and their results are believed to be from actual POL present in the samples. Bristol/USACE chemist correspondence and backup documents regarding the interpretation of chromatograms are further discussed in

Section 2.5 and Attachment 3 of the Chemical Data Quality Review (CDQR) located in Appendix G.

Monitoring well 14MW03 exhibited a concentration of total lead at the site-specific/ADEC Table C groundwater cleanup level of 0.015 mg/L. Dissolved lead was not detected in the groundwater sample collected from well 14MW03 above the LOQ of 0.002 mg/L.

Well MW10-1 had excessive drawdown at a pump rate of 50 milliliters per minute (mL/min). The well was allowed to recharge before the sample was collected.

No other analytes were present in any other samples at concentrations exceeding site-specific groundwater cleanup levels identified in Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009) or Table C Groundwater Cleanup Levels identified in *18 AAC 75.345* (ADEC, 2014).

Table 7-1 presents analytical sampling results for wells exhibiting concentrations of contaminants above established groundwater cleanup levels from the 2004 and 2010 through 2015 annual sampling events. Bolded results exceed either groundwater cleanup levels identified in Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009) or Table C Groundwater Cleanup Levels identified in *18 AAC 75.345* (ADEC, 2014).

Table 7-1 Current and Historical Groundwater Sample Results that Exceed Cleanup Criteria

	Matrix	Water	Water	Water	Water	Water	Water	Water
	Method	**8260B**	**AK101**	**AK102**	**AK103**	**6020**	**6020**	**6020**
	Analyte	Benzene	GRO (C6–C10)	DRO (nC10–<nC25)	RRO (nC25–nC36)	Arsenic-Dissolved	Lead-Total	Lead-Dissolved
	Cleanup Level	0.005[AB]	1.3[B]	1.5 [AB]	1.1 [AB]	0.01 [AB]	0.015 [AB]	0.015 [AB]
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Well ID	**Year**							
88-4*	**2002**	**0.03**	1.2	**72**	**1.9**	--	--	--
	2004	**0.0337**	1.25	**3.89**	**1.46**	--	0.00502	--
	2010	0.0024	0.24	**3.3**	0.43	0.0085	0.002	0.0007 J
	2011	**0.0094**	0.4	**2.3**	0.55	**0.011**	0.0013 J	0.00032 J
	2012	0.0048	0.31	**2.0**	0.24	**0.011**	0.0019 J	ND (0.00025)
88-10	**2002**	0.0027	0.12	**55**	**1.3**	--	**--**	**--**
	2004	ND (0.0004)	0.0357	1.38	ND (0.549)	--	**0.0376**	**--**
	2010	ND (0.00015)	ND (0.044)	**1.6**	0.036 J	ND (0.0004)	0.0015 J	0.00072 J
	2011	ND (0.00045)	ND (0.044)	0.54	0.15	ND (0.0038)	0.00083 J	0.00035 J
	2012	ND (0.00045)	ND (0.044)	0.50	0.064 J	ND (0.004)	0.00076 J	0.00022 J
	2013	ND (0.00045)	ND (0.05) B	0.97	0.043 J	ND (0.004)	ND (0.015) B	ND (0.00025)
	2014	ND (0.00040)	0.021 J	0.66	0.041 J	ND (0.004)	0.0011 J	0.00020 J
	2015	ND (0.001)	ND (0.044)	0.43	ND (0.071)	ND (0.0040)	0.0015 J	0.00026 J
88-5*	**2002**	**0.019**	**1.3**	**9.8**	**2.3**	--	--	--
	2004	**29.7**	**1.5 J**	**11.3**	**2.28**	--	0.012	--
	2010	**0.0093**	0.19	**12**	**1.6**	0.0028	0.0029 J	0.0011 J
	2011	**0.020**	0.24	**7.5**	**2.0**	0.0052	0.0019 J	0.00046 J
	2012	**0.0064**	0.16	**4.6**	0.58	0.0055	0.0021	0.00023 J

Table 7-1 Current and Historical Groundwater Sample Results that Exceed Cleanup Criteria (continued)

	Matrix	Water	Water	Water	Water	Water	Water	Water
	Method	8260B	AK101	AK102	AK103	6020	6020	6020
	Analyte	Benzene	GRO (C6–C10)	DRO (nC10–<nC25)	RRO (nC25–nC36)	Arsenic-Dissolved	Lead-Total	Lead-Dissolved
	Cleanup Level	0.005[AB]	1.3[B]	1.5 [AB]	1.1 [AB]	0.01 [AB]	0.015 [AB]	0.015 [AB]
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Well ID	**Year**							
88-1	**2002**	0.00058	0.024	1.2	0.43	--	--	
	2004	ND (0.0004)	0.0141 J	ND (0.345)	0.168 J	--	0.001 B	--
	2010	ND (0.00015)	ND (0.05)	0.75	0.037 J	ND (0.0004)	ND (0.0029)	ND (0.0004)
	2011	ND (0.00045)	ND (0.044)	0.74	0.26	ND (0.0038)	0.0016 J	0.00021 J
	2012	ND (0.00045)	ND (0.044)	**1.9**	0.15	ND (0.004)	0.00041 J	ND (0.00025)
	2013	ND (0.00045)	ND (0.044)	0.22	0.05 J	ND (0.004)	ND (0.0025)	ND (0.00025)
	2014	ND (0.00040)	ND (0.044)	0.21	0.043 J	ND (0.004)	0.0027	0.00025 J
	2015	ND (0.001)	ND (0.044)	0.10 B	ND (0.071)	ND (0.004)	ND (0.0005)	ND (0.0005)
14MW02	**2014**	0.00014 J	0.28	**1.3**	0.094 J	0.0046 J	0.0060	ND (0.00025)
	2015	ND (0.001)	0.18	**1.6**	0.13	0.0056	0.0010 J	ND (0.00050)
14MW03	**2014**	0.001	0.19	**2.4**	0.21	ND (0.0040)	**0.062**	ND (0.00025)
	2015	ND (0.001)	0.12	**1.3**	0.041 J	0.0024 J	**0.015**	0.00049 J
14MW04	**2014**	ND (0.0004)	0.051	**2.5**	0.54	ND (0.0040)	0.0064	0.0014 J
	2015	ND (0.001)	ND (0.044)	**2.8 QN**	0.37 QN	0.0014 J	0.0064	0.00050 J
14MW05	**2014**	ND(0.002)	0.36	**4.9**	0.55	ND (0.0040)	0.010	0.00029 J
	2015	ND (0.001)	0.13	**12**	0.51	0.0028 J	0.013	0.0030

Table 7-1 Current and Historical Groundwater Sample Results that Exceed Cleanup Criteria (continued)

	Matrix	Water	Water	Water	Water	Water	Water	Water
	Method	**8260B**	**AK101**	**AK102**	**AK103**	**6020**	**6020**	**6020**
	Analyte	Benzene	GRO (C6–C10)	DRO (nC10–<nC25)	RRO (nC25–nC36)	Arsenic-Dissolved	Lead-Total	Lead-Dissolved
	Cleanup Level	0.005[AB]	1.3[B]	1.5 [AB]	1.1 [AB]	0.01 [AB]	0.015 [AB]	0.015 [AB]
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Well ID	**Year**							
14MW06	**2014**	0.0007 J	0.22	**5.2**	0.28	0.0062	0.0027	ND (0.00025)
	2015	ND (0.001)	0.040 J	**2.3**	0.27	0.0024 J	0.00064 J	ND (0.0005)
14MW07	**2014**	0.00072 J	0.026	0.15	0.043 J	ND (0.0040)	**0.13**	0.0015 J
	2015	ND (0.001)	ND (0.044)	ND (0.10) QN	ND (0.073)	ND (0.0040)	0.00069 J	0.00033 J

Notes:

*well was abandoned in 2012

[A]Site-specific groundwater cleanup level identified in Table 1 of 2009 NE Cape Decision Document (USACE, 2009)

[B]Table C Groundwater Cleanup Level identified in *18 AAC 75.345* (ADEC, 2014)

BOLD = sample result exceeds groundwater cleanup level

-- = not analyzed

< = less than

AK = Alaska Test Method

B = analyte detected in method blank at less than 10 times the sample concentration

DRO = diesel range organics

QN = quality issue no directional bias

GRO = gasoline range organics

J = result is an estimate

mg/L = milligrams per liter

ND = non-detect; limit of detection in parentheses

RRO = residual range organics

7.2.1 Data Usability

The overall data usability for the project met the project goal of a minimum 90 percent usability with 100% usability for making project decisions. No results were rejected or had major QC issues that would interfere with project decision-making. All sample results were usable for project purposes with only the minor QC issues noted. Sample results are complete, comparable, and usable for project purposes.

7.3 MNA Results and Discussion

MNA parameters and dissolved petroleum concentrations were measured in samples collected from monitoring wells at the MOC. Historic and 2015 data were evaluated to determine whether groundwater conditions at the MOC support degradation of petroleum constituents by naturally occurring microbes. MNA parameters measured in groundwater samples collected from monitoring wells at the MOC are presented in Table F1 (Appendix F). Analytical results for groundwater samples collected at the MOC are presented in Table F2 (Appendix F).

A YSI 556 water quality multi-meter was used to measure water quality parameters in the field during well purging including DO, oxidation-reduction potential (ORP) (also known as redox), temperature, specific conductance, and pH. Groundwater samples were collected in unpreserved poly containers and were field-analyzed for nitrate (NO_2), dissolved manganese (MnII), ferrous iron (FeII), and sulfate (SO_4) using a HACH® spectrometer. Alkalinity was measured with HACH® test strips and methane was analyzed in the fixed based analytical laboratory. The following paragraph generally describes how groundwater MNA parameters may be interpreted.

A positive ORP value indicates conditions are amenable for oxidation chemical reactions, while a negative ORP value indicates conditions are amenable to reducing chemical reactions (i.e., a reduced environment exists). The presence of DO in groundwater increases aerobic microbial activity and is the preferred terminal electron acceptor for beta-oxidation. In the absence of DO, nitrate, manganese (IV), ferric iron (Fe III) and sulfate (SO_4) act, in the order listed, as terminal electron acceptors for microbial respiration. Byproducts of microbial respiration are carbon dioxide (measured as alkalinity), dissolved manganese (MnII), ferrous iron (FeII), and methane. Methane is anaerobically produced by microbes when no other oxidation source, such as DO or nitrate, is present. The presence of methane indicates anaerobic respiration (methanogenesis) is occurring. Aerobic respiration is comparatively faster than anaerobic respiration. Anaerobic respiration is also dependent on the relative abundance of anaerobic microbes (facultative and/or obligate), such as hydrocarbon degrading bacteria. Facultatively anaerobic bacteria possess the ability to degrade carbon forms in both aerobic and anaerobic conditions. The rate of aerobic and anaerobic respiration is temperature dependent; respiration rate increases with increasing temperature and decreases with decreasing temperature.

The groundwater contours shown on Figure 6 indicate groundwater generally moves through the MOC subsurface in a northwesterly direction from Kangukhsam Mountain toward Site 28 where groundwater surfaces as springs or seeps near the MOC/Site 28 boundary. Permanent wells are not present at Site 28 due to susceptibility of the soil to heaving soil during freeze/thaw cycles which damage permanent wells.

Groundwater samples were collected from 15 monitoring wells at the MOC in 2015 (Figure 6). Figure 4 shows the 15 monitoring wells at the MOC relative to historical excavation extents.

Groundwater monitoring wells MW88-4, MW88-5, 18MW1, and 22MW3, shown on Figures 5 and 6, were previously decommissioned and not sampled in 2015. Monitoring wells MW88-4 and MW88-5 were located in the footprint of the Ultra-Violet Optical Screening Tool (UVOST)-delineated POL plume and were decommissioned in 2012 after sampling during petroleum-contaminated soil removal activities. Monitoring wells 18MW-1 and 22MW3 were decommissioned in 2014 since they were deemed no longer viable.

Wells 26MW1, 22MW2, 20MW1, and 14MW07 are located upgradient of the UVOST-delineated POL contamination and historically have not contained concentrations of POL constituents exceeding ADEC Table C Groundwater Cleanup Levels (ADEC, 2014).

Wells MW88-10, MW88-1 and MW88-3 are located downgradient of 14MW07 and upgradient of POL soil removal areas at the MOC. Wells MW88-10 and MW88-1 have historically had DRO detected above the site-specific/*18AAC 75.345* DRO groundwater cleanup level (1.5 mg/L). In 2015, DRO concentrations observed in these wells were 0.43, 0.1 B, and 0.38 mg/L, respectively. No other POL analytes were detected in the three wells in 2015 with the exception of acenaphthylene detected in well MW88-1 at 0.000034 QL mg/L. The Table C Groundwater Cleanup Level for acenaphthylene, as identified in *18 AAC 75.345*, is 2.2 mg/L (ADEC, 2014). MW88-1 had DRO reported at 1.9 mg/L in 2012. With the exception of 2012, well MW88-1 has shown a steady decrease in DRO from 0.75 mg/L in 2010 to 0.1 mg/L in 2015.

Wells MW10-1, 17MW1 and 14MW01 are located crossgradient to previous MOC POL and PCB soil removal areas and did not have any POL associated analytes exceed either site-specific or ADEC-established groundwater cleanup levels.

Wells 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06 are all located in the footprint of previous POL removal activities of the MOC. In 2015, wells 14MW02, 14MW04, 14MW05, and 14MW06 had DRO concentrations detected above the site-specific/*18 AAC 75.345* groundwater cleanup level of 1.5 mg/L. Well 14MW05 had the highest DRO concentration at 11 and 12 mg/L (QC field duplicate pair results). Total lead was detected in well 14MW03 at a concentration of 0.015 mg/L, which is at the site-specific/*18 AAC 75.345* groundwater cleanup level; dissolved lead was non-detect.

The following paragraphs describe groundwater conditions at each monitoring well location, progressing downgradient from the least impacted wells at the MOC to POL impacted wells that exceed groundwater cleanup levels.

7.3.1 Wells Located Upgradient of MOC POL Impacted Soil Removal Areas

Groundwater monitoring wells 26MW1, 22MW2, 14MW07, 20MW1, MW88-10, MW88-1, and MW88-3 are located upgradient of POL impacted soil removal areas at the MOC and are discussed further below.

Well 26MW1

Well 26MW1 was installed upgradient of all known sources of POL contamination at the MOC and had the highest groundwater elevation (71.42 feet above msl) of all MOC monitoring wells. Analytical results for the sample collected from this well during the 2015 event did not indicate detections of GRO, RRO, or methane. DRO was initially reported at a concentration of 0.078 mg/L (J flagged), which was the first time a petroleum analyte has been detected at this well since 2013. However, following review of the DRO chromatogram and due to what appears to be laboratory contamination/artifact introduction, the DRO result was amended to non-detect at the LOQ and flagged (ND [0.10] QN). No other POL associated analytes were detected. The 6-year average of DO concentrations, 2010 through 2015, was 12.9 mg/L; this was the highest average DO concentration of all monitored wells. The 5-year average ORP value was also the highest value of all sampled wells with an average value of 202 millivolts (mV). The average sulfate concentration was 7.8 mg/L. These data indicate that groundwater in the vicinity of this well does not appear to be impacted by petroleum and is in an aerobic state.

Well 22MW2

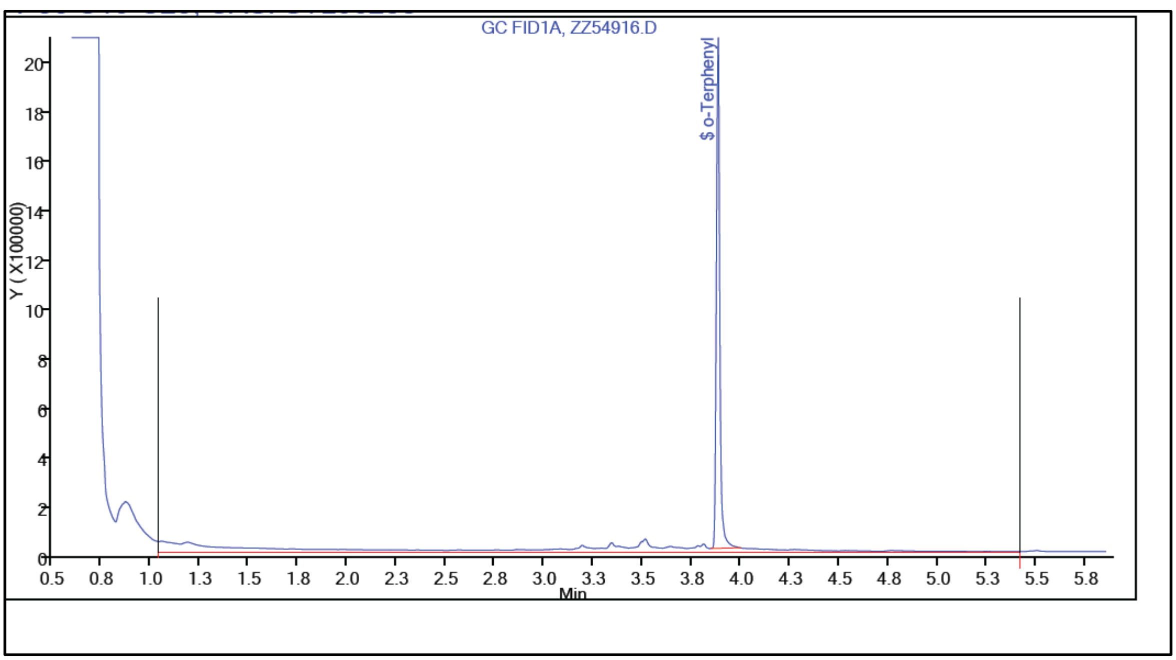
Well 22MW2 is located downgradient and west of well 26MW1. The 2015 groundwater sample results for 22MW2 were primarily non-detect for all petroleum analytes, with the exception of DRO at 0.054 mg/L (J flagged). Following review of the DRO chromatogram and due to what appears to be laboratory contamination/artifact introduction, the DRO result was amended to non-detect at the LOQ and flagged (ND [0.10] QN). Methane was not detected. MNA field parameters measured in groundwater collected from well

22MW2 were similar to 26MW1 with a 6-year average DO concentration of 12.0 mg/L and an average ORP value of 118 mV. These data indicate groundwater in the vicinity of this well does not appear to be impacted by petroleum and is in an aerobic state.

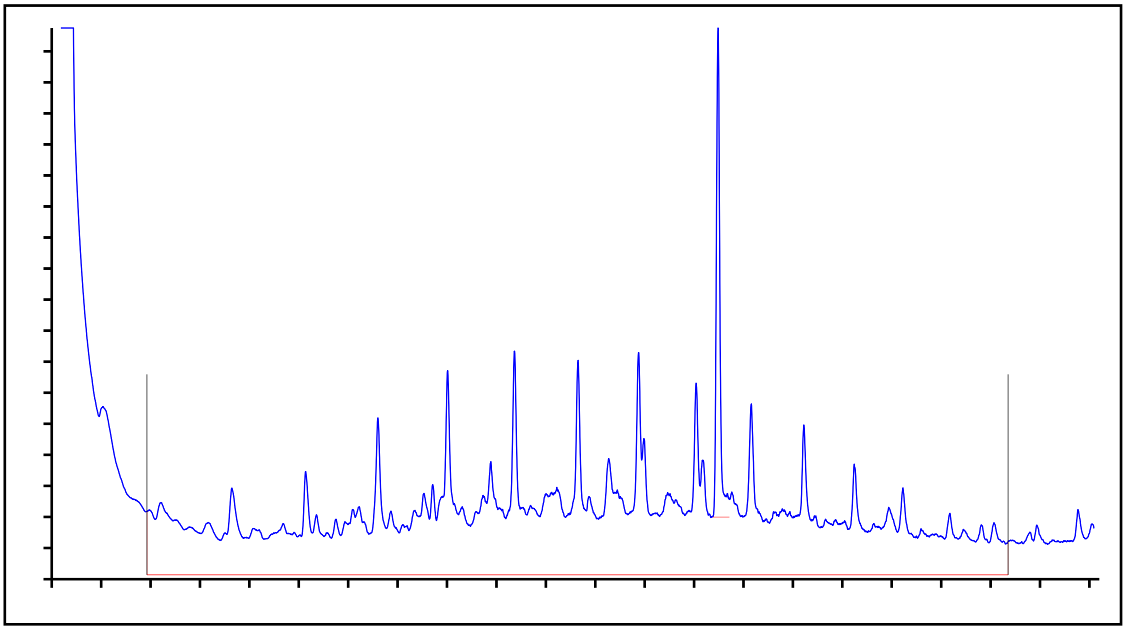
Well 14MW07

Well 14MW07 was installed in 2014. Groundwater sample results from 2015 reported a DRO concentration of 0.056 mg/L (J-flagged) and methane at 0.0016 mg/L (J- flagged). No other POL associated analytes were detected. The DRO chromatogram from the laboratory analysis was examined to determine the origin of the DRO in well 14MW07. The chromatogram is atypical of DRO. Following review of the DRO chromatogram and due to what appears to be laboratory contamination/artifact introduction, the DRO result was amended to non-detect at the LOQ and flagged (ND [0.10] QN). An image of the DRO chromatogram for well 14MW07 is provided below as Graph 7-1 and the 10 parts per million (ppm) DRO initial calibration standard chromatogram is provided below as Graph 7-2).

Graph 7-1 DRO Chromatogram for Well 14MW07 (Lab ID 580-52566-6)



Graph 7-2 Ten ppm DRO Initial Calibration Standard (Well 14MW07)



Groundwater collected from well 14MW07 in 2015 had a DO concentration of 8.47 mg/L and an ORP value of 125.9 mV. These results vary greatly from the relatively high methane (0.03 mg/L) and low ORP (-385.4 mV) observed in 2014. During the 2014 sampling event, completed 2 days after installation and well development, measured turbidity was high (>1000 nephelometric turbidity units [NTU]) and the well was purged dry at low flow rates and allowed to recharge prior to sampling. In 2015 the well was able to be sampled with minimal drawdown of approximately 400 mL/min and turbidity was measured at 9.45 NTU. The parameters collected in 2015 are believed to be more representative of groundwater conditions at 14MW07. The 2015 MNA results are indicative of aerobic conditions in an area not impacted by petroleum.

The following four wells (20MW1, MW88-10, MW88-1, and MW88-3) share comparable groundwater elevations (1.3 feet difference between 20MW1 and MW88-3) and are located upgradient of previous MOC POL soil removal activities; however, in 2010, well MW88-10 exhibited a DRO concentration of 1.6 mg/L which exceeded the site-specific/

18 AAC 75.345 groundwater cleanup level (1.5 mg/L) and other POL associated analytes (PAHs) have been detected.

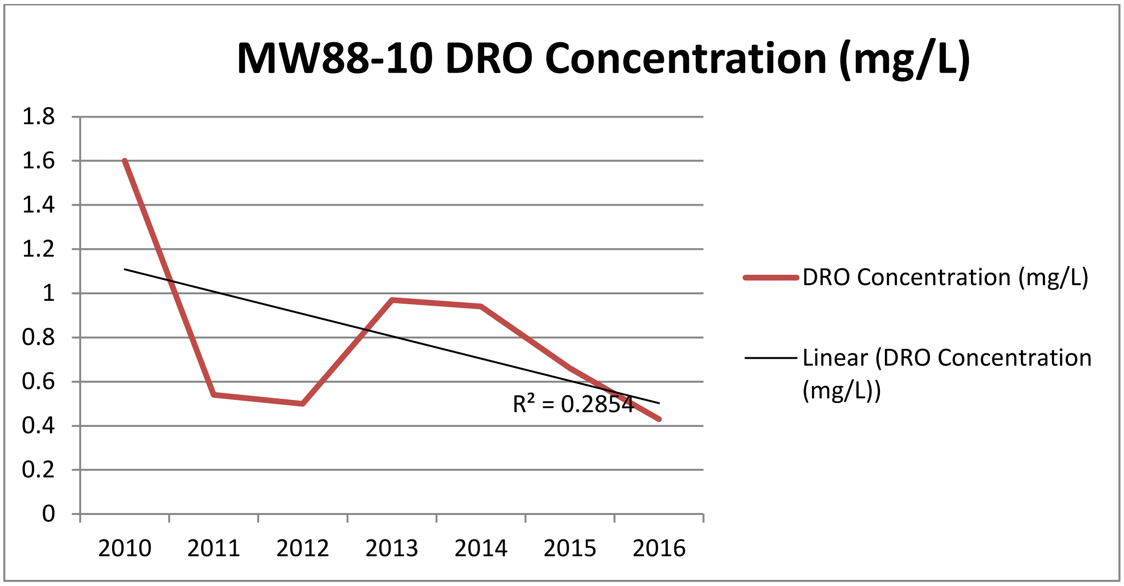
Well 20MW1

Well 20MW1 is located west of and crossgradient to well 14MW07 in the south center of the MOC. Concentrations of GRO, RRO and methane were not detected in samples collected during the 2015 sampling event. DRO was initially reported at 0.055 mg/L (J-flagged) in 2015, which was the highest DRO concentration in the six-year MNA study. However, following review of the DRO chromatogram and due to what appears to be laboratory contamination/artifact introduction, the DRO result was amended to non-detect at the LOQ and flagged (ND [0.10] QN). Bristol/USACE chemist correspondence and backup documents regarding the interpretation of chromatograms are further discussed in Section 7.2 of the text and in Section 2.5 and Attachment 3 of the CDQR in Appendix G. No other POL associated analytes were detected in 2015. MNA results indicated a 6-year average DO level of 9.55 mg/L and an average ORP value of 90.9 mV. These data indicate that groundwater in the vicinity of this well has possibly been impacted by petroleum, but remains in an aerobic state.

Well MW88-10

Well MW88-10 is directly downgradient of well 14MW07 with a groundwater elevation 1.55 feet lower than well 14MW07. Groundwater collected from this well during 2015 exhibited a DRO concentration of 0.43 mg/L. No other POL associated analytes were detected in 2015. As noted above, the concentration of DRO measured in 2010 (1.6 mg/L) exceeded the established site-specific/*18 AAC 75.345* groundwater cleanup level of 1.5 mg/L indicating a downward trend in DRO as well as other POL associated analytes such as PAHs. Graph 7-3 shows the downward trend of DRO from 2010 to 2015. While the decrease is non-linear and the trend line does not support a stable DRO reduction rate, the graph does show decreasing concentrations of DRO over the last 6 years from 1.6 to 0.43 mg/L.

Graph 7-3 MW88-10 DRO Decreasing Trend Concentrations (2010 – 2016)



The 6-year average concentration of methane was 0.0272 mg/L with concentrations ranging from 0.0004 to 0.061 mg/L. The concentration of methane measured during the 2015 monitoring event was 0.0.0062 mg/L. This well has a 6-year average DO concentration of 1.0 mg/L and an average ORP value of 82.1 mV. These data indicate that groundwater in the vicinity of this well has been impacted by petroleum, is in an anaerobic state, and methanogenesis is occurring.

Well MW88-1

Concentrations of methane, RRO, and GRO were not detected in well MW88-1 during the 2015 sampling event. The well exhibited a concentration of DRO at 0.10 B mg/L. The (B) flag was added for potential high bias following review of the DRO chromatogram and due to what appears to be laboratory contamination/artifact introduction. Bristol/USACE chemist correspondence and backup documents regarding the interpretation of chromatograms are further discussed in Section 7.2 of the text and in Section 2.5 and Attachment 3 of the CDQR in Appendix G.

In 2012, DRO was detected at a concentration of 1.9 mg/L, which exceeded the site-specific/*18 AAC 75.345* groundwater cleanup level of 1.5 mg/L. In 2010 and 2011, DRO was reported at 0.75 and 0.74 mg/L, respectively. The 2013 and 2014 analytical results for DRO were 0.22 mg/L and 0.26 mg/L, respectively. The nearly order of magnitude difference in DRO concentrations between the 2012 event and all other sampling events at this well may be attributed to the relatively high groundwater levels measured in 2012. In 2012, groundwater levels were, on average, 2.2 feet higher than levels measured in 2015. The higher groundwater level measured at this well during 2012 may have resulted in groundwater infiltration of the petroleum smear zone, which may have increased the amount of dissolved petroleum in groundwater in the vicinity of the well. While 2012 appears to be an anomalous event, there is a clear trend of reduction of DRO concentrations over the 6 year period. The 6-year average DO concentration of 3.78 mg/L and ORP value of 132.6 mV suggests the groundwater in proximity to this well is in an aerobic state.

Well MW88-3

Groundwater samples were not collected from well MW88-3 prior to 2015 since the well was previously believed to be damaged due to a blockage encountered during the 2010 well evaluation. Additional investigation of the well in 2014 revealed the well to be in good condition; it was determined that the previous "damage" was likely ice blockage. In 2014, the well was developed and sampled. DRO concentration was measured at 0.46 mg/L in 2014 and the well also exhibited detections of PAHs, including naphthalene, 1-methylnaphthylene, 2-methylnaphthylene, and acenaphthylene. GRO was also detected at 0.18 (J,B) mg/L in 2014; however, the trip blank had a reported GRO detection at a comparable concentration. None of the concentrations of analytes measured in 2014 exceeded established site-specific or *18 AAC 75.345* groundwater cleanup levels. The groundwater sample collected in 2015 from well MW88-3 exhibited concentrations of DRO and methane of 0.38 mg/L and 0.0016 mg/L (J-flagged), respectively. No other POL associated analytes were detected. The concentration of DO (4.43 mg/L) and ORP (155.1 mV) measured in 2015 suggest that the groundwater in the vicinity of this well is in an aerobic state, while the relatively low, estimated methane detection implies anaerobic groundwater conditions with methanogenesis occurring. DRO concentrations indicate that it has been moderately impacted by petroleum. In 2014, the concentration of DO was 4.73 mg/L and ORP was measured at 175.5 mV, which are comparable to the 2015 values.

7.3.2 Wells Located Crossgradient of MOC POL Impacted Soil Removal Areas

The following eight groundwater monitoring wells (MW10-1, 17MW1, and 14MW01 through 14MW06) are located crossgradient to POL impacted soil removal areas at the MOC. Wells 14MW02, 14MW03, 14MW04, 14MW05 and 14MW06 are located within the footprint of POL soil removal areas at the MOC.

Well MW10-1

Well MW10-1 was placed in native soil during installation in 1994. The water elevation measured in well MW10-1 during 2014 was roughly 0.43 feet higher than in nearby well 14MW06, which is located approximately 60 feet west of MW10-1. Groundwater data collected from this well in 2015 did not exhibit concentrations of GRO or methane; however, DRO and RRO were detected at 0.39 mg/L and 0.14 mg/L, respectively. The 6-year average DO concentration was 3.3 mg/L and ORP averaged 115.4 mV. The 2015 DO level was 2.44 mg/L and ORP was -101.1 mg/L. These data indicate that groundwater in the vicinity of this well appears to have been slightly impacted by petroleum, groundwater conditions are aerobic, and methanogenesis was not occurring at the time of the 2015 event. The 2015 ORP value of -101.1 mV was the first time ORP had been a negative value since MNA monitoring began in 2010. Previous ORP values ranged from 251.6 mV in 2012 to 68.9 mV in 2013. The 2015 methane result was non-detect. This was the first time methane was not detected in the sample collected from this well since MNA monitoring began. Site 10, which is located upgradient of this monitoring well, was disturbed by excavation and drum removal activities from 2011 to 2014. It is unclear if the drum removal actions at Site 10 impacted groundwater and influenced the MNA or POL parameters measured in well MW10-1. The PAHs naphthalene, 1-methylnaphthylene, 2-methylnaphtylene, benzo[g,h,i]perylene, dibenzo(a,h)anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, and phenanthrene were all detected in 2014, but not during any of the other monitoring events that took place from 2010 to 2015.

Well 17MW1

Well 17MW1 is the westernmost monitoring well. This well is a located on the western edge of the MOC, and was likely not impacted by the large fuel release from the Site 11 AST or fueling rack based on the interpreted groundwater flow direction and analytical results to date. Sample results from the 2015 event did not exhibit detected concentrations of GRO, RRO and methane; however, a concentration of DRO was initially reported at 0.051 mg/L (J flagged). However, following review of the DRO chromatogram and due to what appears to be laboratory contamination/artifact introduction, the DRO result was amended to non-detect at the LOQ and flagged (ND [0.10] QN). Bristol/USACE chemist correspondence and backup documents regarding the interpretation of chromatograms are further discussed in Section 7.2 of the text and in Section 2.5 and Attachment 3 of the CDQR in Appendix G.

DO concentrations measured in groundwater collected from this well over 6 years averaged 8.74 mg/L and ORP averaged 180.53 mV. Methane has not been detected in samples collected from this well since 2010. BTEX and PAH analytes have not been detected in this well since 2010. These data indicate that groundwater in the vicinity of this well may be slightly impacted by petroleum and is in an aerobic state.

Well 14MW01

Well 14MW01 was installed during 2014 just north of the MOC perimeter road on the northwest side of the MOC. The groundwater elevation (59.03 feet above msl) was the lowest elevation of the 15 wells sampled during 2015. The groundwater sample collected contained concentrations of GRO at 0.026 mg/L (J-flagged), DRO at 0.51 mg/L, and methane at 0.054 mg/L. DO was measured at 0.77 mg/L and ORP was 32.7 mV. The MNA results suggest groundwater in the vicinity of this well has been impacted by petroleum, groundwater conditions in the vicinity of this well are anaerobic, and methanogenesis is occurring. The DRO concentration of 0.51 mg/L (B flagged in 2014) remained the same from 2014 to 2015. PAHs showed very modest reductions from 2014 to 2015. None of the POL associated analytes exceeded groundwater cleanup levels in either 2014 or 2015.

Well 14MW02

Well 14MW02 was installed during 2014 in backfill material in the vicinity of the former A2 petroleum plume excavation located on the northwest side of the MOC perimeter road. The 2015 groundwater sample contained GRO at 0.18 mg/L, DRO at 1.6 mg/L, RRO at 0.13 mg/L, and methane at 0.240 mg/L. DO was measured at a concentration of 0.15 mg/L and ORP was -64.0 mV. These data indicate that groundwater in the vicinity of this well has been impacted by petroleum, is in an anaerobic state, and that methanogenesis is occurring. The concentration of DRO measured in 2015 (1.6 mg/L) exceeded the groundwater cleanup level, up from a concentration of 1.3 mg/L measured in 2014. In addition, RRO concentrations increased by approximately 30% from 2014 to 2015. GRO, BTEX and PAH concentrations showed a decrease. Additional monitoring in subsequent years may establish a clearer trend for all POL analytes.

Well 14MW03

Well 14MW03 was installed during 2014 in a previously excavated and backfilled area (Site 13 B2 petroleum excavation area and Site 13 PCB-contaminated soil removal area) with 5 feet of the well screen placed in the clean backfill; the bottom 5 feet of the well screen was placed below the deepest excavation depth reached in this area. The sample collected during the 2015 event contained GRO at 0.12 mg/L, DRO at 1.3 mg/L, RRO at 0.041 mg/L (J-flagged), and methane at 0.088 mg/L. These results indicate groundwater in the vicinity of this well has been impacted by petroleum. The groundwater sample from this well contained a relatively low DO concentration of 0.37 mg/L and a negative ORP (-193.9 mV). Groundwater collected from this well also contained ferrous iron (2.17 mg/L) and dissolved manganese (0.4 mg/L). Groundwater in the vicinity of this well appears to be in an anaerobic state and methanogenesis appears to be occurring. POL-associated analyte comparisons between 2014 and 2015 indicate a DRO reduction from 2.3 mg/L in 2014 to 1.3 mg/L in 2015, a 45% reduction. The 2015 DRO result is less than the 1.5 mg/L site-specific groundwater cleanup level. Analytical results of the 2014 event had detections of all BTEX analytes, as well as PAHs detections including naphthalene, 1-methylnaphthylene, 2-methylnaphtylene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, pyrene, and phenanthrene, all of which were below applicable cleanup levels. The 2015 results also exhibited detections for most of the 2014 POL-related analytes, with the exception of benzene, o-xylene and toluene, PAHs 1-methylnaphthylene, 2-methylnaphtylene, acenaphthylene, anthracene, fluoranthene, pyrene, and phenanthrene. RRO results were nearly 20 times less in 2015 than 2014. Although reductions of POL-associated analytes occurred from 2014 to 2015, two data points are insufficient to consider this a definitive decreasing trend. Additional monitoring in subsequent years may establish a clearer trend for groundwater analytes.

Well 14MW04

Well 14MW04 was installed during 2014 in a previously excavated area north of the MOC perimeter road near the Site 28 boundary. The sample collected during 2015 indicated concentrations of DRO at 1.6 mg/L (QN and QL flagged) and 2.8 mg/L (QN flagged) and RRO at 0.18 mg/L (QN and QL flagged) and 0.37 mg/L (QN flagged); these were field QC duplicates of each other. Methane was detected at 0.11 mg/L and 0.1 mg/L in the field QC duplicate samples. While metal results had good agreement between field duplicates, there was a large variation between field duplicates for DRO and RRO. Six PAHs were detected in 2014 below established Table C Groundwater Cleanup Levels identified in *18 AAC 75.345* (ADEC, 2014), but only three were detected in the duplicate samples in 2015. None were above established groundwater cleanup levels. The DO concentration was measured at 1.05 mg/L and ORP was -118.1 mV. Groundwater in the vicinity of this well appears to be impacted by petroleum, in an anaerobic state, and methanogenesis appears to be occurring. ORP decreased from 27.3 mV in 2014 to -118.1 mV in 2015. DO concentrations increased from 0.33 mg/L in 2014 to 1.5 mg/L in 2015. Methane concentration also increased from 0.025 mg/L to 0.11 mg/L from 2014 to 2015. The 2014 sample was collected shortly after well installation; therefore, the difference observed in MNA data between 2014 and 2015 may reflect ongoing stabilization of groundwater in the vicinity of the well. Additional monitoring in subsequent years may establish a clearer trend for groundwater analytes.

Well 14MW05

Well 14MW05 was also installed during 2014 in a previously excavated area north of the MOC perimeter road near the Site 28 boundary. The 2015 groundwater sampling results exhibited concentrations of GRO at 0.13 and 0.11 mg/L (field QC duplicates), DRO at 12 and 11 mg/L, RRO at 0.51 and 0.28 mg/L (QN flagged-duplicates), and methane at 0.99 and 0.120 mg/L. This sample contained the highest concentration of DRO of all wells sampled in 2015 and sheen was observed in the purge water. The 2015 DO concentration was measured at 0.32 mg/L and the ORP value was 31.8 mV. Groundwater in proximity to this well is impacted by petroleum, is in an anaerobic state, and methanogenesis is occurring. The DRO concentration increased from 4.9 mg/L measured in 2014 to a concentration of 12 mg/L in 2015. This increase may be attributed to ongoing stabilization of groundwater conditions in the vicinity of the well. Additional monitoring in subsequent years may establish a clearer trend for groundwater analytes.

Well 14MW06

Well 14MW06 was installed in 2014 at Site 11 (former AST location) near the easterly side of the AST pads (Site 11) where a large documented fuel spill occurred during site operations. The petroleum-contaminated soil in this area was excavated and the excavation was backfilled in 2011 prior to monitoring well installation. The groundwater sample collected from well 14MW06 during the 2015 event contained GRO at 0.040 mg/L (J-flagged), DRO at 2.3 mg/L, RRO at 0.27 mg/L, and methane at 0.110 mg/L. No other POL associated analytes were detected in 2015. The 2015 sample exhibited a DO concentration of 0.18 mg/L and ORP of 24.9 mV. These data indicate that groundwater in proximity to this well has been impacted by petroleum contamination above groundwater cleanup levels, is in an anaerobic state, and methanogenesis is occurring. The 2014 sample results indicated concentrations of DRO at 5.2 mg/L, which is above the established site-specific/*18 AAC 75.345* groundwater cleanup level (1.5 mg/L), and eight PAHs that were detected below Table C Groundwater Cleanup Levels identified in *18 AAC 75.345* (ADEC, 2014). PAHs were not detected in 2015. Although two years of annual data cannot be considered a definitive trend, there was a year-to-year 55% reduction in the DRO concentrations measured in samples collected from this well. Additional monitoring in subsequent years may establish a clearer trend for groundwater analytes.

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8.0 PROJECT DEVIATIONS

All scoped work was performed in accordance with the *2014 Work Plan* (Bristol, 2014) and the *2015 Work Plan Addendum* (Bristol, 2015); however, an equipment blank was not collected during the field sampling effort in accordance with *ADEC Draft Field Sampling Guidance document* (ADEC, 2010).

The primary purposes of equipment blanks are to trace sources of artificially introduced contamination. The requirement for the collection of equipment blanks were unintentionally omitted from the approved Quality Assurance Project Plan (QAPP) provided as Appendix C of the *2014 Work Plan* (Bristol, 2014). Although disposable pump tubing was used, and although field personnel decontaminated the sampling pumps before the sampling of each well, field personnel inadvertently failed to collect equipment blanks from the pumps that were used during the 2015 sampling effort. This was a deviation from requirements listed in the *ADEC Draft Field Sampling Guidance* document (ADEC, 2010). Future groundwater sampling events should include the collection of equipment blanks as per ADEC guidance.

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9.0 MNA CONCLUSIONS

Section 2.5 of this report notes MOC groundwater likely originates as rain and snowmelt from the mountains which recharges the aquifer underlying the MOC. The water is likely aerated and becomes oxygen enriched as it cascades from the mountains as surface water before it infiltrates the soil and becomes groundwater. Groundwater data from the MOC monitoring well network indicate the groundwater naturally contains few nutrients such as nitrate and sulfate to act as terminal electron acceptors for beta-oxidation. Due to the natural lack of nutrients, DO is the primary terminal electron acceptor present in practical concentrations. DO levels measured in groundwater in the vicinity of wells located upgradient of the former fuel sources at the MOC indicates that DO concentrations are sufficient to support aerobic biodegradation of dissolved petroleum by microbial processes. It should be noted that measured and actual DO concentrations frequently differ as a result of measurement methodologies and practices. As a result, levels of DO measured in groundwater samples should not be used as the only line of evidence for the occurrence of MNA.

Wells 26MW1, 22MW2, 20MW1 and 14MW07 are considered the upgradient, or baseline, wells for groundwater MNA interpretation at the MOC. Samples collected from these three wells generally exhibit groundwater quality data typical of wells not impacted by petroleum: DO near saturation, relatively high ORP values, and no detectable methane. Wells MW88-10, MW88-1, MW88-3 are located upgradient of all POL impacted soil removal areas at the MOC, but generally exhibit groundwater quality data typical of wells impacted by petroleum: decreased DO and lower or negative ORP values relative to upgradient wells. Wells 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06 were installed within the foot print of POL soil excavation areas at the MOC. Samples collected from these ten wells generally exhibit groundwater quality data typical of wells impacted by petroleum: decreased DO and lower or negative ORP values relative to the upgradient wells. The presence of methane, and, in some cases, the presence of ferrous iron and dissolved manganese, which are byproducts of anaerobic microbial respiration, appears to indicate that these wells are generally in an anaerobic state.

Wells 17MW1, 14MW01, and MW10-1 are located crossgradient to soil removal areas at the MOC. Samples collected from well 17MW1 have exhibited groundwater quality data typical of groundwater not impacted by petroleum: DO near saturation, relatively high ORP values, and no methane present. Samples collected from well MW10-1 have exhibited groundwater quality data typical of groundwater impacted by petroleum: decreased DO and ORP relative to the upgradient wells, the presence of methane, and, in several instances in data from previous monitoring events, the presence of ferrous iron and dissolved manganese, which are byproducts of microbial respiration. Releases from drums removed from Site 10 may be the source of POL constituent detections in samples collected from well MW10-1. Well MW10-1 is downgradient of Site 10 as shown on Figure 6.

Groundwater data collected to date from the MOC monitoring well network appears to indicate that as groundwater containing naturally elevated levels of DO and high ORP moves downgradient through the MOC, DO concentrations and ORP values generally decrease as dissolved petroleum concentrations increase, resulting in a reducing (i.e., anaerobic) environment. There are no wells located downgradient of the source area wells because permanent wells cannot be installed in the Site 28 wetland. Heaving soils within Site 28 expand and contract as they freeze and thaw. The freeze/thaw action would destroy any wells installed in Site 28. Historic surface water samples collected from Site 28 have not exhibited petroleum levels above applicable surface water cleanup levels listed in the *2009 NE Cape Decision Document* (USACE, 2009), or evaluation criteria listed in the *Water Quality Standards for Designated Uses Table found in Title 18 of the Alaska Administrative Code (AAC), Chapter 70, Section 020 (18 AAC 70.020) Water Quality*

Standards (ADEC, 2012). Surface water cleanup criteria include total aqueous hydrocarbons (TAqH) in the water column below 15 micrograms per liter (μg/L), total aromatic hydrocarbons (TAH) in the water column below 10 μg/L, and a sheen must not be visible on the water surface or adjoining shoreline.

MNA parameters measured in groundwater in the vicinity of source area well 14MW06 during 2015 gave the strongest indication that natural degradation of dissolved petroleum may be occurring. The low DO concentration and negative ORP exhibited in the groundwater sample collected from 14MW06 suggest that groundwater in the vicinity of the well, that was likely to have been previously (i.e., before the fuel spill) in an aerobic state, has since become anaerobic and methanogenesis is occurring. Comparatively high levels of ferrous iron and dissolved manganese indicate microbial respiration is occurring.

Wells 14MW04 and 14MW05 were installed during 2014 in close proximity to former wells MW88-4 and MW88-5 which were removed in 2012 as a result of POL-contaminated soil excavation activities. Groundwater samples from well MW88-4 had an average DO concentration of 0.43 mg/L and ORP concentration of -70.0 mV from 2010 to 2012. Groundwater samples from well MW88-5 had an average DO concentration of 0.63 mg/L and ORP of-65.0 mV. This previous data collected from wells MW88-4 and MW88-5 appears to indicate that the groundwater has been impacted by petroleum and is in an anaerobic state. Based on 2014 samples, groundwater in the vicinity of wells 14MW04 and 14MW05 also appeared to be impacted by petroleum and was in an anaerobic state.

The groundwater sample collected from well 14MW07 during 2014 contained total lead at 0.13 mg/L and the 2015 result was 0.069 mg/L. Dissolved lead was not detected at the LOQ of 0.002 mg/L in 2015. The Table C Groundwater Cleanup Level, identified in *18 AAC 75.345* (ADEC, 2014), for total lead is 0.015 mg/L. There is no known anthropogenic source of lead in the vicinity of this well, so the source of lead in the groundwater is unclear.

Analytical results for samples collected in 2015 from wells 14MW02, 14MW04, 14MW05 and 14MW06 contained concentrations of DRO that exceeded the groundwater cleanup level of 1.5 mg/L, identified in both Table 1 of the *2009 NE Cape Decision Document* (USACE, 2009) and in Table C of *18 AAC 75.345* (ADEC, 2014), and exhibited MNA parameters that indicated groundwater in the vicinity of the wells is in an anaerobic state and methanogenesis is occurring. Comparatively high levels of ferrous iron and dissolved manganese indicate microbial respiration is occurring. It is unclear whether or not microbial respiration is reducing dissolved petroleum concentrations over time. A determination of whether or not petroleum constituents are being degraded by naturally occurring microbes and the natural attenuation rate will be made after at least three years' of annual groundwater data have been collected.

The CDQR, which includes verification of analytical results and an explanation of data flags, are presented in Appendix G. Attachments to the CDQR include a sample summary table, a completed ADEC Data Review Checklist, copies of laboratory variance requests, chemist correspondence, and copies of current laboratory certifications. All analytical results met usability requirements and those results were capable of supporting project making decisions.

10.0 RECOMMENDATIONS

Analytical results from several of the wells (14MW02, 14MW04, 14MW05, and 14MW06) continue to contain DRO concentrations that exceed the site-specific/*18 AAC 75.345* groundwater cleanup level of 1.5 mg/L. One well (14MW03) contained a concentration of total lead at the site-specific/*18 AAC 75.345* groundwater cleanup level of 0.015 mg/L; however, the concentration of dissolved lead was 0.00049 J which is below the site-specific/18 AAC 75.345 groundwater cleanup level.

Seven of the wells sampled during the 2015 sampling event were installed and sampled for the first time in 2014. At least three years' worth of annual groundwater data must be collected to determine whether or not petroleum constituents are being degraded by naturally occurring microbes or attenuating by other processes. Bristol recommends continued MNA sampling of the 15 monitoring wells present at the MOC until Remedial Action Objectives (RAOs) listed in the *2009 NE Cape Decision Document* (USACE, 2009) are met.

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11.0 REFERENCES

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FIGURES

Drawing: G:\JOBS\34140087_NORTHEAST_CAPE\2015 GROUNDWATER SAMPLING REPORT REV1\MAPS\FIGURE1.DWG - Layout: 8.5 X 11
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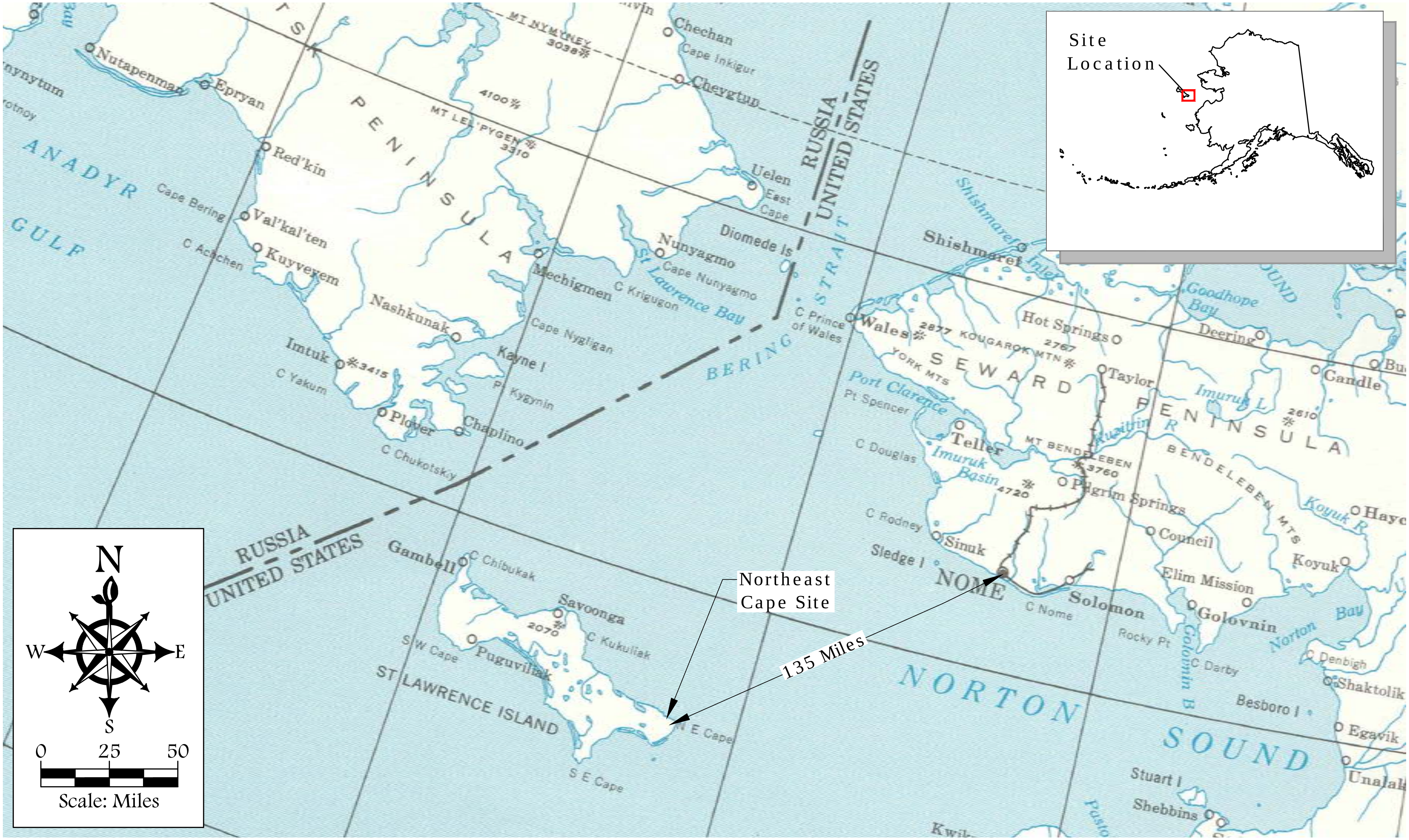
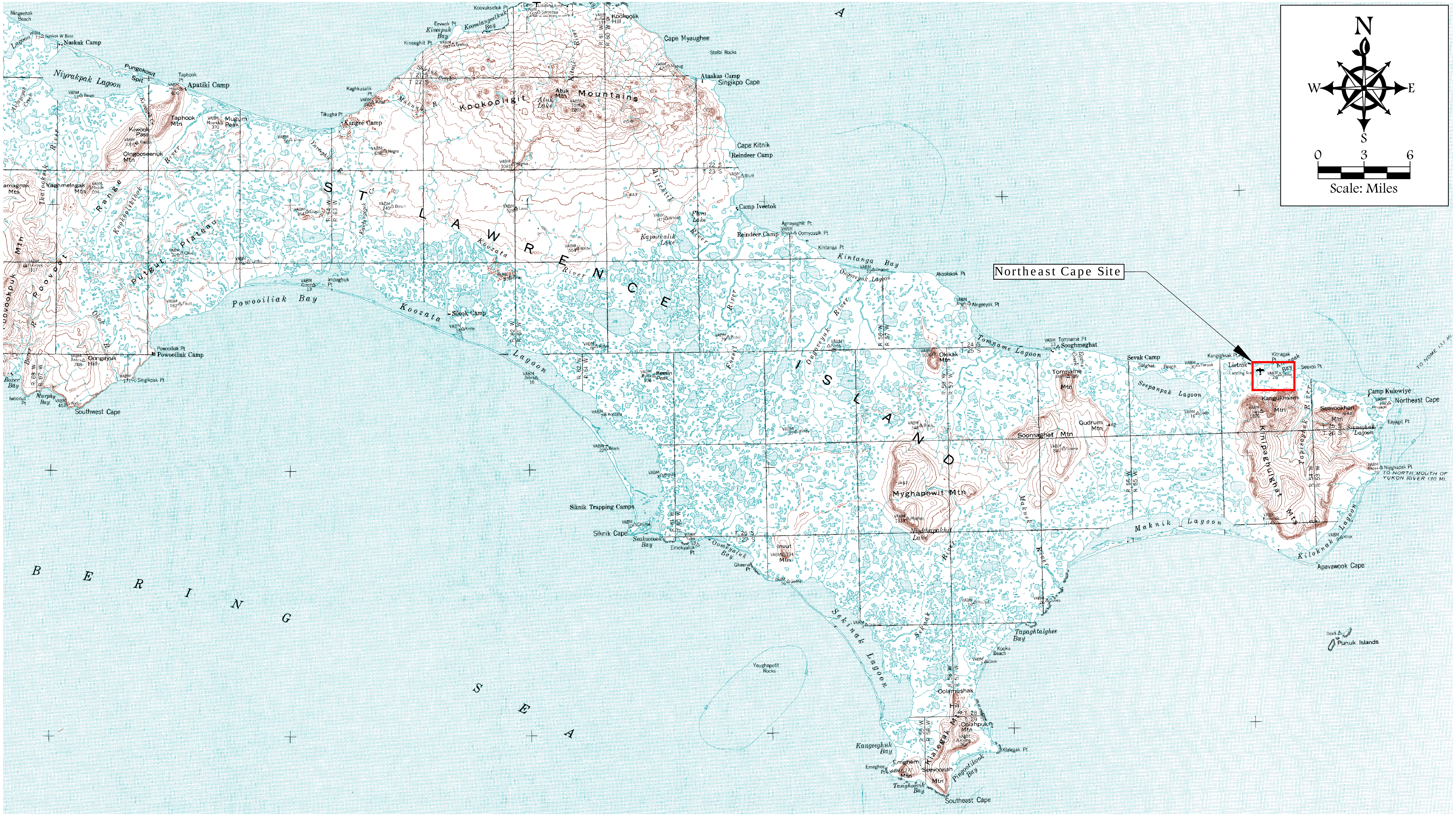


Note:
FUDS   formerly used defense site

Source:
USGS National Atlas Sheet Number 42-43

FIGURE 1
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
NORTHEAST CAPE FUDS
VICINITY MAP

DATUM:	N/A
PROJECTION:	N/A
Project No.	34140087
DATE	02/13/2014
DWN.	NAP
SCALE	1" = 50 mi
APPRVD.	RJ



Note:

FUDS formerly used defense site

FIGURE 2

NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA

NORTHEAST CAPE FUDS

LOCATION MAP

DATUM:	NAD 27
PROJECTION:	UTM 2N M
Project No.	34140087
DATE	02/13/2014
DWN.	NAP
SCALE	1" = 6 mi
APPRVD.	RJ

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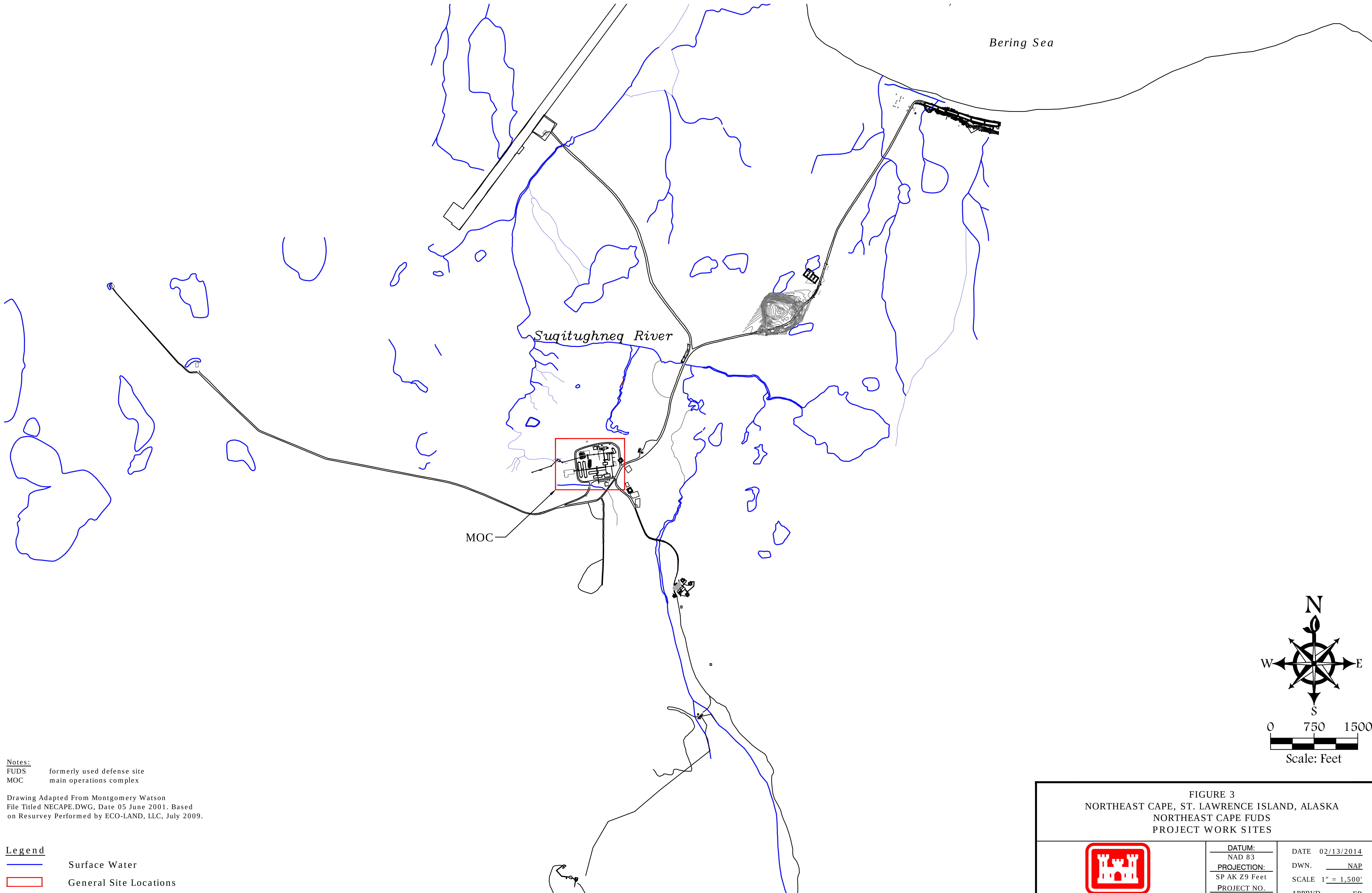


Notes:
FUDS formerly used defense site
MOC main operations complex

Drawing Adapted From Montgomery Watson
File Titled NECAPE.DWG, Date 05 June 2001. Based
on Resurvey Performed by ECO-LAND, LLC, July 2009.

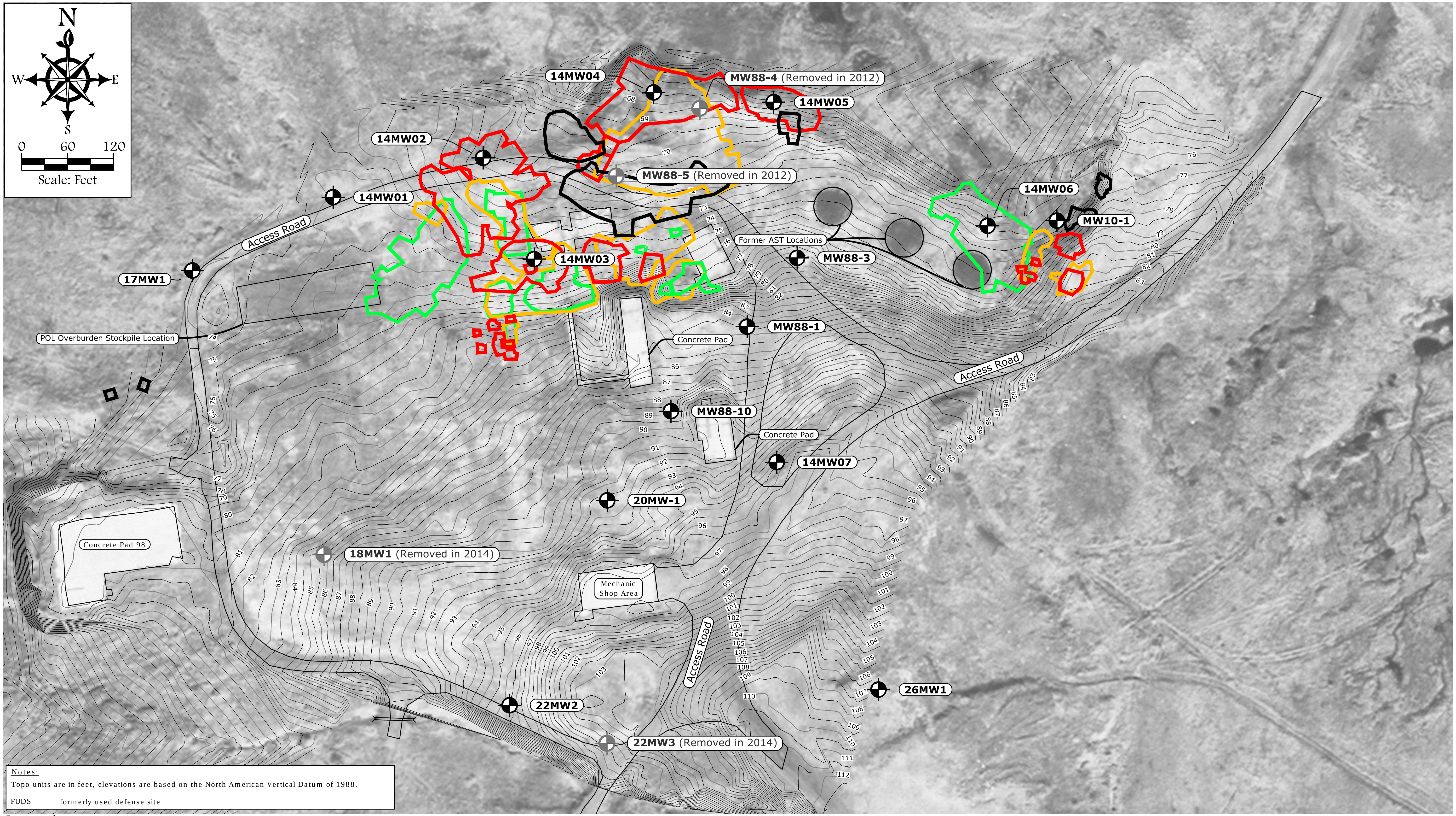
Legend

Surface Water

General Site Locations

FIGURE 3
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
NORTHEAST CAPE FUDS
PROJECT WORK SITES

DATUM: NAD 83	DATE	02/13/2014
PROJECTION: SP AK Z9 Feet	DWN.	NAP
PROJECT NO. 34140087	SCALE	1" = 1,500'
	APPRVD.	EB



Notes:

Topo units are in feet, elevations are based on the North American Vertical Datum of 1988.

FUDS formerly used defense site

Legend

- 2015 Monitoring Well Sample Location
- Decommissioned Monitoring Well Location
- Secondary Topographic Contours
- 73 Primary Topographic Contours and Ground Elevation
- 2011 Excavation
- 2012 Excavation
- 2013 Excavation
- 2014 Excavation

FIGURE 4
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
NORTHEAST CAPE FUDS
HISTORICAL EXCAVATION EXTENTS AT THE MOC AND GROUNDWATER MONITORING WELL LOCATIONS

DATUM: NAD 83	DATE 01/23/2015
PROJECTION: STATE PLANE AK 9	DWN. NAP
PROJECT NO. 34140087	SCALE 1"=120'
	APPRVD. EB

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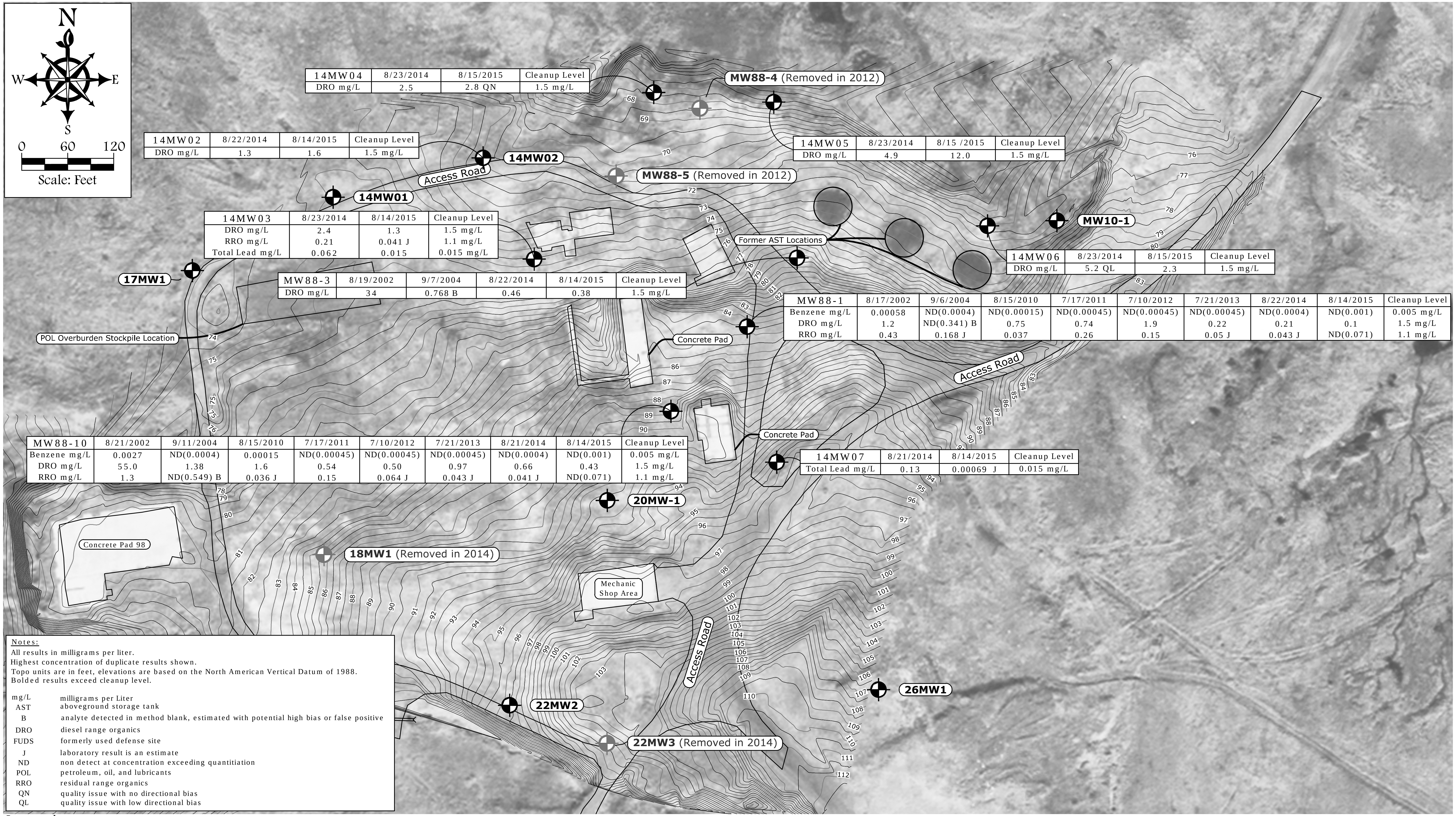

14MW04	8/23/2014	8/15/2015	Cleanup Level
DRO mg/L	2.5	2.8 QN	1.5 mg/L

14MW02	8/22/2014	8/14/2015	Cleanup Level
DRO mg/L	1.3	1.6	1.5 mg/L

14MW05	8/23/2014	8/15 /2015	Cleanup Level
DRO mg/L	4.9	12.0	1.5 mg/L

14MW03	8/23/2014	8/14/2015	Cleanup Level
DRO mg/L	2.4	1.3	1.5 mg/L
RRO mg/L	0.21	0.041 J	1.1 mg/L
Total Lead mg/L	0.062	0.015	0.015 mg/L

14MW06	8/23/2014	8/15/2015	Cleanup Level
DRO mg/L	5.2 QL	2.3	1.5 mg/L

MW88-3	8/19/2002	9/7/2004	8/22/2014	8/14/2015	Cleanup Level
DRO mg/L	34	0.768 B	0.46	0.38	1.5 mg/L

MW88-1	8/17/2002	9/6/2004	8/15/2010	7/17/2011	7/10/2012	7/21/2013	8/22/2014	8/14/2015	Cleanup Level
Benzene mg/L	0.00058	ND(0.0004)	ND(0.00015)	ND(0.00045)	ND(0.00045)	ND(0.00045)	ND(0.0004)	ND(0.001)	0.005 mg/L
DRO mg/L	1.2	ND(0.341) B	0.75	0.74	1.9	0.22	0.21	0.1	1.5 mg/L
RRO mg/L	0.43	0.168 J	0.037	0.26	0.15	0.05 J	0.043 J	ND(0.071)	1.1 mg/L

MW88-10	8/21/2002	9/11/2004	8/15/2010	7/17/2011	7/10/2012	7/21/2013	8/21/2014	8/14/2015	Cleanup Level
Benzene mg/L	0.0027	ND(0.0004)	0.00015	ND(0.00045)	ND(0.00045)	ND(0.00045)	ND(0.0004)	ND(0.001)	0.005 mg/L
DRO mg/L	55.0	1.38	1.6	0.54	0.50	0.97	0.66	0.43	1.5 mg/L
RRO mg/L	1.3	ND(0.549) B	0.036 J	0.15	0.064 J	0.043 J	0.041 J	ND(0.071)	1.1 mg/L

14MW07	8/21/2014	8/14/2015	Cleanup Level
Total Lead mg/L	0.13	0.00069 J	0.015 mg/L

Notes:

All results in milligrams per liter.
Highest concentration of duplicate results shown.
Topo units are in feet, elevations are based on the North American Vertical Datum of 1988.
Bolded results exceed cleanup level.

mg/L	milligrams per Liter
AST	aboveground storage tank
B	analyte detected in method blank, estimated with potential high bias or false positive
DRO	diesel range organics
FUDS	formerly used defense site
J	laboratory result is an estimate
ND	non detect at concentration exceeding quantitiation
POL	petroleum, oil, and lubricants
RRO	residual range organics
QN	quality issue with no directional bias
QL	quality issue with low directional bias

Legend

- 2015 Monitoring Well Sample Location
- Decommissioned Monitoring Well Location
- Secondary Topographic Contours
- 73 Primary Topographic Contours and Ground Elevation

FIGURE 5
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
NORTHEAST CAPE FUDS
2015 GROUNDWATER SAMPLING RESULTS
EXCEEDING ESTABLISHED CLEANUP LEVELS

DATUM: NAD 83
PROJECTION: STATE PLANE AK 9
PROJECT NO. 34140087

DATE 01/23/2015
DWN. NAP
SCALE 1"=120'
APPRVD. EB

Drawing: G:\JOBS\34140087_NORTHEAST_CAPE\2015 GROUNDWATER SAMPLING REPORT REV1\MAPS\FIGURES.DWG - Layout: 11X17
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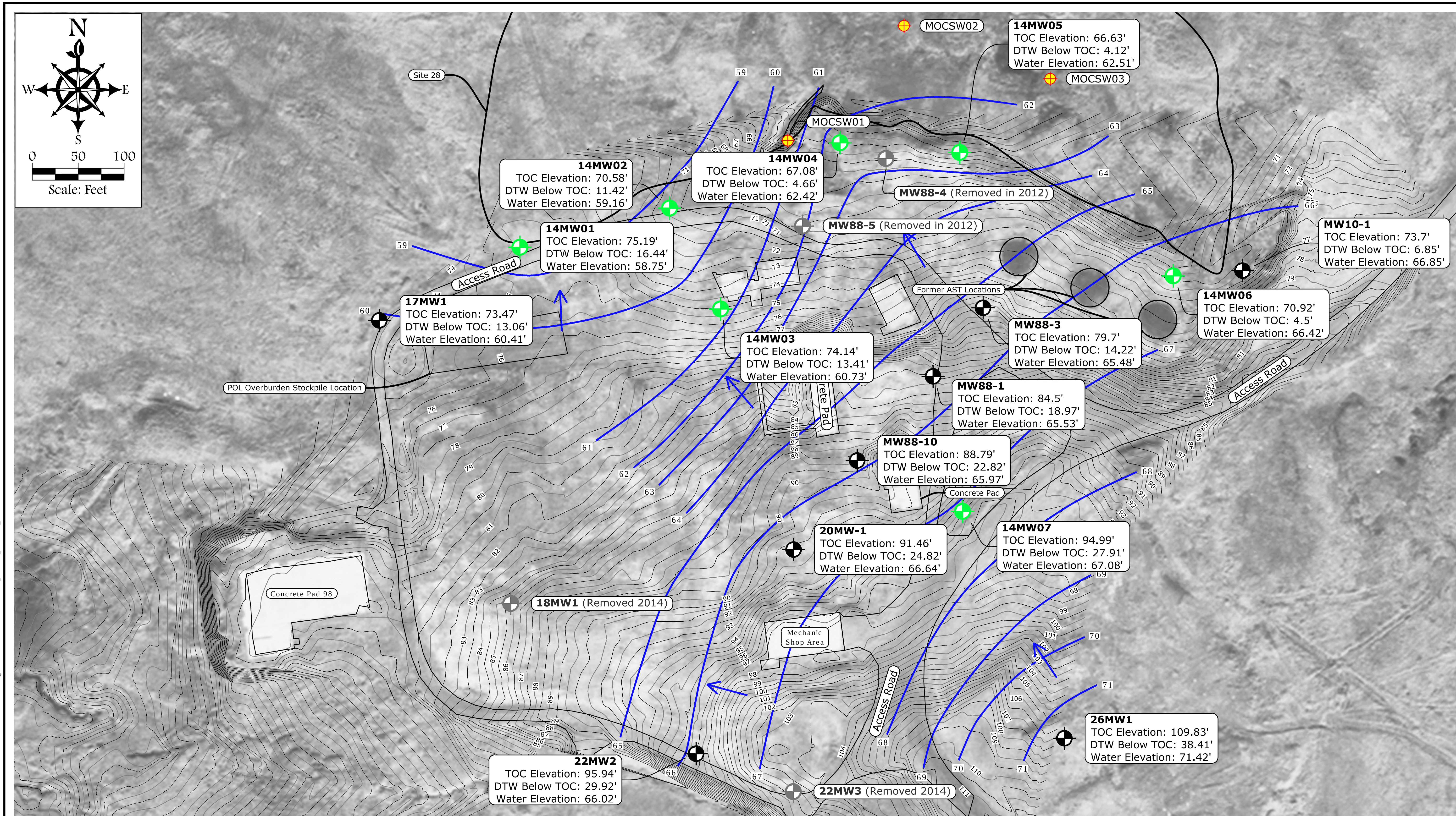

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Legend

- Monitoring Well Installed prior to 2014
- Monitoring Well Installed in 2014
- Decommissioned Monitoring Well Location
- Site 28 Surface Water Sample Location
- Secondary Topographic Contours
- 73 Primary Topographic Contours and Ground Elevation
- Groundwater Flow Direction

Notes:

'	foot/feet
AST	aboveground storage tank
DTW	depth to water
FUDS	formerly used defense site
POL	petroleum, oil, and lubricants
TOC	top of casing

Groundwater elevation data was collected on 7/19/2013.
Topo units are in feet, elevations are based on the North American Vertical Datum of 1988.

FIGURE 6
NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA
NORTHEAST CAPE FUDS
2015 MOC POTENTIOMETRIC SURFACE MAP

DATUM:	NAD 83
PROJECTION:	STATE PLANE AK 9
PROJECT NO.	34140087
DATE	12/18/2015
DWN.	NAP
SCALE	1"=100'
APPRVD.	LK

APPENDIX A

Right-of-Entry Permit and
Daily Quality Control Reports

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
ENVIRONMENTAL ENGINEERING SECTION (EN-EE)
P.O. BOX 6898
JBER, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

01 May 2013

Environmental Engineering Section C-0004

SUBJECT: Northeast Cape Right of Entry Documents, Contract W911KB-13-C-0004, NE Cape HTRW Remedial Action (FY13), Northeast Cape, St. Lawrence Island, Alaska

Bristol Environmental Remediation Services
111 W. 16th Avenue, Suite 301
Anchorage, AK 99501

Gentlemen:

The purpose of this letter is to deliver Northeast Cape Right of Entry (ROE) documents recently signed by members of Kukulget, Inc. and Sivuqaq, Inc. All personnel (contractor, subcontractors, government, and other visitors) working on the project should be made aware of and adhere to the conditions in the ROE documents. Please include the ROE documents in the 2013 Work Plan.

If you have any questions, please contact the undersigned at 753-5789.

Sincerely,

Ronald S. Broyles
Contracting Officer's Representative

DEPARTMENT OF THE ARMY
RIGHT-OF-ENTRY FOR
ENVIRONMENTAL ASSESSMENT AND RESPONSE

The undersigned, hereinafter called the "**Owner**", in consideration of the mutual benefits of the work described below, hereby grants to the **UNITED STATES OF AMERICA**, hereinafter called the "Government", a right-of-entry upon the following terms and conditions:

1. The Owner hereby grants to the Government an irrevocable right to enter in, on, over and across the land described herein, for a period not to exceed five (5) years, **beginning June 1, 2013**, and terminating upon the earlier completion of remediation or the filling of a notice of termination in the local land records by the representative of the United States in charge of the Saint Lawrence Island remediation project, for use by the United States, its representatives, agents, contractors, and assigns, as a work area for environmental investigation and response**;** including the right to store, move, and remove equipment and supplies; erect and remove temporary structures on the land; investigate and collect samples; excavate and remove ordnance and explosive waste, pollutants, hazardous substances, contaminated soils, containerized waste, and replace with uncontaminated soil; excavate and remove all storage tanks (above, at and below ground level), contents and appurtenant piping; demolish and dispose of former military structures and debris; construct, operate, maintain, alter, repair and remove groundwater monitoring wells, groundwater purification and injection systems, appurtenances thereto and other devices for the monitoring and treatment of contamination in soil, air and water; and perform any other such work which may be necessary and incident to the Government's use for the environmental investigation and response on said lands; subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowner(s), their heirs, executors, administrators, successors and assigns, all such right, title, interest and privilege as may be used and enjoyed without interfering with or abridging the rights and right-of-entry hereby acquired.

2. The Owner also grants the right to enter and exit over and across any other lands of the Owner as necessary to use the described lands for the purposes listed above.

3. All tools, equipment, and other property taken upon or placed upon the land by the Government shall remain the property of the Government and may be removed by the Government at any time within a reasonable period after the expiration of this permit or right-of-entry.

4. Upon expiration or termination of this right-of-entry, the Government shall assure restoration of the ground contour and replace any pavement or other cover which was removed or damaged for this work, establish a groundcover of grass on areas not otherwise covered and reconnect any operating utility lines which were required to be disconnected or otherwise disrupted.

5. If any action of the Government's employees or agents in the exercise of this right-of-entry results in damage to the real property, the Government will, in its sole discretion, either repair such damage or make an appropriate settlement with the Owner. In no event shall such repair or settlement exceed the fair market value of the fee title to the real property at the time immediately preceding such damage. The Government's liability under this clause is subject to the availability of appropriations for such payment, and nothing contained in this agreement may be considered as implying that Congress will at a later date appropriate funds sufficient to meet any deficiencies. The provisions of this clause are without prejudice to any rights the Owner may have to make a claim under applicable laws for any damages other than those provided for herein.

6. The land affected by this right-of-entry is located in the State of Alaska, and is described as follows:

All surface and subsurface rights on Saint Lawrence Island, Alaska, within;
Township 25 South, Range 54 West, Kateel River Meridian

WITNESS MY HAND AND SEAL this 24 day of April, 2013.

Kukulget, Inc.

Authorized Signature

Morris Toolie, Jr. - President

P.O. Box 160
Savoonga, Alaska 99769

(907) 984-6184

Sivuqaq, Inc.

Authorized Signature

Rodney Ungwiluk, Jr. – President

P.O. Box 101
Gambell, AK 99742

907) 985-5826

UNITED STATES OF AMERICA

Thomas M. Kretzschmar
Chief, Real Estate Division
US Army Engineer District, AK
P.O. Box 6898
JBER, Alaska 99506-0898
FAX 907-753-1836

5. If any action of the Government's employees or agents in the exercise of this right-of-entry results in damage to the real property, the Government will, in its sole discretion, either repair such damage or make an appropriate settlement with the Owner. In no event shall such repair or settlement exceed the fair market value of the fee title to the real property at the time immediately preceding such damage. The Government's liability under this clause is subject to the availability of appropriations for such payment, and nothing contained in this agreement may be considered as implying that Congress will at a later date appropriate funds sufficient to meet any deficiencies. The provisions of this clause are without prejudice to any rights the Owner may have to make a claim under applicable laws for any damages other than those provided for herein.

6. The land affected by this right-of-entry is located in the State of Alaska, and is described as follows:

All surface and subsurface rights on Saint Lawrence Island, Alaska, within;
Township 25 South, Range 54 West, Kateel River Meridian

WITNESS MY HAND AND SEAL this 20th day of April, 2013.

Kukulget, Inc.

Authorized Signature

Morris Toolie, Jr. - President

P.O. Box 160
Savoonga, Alaska 99769

(907) 984-6184

Sivuqaq, Inc.

Archie Ungwiluk

Authorized Signature

Archie Ungwiluk, President

P.O. Box 101
Gambell, AK 99742

907) 985-5826

UNITED STATES OF AMERICA

Thomas M. Kretzschmar

Thomas M. Kretzschmar
Chief, Real Estate Division
US Army Engineer District, AK
P.O. Box 6898
JBER, Alaska 99506-0898
FAX 907-753-1836


Gambell
Northeast Cape
ST. LAWRENCE ISLAND
Alaska
Northwest Cape
Savoonga
Kookoolik
Kookooligit Mountains
Aghsit Point
Vngyat Point
Tatik Point
Ivekan Mt.
Boxer Bay
Southwest Cape
Powooiliak Camp
Siknik Cape
Kialegak Mts.
Southeast Cape
Myghapowit Mt.
Kinipaghulghat Mts.
Apavawook Cape
Punuk Islands
Niyrakpak Lagoon
Makinik Lagoon
Monday
Sunday
Date Line
BERING
O. Ratmanova (Big Diomede I.) DIOMEDE IS.
Little Diomede I.
Fairway Rock
Wales
Tin City
Cape Prince of Wales
Lost River
Brevig Mission
Point Spencer
Port Clarence
Teller
York Mts.
King Island
Cape Douglas
Cape Woolley
Cape Rodney
Sinuk
Sledge Island
Nome
FORT DAVIS
Cape Nome
Solomon
Bluff
Dickson
Port Safety
Golovin
Elim
Golovin Mission
Moses Point
White Mountain
Council
Kigluaik Mts.
Pilgrim Springs
Bendeleben Mts.
Aurora
Limit of Wo Country
NORTON SOUND
Stuart Island
Stebbins
Point Romanof
Pikmiktalik
Kwikpak
Kotlik
Chaniliut
(Emanguk) Emmonak
Alakanuk
New Hamilton
Fish Village
Sheldon Point
Black
New Knockhock
Mountain Village
St. Marys
Krekatok
Lavrentiya
Lorino
Mys Nunyamo
Mys Kriguygun (Novosilskogo)
Mys Nygchigen
Omryl'kot
Yanrakynnot
Ostrov Arakamchechen
Ostrov Yttygran
Novoye Chaplino
Provideniya
Sireniki
Ureliki
Mys Chaplina
Mys Chukotskiy
Mys Stoletiya
170°43'00" W 169°33'00" W 168°23'00" W 167°13'00" W 166°03'00" W 164°53'00" W 163°43'00" W WGS84 161°31'00" W
0 25 50 75 100 miles
0 25 50 75 100 125 150 175 km
TN MN
06/20/0

Kukulget Inc.
P.O. Box 160
Savoonga, AK.
99769

Phone/Fax (907)-984-6184

April 23, 2013

Mr. Thomas M. Kretzschmar
Chief, Real Estate Division
US Army Engineer District, AK
P. O. B0x 6898
JBER, Alaska 99506-0898

Dear Mr. Kretzschmar:

The Board of Director's held a meeting April 5, 2013 and these items shall be considered for the upcoming project at Northeast Cape starting June 1, 2013:

1. Fishing only at the mouth of Tapisak River

2. There shall not be any beachcombing by project employees

3. There shall not be any 4 wheeler riding or any type of land mode transportation on Lands other than stated in the Project's use.

Thank you and please consider these issues as we did not revise the Right of Entry Contract with these additions.

Sincerely yours,

Morris Toolie, Jr.
President

DAILY QUALITY CONTROL REPORT
ENVIRONMENTAL QUALITY CONTROL/QUALITY ASSURANCE REPORT

(ER 415-1-302)

Contract No. / Delivery Order No.	UPC/Project Title and Location of Work
W911KB-14-D-0006 TO 0002	Northeast Cape HTRW Remedial Actions. Northeast Cape, St. Lawrence Island, Alaska.

CQC Report Number: NEC 2015-001
Date or Time Period: Date: Tuesday 8/11/2015
Client: USACE, Alaska District

Weather Conditions: Clouds with slight breeze

Temp 8:00 am: 45 °F- Temp 7:00 pm: 45 ºF

Southwest winds 10 – 20 mph.

Quality Control Inspections Performed This Date (Include inspections, results, deficiencies, and corrective action.)

Preparatory: No
Initial: No
Follow-up: No

Environmental Field Sampling and Testing

Has field testing been performed this date? Yes ☐ No ☒ N/A ☐

Type of Test	Method/Matrix	Quantity of Samples	Total
		0	0
		0	0
		0	0
		0	0

Have Data Quality Objectives been achieved? Yes ☐ No ☐ N/A ☒

Have Samples Been Collected for Laboratory Analysis? Yes ☒ No ☐ N/A ☐

Type of Test	EPA Test Method/Matrix	Daily Samples	Total Samples
DRO/RRO, GRO/BTEX, PAHs, PCBs, 8 RCRA metals (Site 9 surface waters)	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B		3 primary, 1 duplicate

Have QA and QC samples been collected in the specified quantity? Yes ☒ No ☐ N/A ☐
Have samples been properly labeled and packaged? Yes ☒ No ☐ N/A ☐
Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) Yes ☒ No ☐ N/A ☐
Have required amount of QC trip blanks and rinsates been achieved? Yes ☒ No ☐ N/A ☐

Health and Safety

Worker protection levels this date: Level C ☐ Level D ☐
Was any work activity conducted within a confined space? Yes ☐ No ☒ N/A ☐

Was any work activity conducted within an area determined to be immediately dangerous to life and health?	Yes ☐ No ☒ N/A ☐
Were approved decontamination procedures used on workers and equipment as required?	Yes ☒ No ☐ N/A ☐
Was a Job Safety Meeting held this day?	Yes ☒ No ☐ N/A ☐
Were there any "Lost Time" accidents this day? (If YES, attach copy of completed accident report)	Yes ☐ No ☒ N/A ☐
Was hazardous waste/material released into the environment?	Yes ☐ No ☒ N/A ☐

Safety Comments: (include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

A Health and Safety Meeting was held this day. Subjects discussed are as follows:

1. Airplane safety
2. General safety ; Slips trips and falls

Work Activities Performed This Date

Specification or Contract Reference	Activity and Location
General	1. Work started with a H & S meeting at 0800 hrs. 2. Work crew of three mobilized to St. Lawrence Island from Nome on Bring Air.
CLIN 0038: 2015 Monitored Natural Attenuation Sampling of Groundwater at the MOC	1. All MOC wells ; measured the water levels in each well
CLIN 0039: Landfill Cap Visual Inspections and Surface Water Sampling	1. Site 9 landfill surface water samples collected (3 duplicate and 1 MS/MSD) 2. Site 7 landfill inspection performed 3. Site 9 landfill inspection performed

Manpower and Equipment

Labor Classification	Number	Hours
PM—Greg Jarrell		
Site Supt./SSHO—Chuck Croley	1	12
CQCSM/Environmental sampler—Eric Barnhill	1	12
Geologist Lyndsey Kleppin	1	12
Environ. Sampler-Noyuk Peacock		
Hazardous Waste Specialist-Tyler Ellingboe		
Chemist – Marty Hannah		
Totals	3	36

Work Progress

Are there any Contractor-caused delays or potential finding of fact?	Yes ☐ No ☒
Are there any Government-caused delays or potential finding of fact?	Yes ☐ No ☒
Are there any unforeseeable or weather-related delays?	Yes ☐ No ☒

Progress Tracking Table

PROJECT SUMMARY TO DATE			
Item	**Today's Total (Units)**	**Previous Total**	**Project Total**
MOC Wells Sampling	---		
Site9 Surface Water sample	3	3	3
Site 7 Inspection	1	1	1
Site 9 Inspection	1	1	1

Comments/Remarks:

Definable Feature of Work	**Progress**
MOC Wells Sampling	5%
Site9 Surface Water sample	100%
Site 7 Inspection	100%
Site 9 Inspection	100%

Comments/Remarks:

The BERS Science crew mobilized to the site on Tuesday August 11, 2015. The crew was without a motorized vehicle. The crew finished the landfill inspections at Site 9 and Site 7 as well as the surface water samples at Site 9 and measured the water level of all of the MOC wells.

PHOTOS:

Site 7 Landfill in the distance and Site 9 landfill; View to the Northeast Photographer: E. Barnhill

Site 7 Landfill; View to the Northeast Photographer: E. Barnhill

MOC well 26 MW1 prior to water level meter reading. View: Down Photographer: E. Barnhill

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Contractor's Verification: On behalf of the Contractor, I certify that the above report is complete and correct and that all materials and equipment used, work performed, and tests conducted during this period were in strict compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

CQCSM Signature

August 12, 2015

Date

DAILY QUALITY CONTROL REPORT
ENVIRONMENTAL QUALITY CONTROL/QUALITY ASSURANCE REPORT

(ER 415-1-302)

Contract No. / Delivery Order No.	UPC/Project Title and Location of Work
W911KB-14-D-0006 TO 0002	Northeast Cape HTRW Remedial Actions. Northeast Cape, St. Lawrence Island, Alaska.

CQC Report Number: NEC 2015-002
Date or Time Period: Date: Wednesday 8/12/2015
Client: USACE, Alaska District

Weather Conditions: Clouds with slight breeze and rain.

Temp 8:00 am: 45 °F-   Temp 7:00 pm: 45 ºF

Southwest winds 10 – 20 mph.

Quality Control Inspections Performed This Date (Include inspections, results, deficiencies, and corrective action.)

Preparatory: No
Initial: No
Follow-up: No

Environmental Field Sampling and Testing

Has field testing been performed this date? Yes ☐ No ☒ N/A ☐

Type of Test	Method/Matrix	Quantity of Samples	Total
		0	0
		0	0
		0	0
		0	0

Have Data Quality Objectives been achieved? Yes ☐ No ☐ N/A ☒

Have Samples Been Collected for Laboratory Analysis? Yes ☒ No ☐ N/A ☐

Type of Test	EPA Test Method/Matrix	Daily Samples	Total Samples
DRO/RRO, GRO/BTEX, PAHs, PCBs, 8 RCRA metals (Site 9 surface waters)	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B		3 primary, 1 duplicate

Have QA and QC samples been collected in the specified quantity? Yes ☒ No ☐ N/A ☐
Have samples been properly labeled and packaged? Yes ☒ No ☐ N/A ☐
Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) Yes ☒ No ☐ N/A ☐
Have required amount of QC trip blanks and rinsates been achieved? Yes ☒ No ☐ N/A ☐

Health and Safety

Worker protection levels this date: Level C ☐ Level D ☐
Was any work activity conducted within a confined space? Yes ☐ No ☒ N/A ☐

Was any work activity conducted within an area determined to be immediately dangerous to life and health?	Yes ☐ No ☒ N/A ☐
Were approved decontamination procedures used on workers and equipment as required?	Yes ☐ No ☐ N/A ☒
Was a Job Safety Meeting held this day?	Yes ☒ No ☐ N/A ☐
Were there any "Lost Time" accidents this day? (If YES, attach copy of completed accident report)	Yes ☐ No ☒ N/A ☐
Was hazardous waste/material released into the environment?	Yes ☐ No ☒ N/A ☐

Safety Comments: (include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

Work Activities Performed This Date

Specification or Contract Reference	Activity and Location
General	1. The UTV rented for use on the site had unforeseen mechanical problems. The vehicle was slated to be repaired late enough in the day that traveling to the Island without a vehicle would have been extremely unproductive. The decision was made to stay in Nome and prepare for the next day.
CLIN 0038: 2015 Monitored Natural Attenuation Sampling of Groundwater at the MOC	1.
CLIN 0039: Landfill Cap Visual Inspections and Surface Water Sampling	1.

Manpower and Equipment

Labor Classification	Number	Hours
PM—Greg Jarrell		
CQCSM/Environmental sampler—Eric Barnhill	1	8
Geologist Lyndsey Kleppin	1	8
Environ. Sampler-Noyuk Peacock	1	8
Hazardous Waste Specialist-Tyler Ellingboe		
Chemist – Marty Hannah		
Totals	3	24

Work Progress

Are there any Contractor-caused delays or potential finding of fact?	Yes ☐ No ☒
Are there any Government-caused delays or potential finding of fact?	Yes ☐ No ☒
Are there any unforeseeable or weather-related delays?	Yes ☐ No ☒

Progress Tracking Table

PROJECT SUMMARY TO DATE			
Item	Today's Total (Units)	Previous Total	Project Total
MOC Wells Sampling	---		
Site9 Surface Water sample	3	3	3
Site 7 Inspection	1	1	1
Site 9 Inspection	1	1	1

Comments/Remarks:

Definable Feature of Work	Progress
MOC Wells Sampling	5%
Site9 Surface Water sample	100%
Site 7 Inspection	100%
Site 9 Inspection	100%

Comments/Remarks:

The UTV rented for use on the site had unforeseen mechanical problems. The vehicle was slated to be repaired late enough in the day that traveling to the Island without a vehicle would have been extremely unproductive. The decision was made to stay in Nome and prepare for the next day.

Contractor's Verification: On behalf of the Contractor, I certify that the above report is complete and correct and that all materials and equipment used, work performed, and tests conducted during this period were in strict compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

August 13, 2015

CQCSM Signature

Date

DAILY QUALITY CONTROL REPORT
ENVIRONMENTAL QUALITY CONTROL/QUALITY ASSURANCE REPORT

(ER 415-1-302)

Contract No. / Delivery Order No.	UPC/Project Title and Location of Work
W911KB-14-D-0006 TO 0002	Northeast Cape HTRW Remedial Actions. Northeast Cape, St. Lawrence Island, Alaska.

CQC Report Number: NEC 2015-003
Date or Time Period: Date: Thursday 8/13/2015
Client: USACE, Alaska District

Weather Conditions: Mostly Cloudy, slight breeze.

Temp 8:00 am: 45 °F   Temp 6:00 pm: 45 ºF

Southwest winds 10 – 15 mph.

Quality Control Inspections Performed This Date (Include inspections, results, deficiencies, and corrective action.)

Preparatory: No
Initial: No
Follow-up: No

Environmental Field Sampling and Testing

Has field testing been performed this date? Yes ☐ No ☒ N/A ☐

Type of Test	Method/Matrix	Quantity of Samples	Total
		0	0
		0	0
		0	0
		0	0

Have Data Quality Objectives been achieved? Yes ☐ No ☐ N/A ☒

Have Samples Been Collected for Laboratory Analysis? Yes ☒ No ☐ N/A ☐

Type of Test	EPA Test Method/Matrix	Daily Samples	Total Samples
DRO/RRO, GRO/BTEX, PAHs, PCBs, 8 RCRA metals (Site 9 surface waters)	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B		3 primary, 1 duplicate
DRO/RRO, GRO/BTEX, PAHs, VOCs, PCBs, 8 RCRA metals+ Nickel, vanadium and zinc	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B	5 Primary	5 primary (1 MS/MSD)

Have QA and QC samples been collected in the specified quantity? Yes ☒ No ☐ N/A ☐
Have samples been properly labeled and packaged? Yes ☒ No ☐ N/A ☐
Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) Yes ☒ No ☐ N/A ☐
Have required amount of QC trip blanks and rinsates been achieved? Yes ☒ No ☐ N/A ☐

Health and Safety

Worker protection levels this date: Level C ☐ Level D ☐

Was any work activity conducted within a confined space? Yes ☐ No ☒ N/A ☐

Was any work activity conducted within an area determined to be immediately dangerous to life and health? Yes ☐ No ☒ N/A ☐

Were approved decontamination procedures used on workers and equipment as required? Yes ☐ No ☐ N/A ☒

Was a Job Safety Meeting held this day? Yes ☒ No ☐ N/A ☐

Were there any "Lost Time" accidents this day? (If YES, attach copy of completed accident report) Yes ☐ No ☒ N/A ☐

Was hazardous waste/material released into the environment? Yes ☐ No ☒ N/A ☐

Safety Comments: (include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

Work Activities Performed This Date

Specification or Contract Reference	Activity and Location
General	1. The work crew mobilized to the site on Bering air charter. A UTV was sent to the site in a Casa cargo plane.
CLIN 0038: 2015 Monitored Natural Attenuation Sampling of Groundwater at the MOC	1. 5 wells were sampled. Samples include 5 primary samples and one QC sample
CLIN 0039: Landfill Cap Visual Inspections and Surface Water Sampling	

Manpower and Equipment

Labor Classification	Number	Hours
PM—Greg Jarrell		
CQCSM/Environmental sampler—Eric Barnhill	1	12.5
Geologist Lyndsey Kleppin	1	12.5
Environ. Sampler-Noyuk Peacock	1	12.5
Hazardous Waste Specialist-Tyler Ellingboe		
Chemist – Marty Hannah		
Totals	3	37.5

Work Progress

Are there any Contractor-caused delays or potential finding of fact? Yes ☐ No ☒

Are there any Government-caused delays or potential finding of fact? Yes ☐ No ☒

Are there any unforeseeable or weather-related delays? Yes ☐ No ☒

Progress Tracking Table

PROJECT SUMMARY TO DATE			
Item	**Today's Total (Units)**	**Previous Total**	**Project Total**
MOC Wells Sampling	5	0	5
Site9 Surface Water sample	3	3	3
Site 7 Inspection	1	1	1
Site 9 Inspection	1	1	1

Comments/Remarks:

Definable Feature of Work	Progress
MOC Wells Sampling	35%
Site9 Surface Water sample	100%
Site 7 Inspection	100%
Site 9 Inspection	100%

Comments/Remarks:

The work crew mobilized to the site on Bering air charter. A UTV was sent to the site in a Casa cargo plane.

5 wells were sampled. All wells were in good shape; no damage noted.

PHOTOS

Equipment and supplies prepared to overnight on the airstrip curtain; Downward view Photographer: E. Barnhill

UTV on airstrip curtain; close-up view Photographer: E. Barnhill

Contractor's Verification: On behalf of the Contractor, I certify that the above report is complete and correct and that all materials and equipment used, work performed, and tests conducted during this period were in strict compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

______________________________ August 14, 2015

CQCSM Signature Date

DAILY QUALITY CONTROL REPORT
ENVIRONMENTAL QUALITY CONTROL/QUALITY ASSURANCE REPORT
(ER 415-1-302)

Contract No. / Delivery Order No.	UPC/Project Title and Location of Work
W911KB-14-D-0006 TO 0002	Northeast Cape HTRW Remedial Actions. Northeast Cape, St. Lawrence Island, Alaska.

CQC Report Number: NEC 2015-004
Date or Time Period: Date: Friday 8/14/2015
Client: USACE, Alaska District

Weather Conditions: Mostly Cloudy, slight breeze.

Temp 8:00 am: 45 °F Temp 6:00 pm: 45 ºF

Southwest winds 10 – 15 mph.

Quality Control Inspections Performed This Date (Include inspections, results, deficiencies, and corrective action.)

Preparatory: No
Initial: No
Follow-up: No

Environmental Field Sampling and Testing

Has field testing been performed this date? Yes ☐ No ☒ N/A ☐

Type of Test	Method/Matrix	Quantity of Samples	Total
		0	0
		0	0
		0	0
		0	0

Have Data Quality Objectives been achieved? Yes ☐ No ☐ N/A ☒

Have Samples Been Collected for Laboratory Analysis? Yes ☒ No ☐ N/A ☐

Type of Test	EPA Test Method/Matrix	Daily Samples	Total Samples
DRO/RRO, GRO/BTEX, PAHs, PCBs, 8 RCRA metals (Site 9 surface waters)	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B		3 primary, 1 duplicate
DRO/RRO, GRO/BTEX, PAHs, VOCs, PCBs, 8 RCRA metals+ Nickel, vanadium and zinc	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B	5 Primary	5 primary (1 MS/MSD)

Have QA and QC samples been collected in the specified quantity? Yes ☒ No ☐ N/A ☐
Have samples been properly labeled and packaged? Yes ☒ No ☐ N/A ☐
Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) Yes ☒ No ☐ N/A ☐
Have required amount of QC trip blanks and rinsates been achieved? Yes ☒ No ☐ N/A ☐

Health and Safety

Worker protection levels this date: Level C ☐ Level D ☐

Was any work activity conducted within a confined space? Yes ☐ No ☒ N/A ☐

Was any work activity conducted within an area determined to be immediately dangerous to life and health? Yes ☐ No ☒ N/A ☐

Were approved decontamination procedures used on workers and equipment as required? Yes ☐ No ☐ N/A ☒

Was a Job Safety Meeting held this day? Yes ☒ No ☐ N/A ☐

Were there any "Lost Time" accidents this day? (If YES, attach copy of completed accident report) Yes ☐ No ☒ N/A ☐

Was hazardous waste/material released into the environment? Yes ☐ No ☒ N/A ☐

Safety Comments: (include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

Work Activities Performed This Date

Specification or Contract Reference	Activity and Location
General	1. The work crew mobilized to the site on Bering air charter.
CLIN 0038: 2015 Monitored Natural Attenuation Sampling of Groundwater at the MOC	1. 6 wells were sampled. Samples include 6 primary.
CLIN 0039: Landfill Cap Visual Inspections and Surface Water Sampling	

Manpower and Equipment

Labor Classification	Number	Hours
PM—Greg Jarrell		
CQCSM/Environmental sampler—Eric Barnhill	1	11.5
Geologist Lyndsey Kleppin	1	11.5
Environ. Sampler-Noyuk Peacock	1	11.5
Hazardous Waste Specialist-Tyler Ellingboe		
Chemist – Marty Hannah		
Totals	3	34.5

Work Progress

Are there any Contractor-caused delays or potential finding of fact? Yes ☐ No ☒

Are there any Government-caused delays or potential finding of fact? Yes ☐ No ☒

Are there any unforeseeable or weather-related delays? Yes ☐ No ☒

Progress Tracking Table

PROJECT SUMMARY TO DATE			
Item	**Today's Total (Units-Primary Samples)**	**Previous Total**	**Project Total**
MOC Wells Sampling	6	5	11
Site9 Surface Water sample	3	3	3
Site 7 Inspection	1	1	1
Site 9 Inspection	1	1	1

Comments/Remarks:

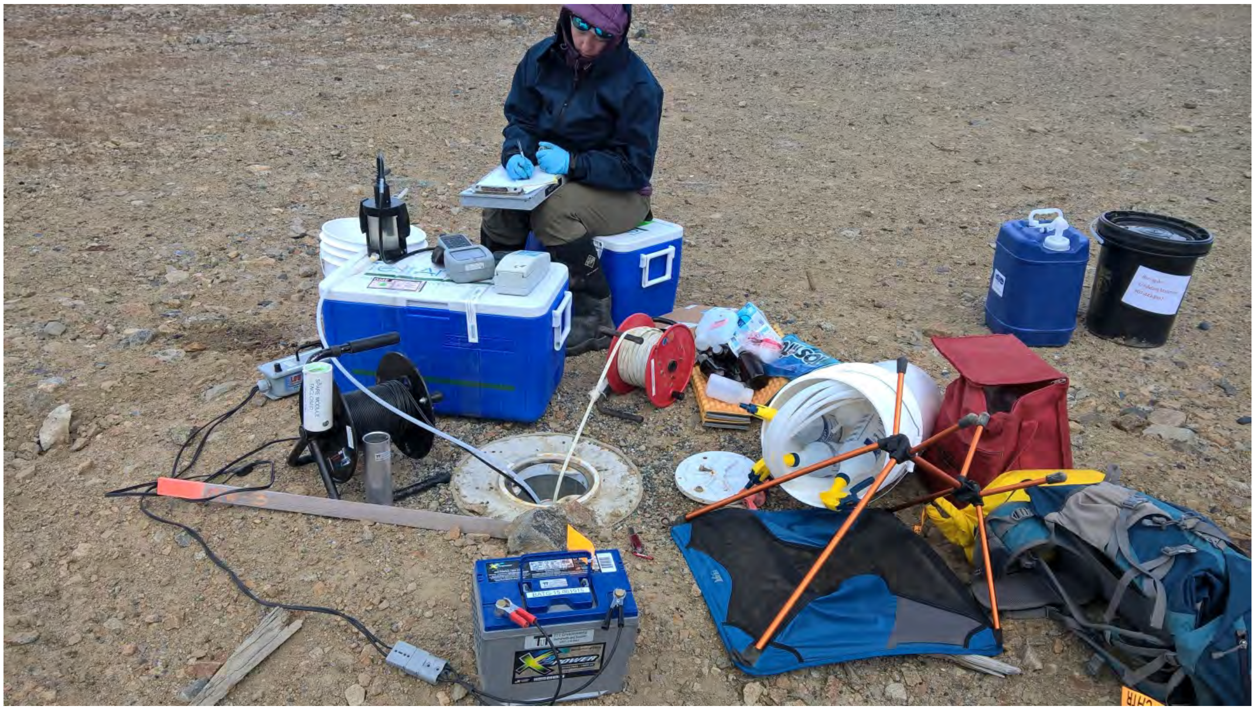
Definable Feature of Work	Progress
MOC Wells Sampling	75%
Site9 Surface Water sample	100%
Site 7 Inspection	100%
Site 9 Inspection	100%

Comments/Remarks:

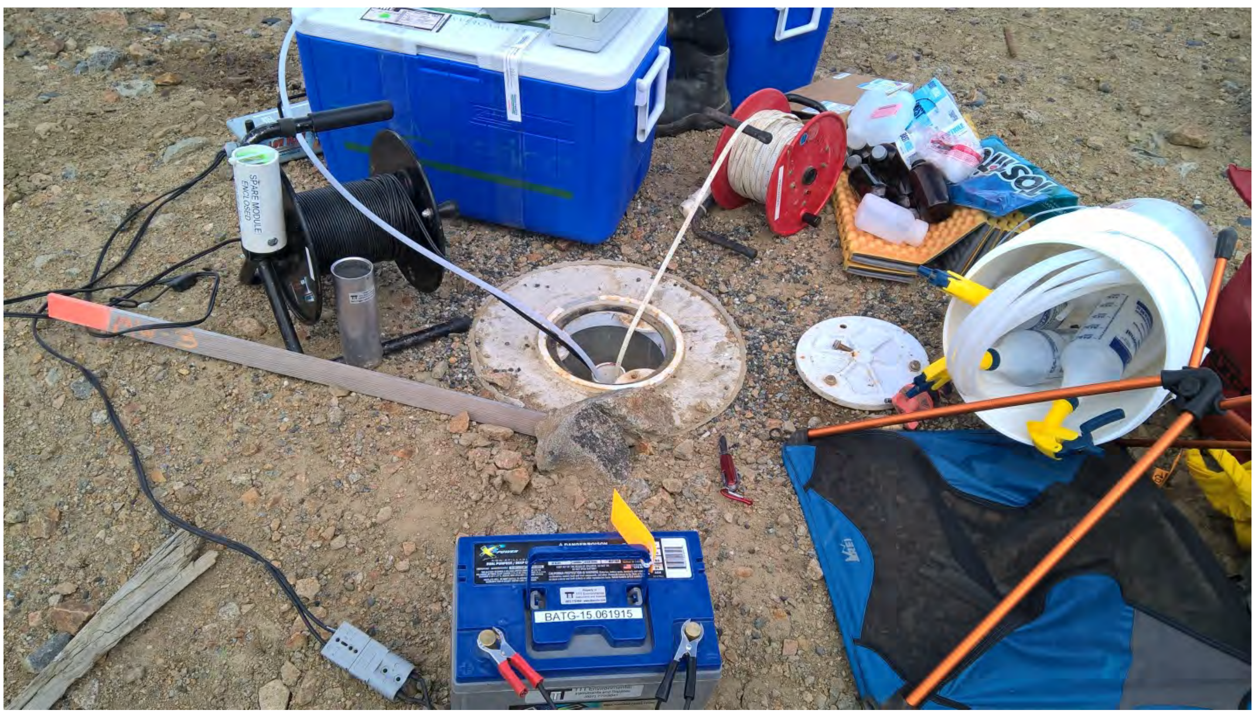
The work crew mobilized to the site on Bering air charter.

6 wells were sampled. All wells were in good shape; no damage noted.

PHOTOS



Groundwater sampling; Downward view Photographer: E. Barnhill



Groundwater sampling setup; close-up view Photographer: E. Barnhill

Contractor's Verification: On behalf of the Contractor, I certify that the above report is complete and correct and that all materials and equipment used, work performed, and tests conducted during this period were in strict compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

CQCSM Signature

Date: August 15, 2015

DAILY QUALITY CONTROL REPORT
ENVIRONMENTAL QUALITY CONTROL/QUALITY ASSURANCE REPORT

(ER 415-1-302)

Contract No. / Delivery Order No.	UPC/Project Title and Location of Work
W911KB-14-D-0006 TO 0002	Northeast Cape HTRW Remedial Actions. Northeast Cape, St. Lawrence Island, Alaska.

CQC Report Number: NEC 2015-005
Date or Time Period: Date: Saturday 8/15/2015
Client: USACE, Alaska District

Weather Conditions: Cloudy, fog, rain, slight breeze.

Temp 8:00 am: 45 °F

Temp 6:00 pm: 45 ºF

Southwest winds 10 – 15 mph

Quality Control Inspections Performed This Date (Include inspections, results, deficiencies, and corrective action.)

Preparatory: No
Initial: No
Follow-up: No

Environmental Field Sampling and Testing

Has field testing been performed this date? Yes ☐ No ☒ N/A ☐

Type of Test	Method/Matrix	Quantity of Samples	Total
		0	0
		0	0
		0	0
		0	0

Have Data Quality Objectives been achieved? Yes ☐ No ☐ N/A ☒

Have Samples Been Collected for Laboratory Analysis? Yes ☒ No ☐ N/A ☐

Type of Test	EPA Test Method/Matrix	Daily Samples	Total Samples
DRO/RRO, GRO/BTEX, PAHs, PCBs, 8 RCRA metals (Site 9 surface waters)	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B		3 primary, 1 duplicate
DRO/RRO, GRO/BTEX, PAHs, VOCs, PCBs, 8 RCRA metals+ Nickel, vanadium and zinc	Surface Water AK102/103, AK101, 8260B, 8270C, 8082A, 6020A/7470B	5 Primary	5 primary (1 MS/MSD)

Have QA and QC samples been collected in the specified quantity? Yes ☒ No ☐ N/A ☐
Have samples been properly labeled and packaged? Yes ☒ No ☐ N/A ☐
Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) Yes ☒ No ☐ N/A ☐
Have required amount of QC trip blanks and rinsates been achieved? Yes ☒ No ☐ N/A ☐

Health and Safety

Worker protection levels this date:	Level C ☐ Level D ☐
Was any work activity conducted within a confined space?	Yes ☐ No ☒ N/A ☐
Was any work activity conducted within an area determined to be immediately dangerous to life and health?	Yes ☐ No ☒ N/A ☐
Were approved decontamination procedures used on workers and equipment as required?	Yes ☐ No ☐ N/A ☒
Was a Job Safety Meeting held this day?	Yes ☒ No ☐ N/A ☐
Were there any "Lost Time" accidents this day? (If YES, attach copy of completed accident report)	Yes ☐ No ☒ N/A ☐
Was hazardous waste/material released into the environment?	Yes ☐ No ☒ N/A ☐

Safety Comments: (include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

Work Activities Performed This Date

Specification or Contract Reference	Activity and Location
General	1. The work crew mobilized to the site on Bering air charter.
CLIN 0038: 2015 Monitored Natural Attenuation Sampling of Groundwater at the MOC	1. 4 wells were sampled. Samples include 4 primary and 2 duplicates.
CLIN 0039: Landfill Cap Visual Inspections and Surface Water Sampling	

Manpower and Equipment

Labor Classification	Number	Hours
PM—Greg Jarrell		
CQCSM/Environmental sampler—Eric Barnhill	1	11.5
Geologist Lyndsey Kleppin	1	11.5
Environ. Sampler-Noyuk Peacock	1	11.5
Hazardous Waste Specialist-Tyler Ellingboe		
Chemist – Marty Hannah		
Totals	3	34.5

Work Progress

Are there any Contractor-caused delays or potential finding of fact?	Yes ☐ No ☒
Are there any Government-caused delays or potential finding of fact?	Yes ☐ No ☒
Are there any unforeseeable or weather-related delays?	Yes ☐ No ☒

Progress Tracking Table

PROJECT SUMMARY TO DATE			
Item	Today's Total (Units-Primary Samples)	Previous Total	Project Total
MOC Wells Sampling	4	11	15
Site9 Surface Water sample	3	3	3
Site 7 Inspection	1	1	1
Site 9 Inspection	1	1	1

Comments/Remarks:

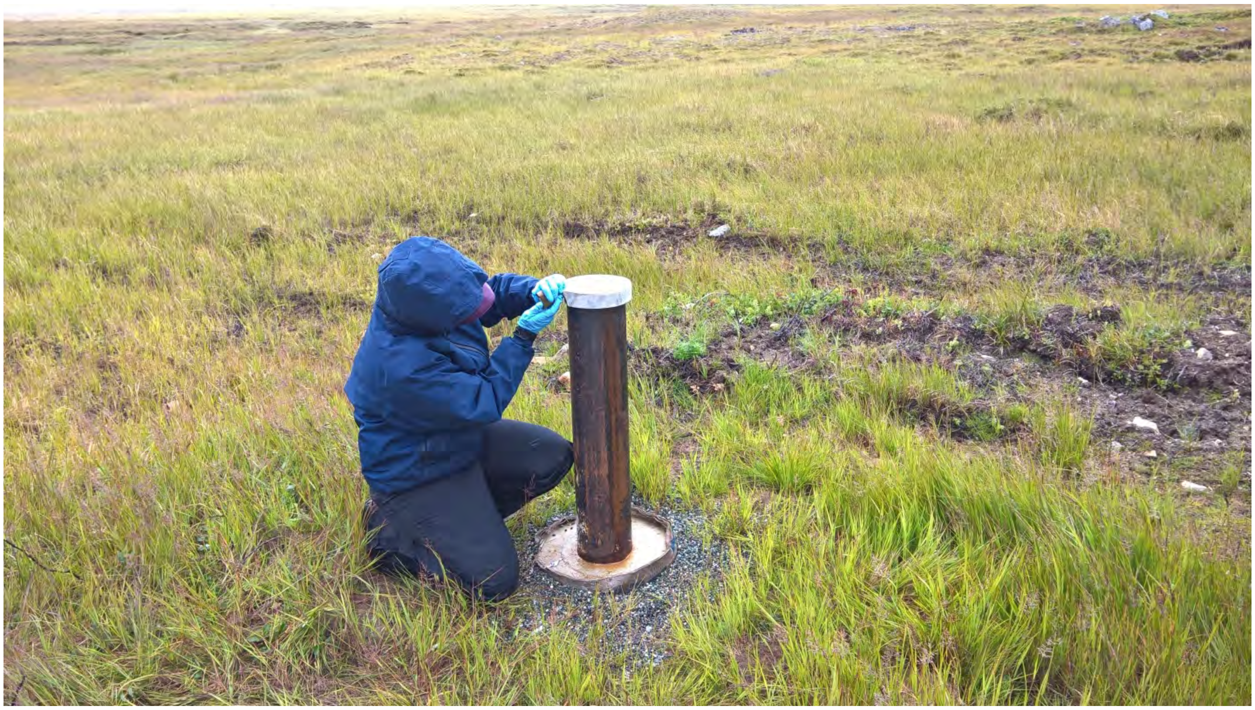
Definable Feature of Work	Progress
MOC Wells Sampling	100%
Site9 Surface Water sample	100%
Site 7 Inspection	100%
Site 9 Inspection	100%

Comments/Remarks:

The work crew mobilized to the site on Bering air charter.

4 wells were sampled. All wells were in good shape; no damage noted.

PHOTOS



Groundwater sampling – opening stick-up well; View to the north Photographer: E. Barnhill

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Contractor's Verification: On behalf of the Contractor, I certify that the above report is complete and correct and that all materials and equipment used, work performed, and tests conducted during this period were in strict compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

______________________________ August 15, 2015

CQCSM Signature Date

APPENDIX B

Monthly Status Reports

111 W. 16th Avenue, Third Floor
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2011, 2013 and 2014 Northeast Cape HTRW Remedial Actions
Contracts: W911KB-06-D-0007 TO 0007, W911KB-13-C-0004, and W911KB-14-D-0006 TO 0002
Monthly Status Report
December 9, 2014 through January 11, 2015
Submitted on 1/12/2015

Summary of Work Tasks December 9 through January 11, 2014

- Bristol is completing in-town demobilization activities.
  - The last pieces of rental equipment have been returned.
  - Repairs and maintenance are being performed on heavy equipment and vehicles that were used at NE Cape.
- Bristol finalized the 2014 Work Plan and submitted the document to the USACE on 12/18/2014.
- Bristol finalized the 2013 HTRW RA Report and the Site 28 Tech Memo Addendum. The reports are currently with Bristol's technical editing/formatting team and will be submitted on 1/13/2015.
- Bristol has received the very first disposal documents for Site 28 sediment and miscellaneous debris.
- Bristol is working on the 2014 HTRW RA Report and the CDQR. Anticipated delivery date is 1/30/2015.

Subcontractors

- Eco-Land surveyors submitted the final data delivery package on 12/10/2014.
- Bristol is in the process of closing subcontracts with Fairweather, TestAmerica and Global Services

USACE and ADEC Correspondence

- 12/22/2014 – J. Craner emailed R. James with some minor corrections that needed to be made to the 2014 work plan regarding the FRMD number of the document. Bristol made the changes and delivered the edited sheets and CDs to the USACE on 12/30/2014.
- 12/29/2014 – J. Craner emailed copies of signed manifests to R. James. The manifests were related to miscellaneous debris shipped from NE Cape.
- 1/8/2015 – R. James emailed V. Palmer and J. Craner with questions regarding final report deliverables. The FRMD request sheet was submitted to the USACE for the final 2013 reports. The USACE returned the FRMD document sheet to Bristol.

Project Schedule

- Waste disposal is ongoing
- 1/12/2015 thru 1/23/2015 – Maintenance and repair to heavy equipment used at NE Cape.
- 1/13/2015 – Submittal of final 2013 HTRW RA Report and Site 28 Tech Memo Addendum
- 1/30/2015 – Submittal of draft 2014 RA Report
- March, 2015 – Submittal of draft-final 2014 RA Report
- Late April/Early May, 2015 – Submittal of final 2014 RA Report and contract closeout

Payments and Invoices

- Bristol paid approximately $76,677 to subcontractors and vendors during the period 12/9/2014 thru 1/11/2015 for Contract W911KB-14-D-0006 TO 0002.
- Bristol paid approximately $34,854 to vendors during the period 12/9/2014 thru 1/11/2015 for Contract W911KB-13-C-0004.
- Bristol paid $6,250 to subcontractors and vendors during the period 12/9/2014 thru 1/11/2015 for Contract W911KB-06-D-0007 TO 0007.

Work Underway

- Bristol is printing and binding the 2013 HTRW RA Report and will submit on Tuesday, 1/13/2015.
- The 2014 HTRW RA Report and CDQR are currently being written.
- Bristol is organizing equipment and supplies that have returned from NE Cape and performing maintenance and repairs on heavy equipment.
- Bulk bags are in transit to the disposal facility.

Work Planned for the Upcoming Month

- Submit 2013 RA Report, Site 28 Tech Memo and the Draft 2014 HTRW RA Report
- Closeout subcontracts.
- Complete waste disposal and receive disposal paperwork from Waste Management.

Accident/Exposure Hours

- During the period 12/9/2014 thru 1/11/2015, Bristol has worked 181.00 hours for contract W911KB-06-D-0007 TO 007
- During the period 12/9/2014 thru 1/11/2015, Bristol has worked 210.75 hours for contract W911KB-13-C-0004
- During the period 12/9/2014 thru 1/11/2015, Bristol has worked 352.50 hours for contract W911KB-14-D-0006 TO 0002

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2011, 2013 and 2014 Northeast Cape HTRW Remedial Actions
Contracts: W911KB-06-D-0007 TO 0007, W911KB-13-C-0004, and W911KB-14-D-0006 TO 0002
Monthly Status Report
January 12, 2015 through February 11, 2015

Submitted on 2/11/2015

Summary of Work Tasks January 12 through February 11, 2015

- Bristol is completing in-town demobilization activities.
  - Repairs and maintenance are being performed on heavy equipment and vehicles that were used at NE Cape.
  - Conex containers are being organized in the Bristol storage yard.
- Bristol finalized the 2013 HTRW RA Report and the Site 28 Tech Memo Addendum. The reports are currently with Bristol's technical editing/formatting team and will be submitted on 1/13/2015.
- Bristol has received the very first disposal documents for Site 28 sediment and miscellaneous debris.
- Bristol is working on the 2014 HTRW RA Report and the CDQR. Anticipated delivery date is 1/30/2015.

Subcontractors

- Eco-Land surveyors submitted the final data delivery package on 12/10/2014.
- Bristol is in the process of closing subcontracts with Fairweather, TestAmerica and Global Services

USACE and ADEC Correspondence

- 12/22/2014 – J. Craner emailed R. James with some minor corrections that needed to be made to the 2014 work plan regarding the FRMD number of the document. Bristol made the changes and delivered the edited sheets and CDs to the USACE on 12/30/2014.
- 12/29/2014 – J. Craner emailed copies of signed manifests to R. James. The manifests were related to miscellaneous debris shipped from NE Cape.
- 1/8/2015 – R. James emailed V. Palmer and J. Craner with questions regarding final report deliverables. The FRMD request sheet was submitted to the USACE for the final 2013 reports. The USACE returned the FRMD document sheet to Bristol.

Project Schedule

- Waste disposal is ongoing
- 1/12/2015 thru 1/23/2015 – Maintenance and repair to heavy equipment used at NE Cape.
- 1/13/2015 – Submittal of final 2013 HTRW RA Report and Site 28 Tech Memo Addendum
- 1/30/2015 – Submittal of draft 2014 RA Report
- March, 2015 – Submittal of draft-final 2014 RA Report
- Late April/Early May, 2015 – Submittal of final 2014 RA Report and contract closeout

Payments and Invoices

- Bristol paid approximately $76,677 to subcontractors and vendors during the period 12/9/2014 thru 1/11/2015 for Contract W911KB-14-D-0006 TO 0002.
- Bristol paid approximately $34,854 to vendors during the period 12/9/2014 thru 1/11/2015 for Contract W911KB-13-C-0004.
- Bristol paid $6,250 to subcontractors and vendors during the period 12/9/2014 thru 1/11/2015 for Contract W911KB-06-D-0007 TO 0007.

Work Underway

- Bristol is printing and binding the 2013 HTRW RA Report and will submit on Tuesday, 1/13/2015.
- The 2014 HTRW RA Report and CDQR are currently being written.
- Bristol is organizing equipment and supplies that have returned from NE Cape and performing maintenance and repairs on heavy equipment.
- Bulk bags are in transit to the disposal facility.

Work Planned for the Upcoming Month

- Submit 2013 RA Report, Site 28 Tech Memo and the Draft 2014 HTRW RA Report
- Closeout subcontracts.
- Complete waste disposal and receive disposal paperwork from Waste Management.

Accident/Exposure Hours

- During the period 12/9/2014 thru 1/11/2015, Bristol has worked 181.00 hours for contract W911KB-06-D-0007 TO 007
- During the period 12/9/2014 thru 1/11/2015, Bristol has worked 210.75 hours for contract W911KB-13-C-0004
- During the period 12/9/2014 thru 1/11/2015, Bristol has worked 352.50 hours for contract W911KB-14-D-0006 TO 0002

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2013 and2014 Northeast Cape HTRW Remedial Actions
Contracts: W911KB-13-C-0004, and W911KB-14-D-0006 TO 0002
Monthly Status Report
February 12, 2015 through April 15, 2015

Submitted on 4/16/2015

Summary of Work Tasks February 12 through April 15, 2015

- Primary work tasks during this period focused on the 2014 RA Report.
- Bristol submitted the draft 2014 HTRW RA Report and the CDQR on 1/30/2015. Comments have been received and addressed. A comment resolution meeting was held with the USACE on 4/1/2015. Bristol initiated work on the draft-final 2014 RA Report. Anticipated submittal of the draft-final 2014 RA Report is 4/24/2015.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project.

USACE and ADEC Correspondence

- 02/12/2015 – J. Craner emailed G. Jarrell, R. Broyles and V. Palmer with a portion of the USACE's comments on the draft 2014 RA Report.
- 02/25/2015 – Bristol received final payment for the 2013 NE Cape contract in the amount of $10,114.31.
- 03/6/2015 – J. Craner emailed the remaining comments from A. Shewman and S. Benjamin on the 2014 RA Report.
- 3/16/2015 – Bristol returned responses to the USACE comments on the 2014 RA Report.
- 3/17/2015 – J. Craner acknowledges receipt of Bristol's responses to USACE comments.
- 3/23/2015 – R. Broyles emailed Bristol to request a comment resolution meeting. Bristol provided available times to the USACE and a meeting was set for 4/1/2015 at 1:30 PM at the USACE offices.
- 3/31/2015 – Bristol submitted pay estimate 08 for the 2014 NE Cape project in the amount of $52,915.87 to R. Broyles. R. Broyles signed the pay estimate and returned to Bristol on 4/1/2015. Bristol sent the R. Broyles invoice 34140087-08 on 4/3/2015.
- 4/1/2015 – G. Jarrell, R. James and M. Hannah attended a comment resolution meeting at the USACE offices at 1:30 PM. In attendance: V. Palmer, A. Shewman, J. Craner, R. Broyles, L. Geist and S. Benjamin.
- 4/2/2015 – J. Craner emailed to Bristol the USACE's acceptance of Bristol's responses to comments on the draft 2014 RA Report. The comment sheets contained notes from the comment resolution meeting conducted on 4/1/2015.

- 4/7/2015 – Bristol emailed A. Shewman a revised write-up of the MNA section for the 2014 RA Report for review.

Project Schedule

- 4/15/2015 thru 4/24/2015 – The draft-final 2014 NE Cape RA Report is being edited and formatted and will be submitted to the USACE by 4/24/2015.
- 5/1/2015 – Work is anticipated to begin on the 2015 Work Plan Addendum for monitoring well sampling in August, 2015. Anticipated submittal date for Work Plan Addendum is mid- to late-may, 2015.
- May, 2015 – Receipt of draft-final 2014 RA Report comments.
- Early June, 2015 – Submittal of final 2014 NE Cape RA Report.

Payments and Invoices

- Bristol paid approximately $1,193.05 to vendors during the period 02/12/2015 thru 4/15/2015 for Contract W911KB-14-D-0006 TO 0002.
- Bristol received payment for invoice 34130068-09 on 2/25/2015 in the amount of $10,114.31
- Bristol sent invoice 34140087-08 on 4/3/2015 in the amount of $52.915.87.

Work Underway

- Bristol is in the process of editing and formatting the draft-final 2014 HTRW RA Report and will submit by Friday, 4/24/2015.
- Bristol is performing maintenance and repairs on heavy equipment.

Work Planned for the Upcoming Month

- Submit 2014 draft-final RA Report, Site 28 Tech Memo and the Draft 2014 HTRW RA Report

Accident/Exposure Hours

- During the period 2/12/2015 thru 4/15/2015, Bristol has worked 1,289.75 hours for contract W911KB-13-C-0004
- During the period 2/12/2015 thru 4/15/2015, Bristol has worked 335.50 hours for contract W911KB-14-D-0006 TO 0002

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
April 16, 2015 through June 23, 2015

Submitted on 6/24/2015

Summary of Work Tasks April 16 through June 23, 2015

- Primary work tasks during this period focused on the 2014 RA Report and the Work Plan Addendum for work to be completed in August, 2015.
- Bristol submitted the draft-final 2014 HTRW RA Report on 4/24/2015. Some additional comments have been received from the USACE and will be addressed prior to submission of the final report.
- The draft Work Plan Addendum was submitted to the USACE on 6/23/2015.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project.

USACE and ADEC Correspondence

- 04/17/2015 – The monthly status report for time period February 12 thru April 15 was submitted to Palmer, Broyles and Suprenant via email.
- 4/17/2015 – Bristol received Shewman's comments on the MOC monitoring well natural attenuation write-up for the 2014 RA Report. Bristol's James acknowledged receipt via email.
- 4/24/2015 – Bristol submitted the draft-final RA Report. A transmittal letter was emailed to the USACE's Broyles, Craner and Palmer.
- 4/28/2015 – Bristol's Hannah emailed USACE's Utley and Benjamin regarding SEDD. Utley responded via email on 4/28/2015.
- 4/30/2015 – Craner emailed James and Jarrell (Bristol), Palmer (USACE), and Broyles (USACE) acknowledging receipt of the draft-final RA Report. Craner provided one additional correction that needed to be made to Figure 14 and said that the rest of the USACE's comments had been adequately addressed, pending review from a select few. Bristol's James responded and noted that the change would be made to Figure 14.
- 5/4/2015 – Bristol's Hannah emailed Utley regarding SEDD files.
- 5/4/2015 – Bristol submitted pay estimate 09 for the 2014 NE Cape project in the amount of $15,950.51 to R. Broyles. R. Broyles signed the pay estimate and returned to Bristol on 5/4/2015.

- 5/4/2015 – Bristol submitted the monthly record of work-related injuries/illnesses & exposure forms for April, 2015.
- 5/5/2015 – Bristol submitted invoice 34140087-09 to Broyles in the amount of $15,950.51.
- 5/6/2015 – O. Northern emailed B. Burked contract modification 03 in the amount of $221,235.00.
- 5/11/2015 – USACE's Craner emailed Bristol USACE comments on the draft-final RA report. Craner noted that S. Benjamin had some outstanding chemistry comments that needed to be addressed. Craner provided suggestions on how to restructure Appendix I.
- 6/1/2015 – Bristol emailed A. Shewman an updated NE Cape Schedule.
- 6/18/2015 – Bristol emailed the USACE to inform them that the Work Plan Addendum for 2015 sampling would be delivered later than expected.
- 6/23/2015 – The Work Plan Addendum for 2015 monitoring well sampling and landfill cap inspections was delivered to J. Craner.
- 6/23/2015 – Bristol submitted the monthly record of work-related injuries/illnesses & exposure forms for May, 2015

Project Schedule

- 6/24/2015 thru 8/9/2015 – Bristol will prepare equipment/supplies for the monitoring well sampling and landfill cap inspections currently scheduled to begin August 10, 2015.
- Bristol awaits comments from the ADEC on the 2014 draft-final RA report. Comments will be addressed and a final report will be submitted once comments are received.
- Bristol awaits comments on the Work Plan Addendum submitted 6/23/2015. Bristol will address comments and submit the final work plan following receipt of comments and prior to mobilizing for the field effort in August, 2015.

Payments and Invoices

- Bristol paid approximately $4,412.80 to vendors during the period 4/16/2015 thru 6/23/2015.
- Bristol received payment for invoice 34140087-09 on 5/12/2015 in the amount of $15,950.51

Work Underway

- Bristol is in the process of addressing comments on the draft-final report.
- Bristol is planning for the upcoming monitoring well sampling and landfill cap inspections slated for August, 2015.

Work Planned for the Upcoming Month

- Bristol will submit the final Work Plan Addendum that addresses USACE and ADEC comments.

- Bristol will ship some supplies/equipment to Nome in preparation for August sampling and landfill cap inspections.

Accident/Exposure Hours

- During the period 4/16/2015 thru 6/15/2015, Bristol has worked 567 hours for contract W911KB-14-D-0006, Task Order 0002.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
24 June 2015 through 9 August 2015

Submitted on 9 August 2015

Summary of Work Tasks 24 June 2015 through 7 August 2015

- Primary work tasks during this period focused on the responding to stakeholder comments on the 2014 Draft-Final RA Report (Revision 1) and the Work Plan Addendum for work to be completed in August 2015.
- The final Work Plan Addendum was submitted to the USACE on 7 August 2015 (Serialized Letter H-0018).
- Conducted mobilization activities for scoped 2015 groundwater sampling and landfill inspection event.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project.

USACE and ADEC Correspondence

- 14 July 2015 - Informed USACE of tentative schedule of week of August 10th to perform scheduled fieldwork at NE Cape. Informed by Ron Broyles that ADEC has until 24 July 2015 to submit comments on the Work Plan Addendum.
- 15 July 2015 - Submitted copies of SWPPP NOTs to Jeremy Craner as per request.
- 21 July 2015 - Submitted Bristol RTCs for Work Plan Addendum to USACE for final approval.
- 22 July 2015 - Notified by Valerie Palmer that ADEC and ACAT have confirmed that they will have comments on the Draft-Final RA Report by the end of the day (22 July 2015).
- 23 July 2015 - Received ADEC and ACAT comments on the Draft-Final RA Report from Valerie Palmer.
- 23 July 2015 - Received one more set of comments on Draft-Final RA Report (Revision 1) from TAPP advisor. Comments forwarded to Bristol from Valerie Palmer.
- 27 July 2015 - Bristol received information from Valerie Palmer outlining the yet to be resolved USACE comments from the Draft-Final 2014 RA Report.

- 27 July 2015 - Bristol received clarification from Valerie Palmer about which USACE comments were yet to be resolved for the Draft-Final 2014 RA report, and a reminder that USACE comments are not to be included in the final report; only stakeholders.
- 28 July 2015 - Bristol emailed figure changes to USACE Environmental Engineer for acceptance of changes prior to his departure.
- 28 July 2015 - Bristol received acceptance of the proposed figure changes with one caveat.
- 28 July 2015 - Bristol's Hannah emailed Valerie Palmer to ask for a digital copy of the Jacobs 5 year review.
- 28 July 2015 - Valerie Palmer sent an email stating that the 5 year review document would be available on AMRDEC.
- 30 July 2015 - Bristol's Tyler Ellingboe sent an email asking if Bristol's response to the 2014 Work Plan Addendum were acceptable.
- 30 July 2015 - Bristol received all comment forms for the 2014 Work Plan Addendum from Valerie Palmer with all comments accepted and one comment needing clarification. In addition Palmer instructed Bristol to finalize the Work Plan despite not having received work plan comments from USACE.
- 3 August 2015 - Bristol submitted an inquiry to USACE Project Manager Valerie Palmer as to whether or not the Work Plan Addendum needed FRMD & ARIMS numbers
- 3 August 2015 - Valerie Palmer sent a copy of the FRMD document request form to Bristol.
- 3 August 2015 - Bristol submitted an FRMD document request form to USACE Project Manager Valerie Palmer. Bristol Received FRMD numbers from USACE Project Manager Valerie Palmer.

Project Schedule

- 10 August 2015 thru 17 August 2015 – Bristol will conduct field work for the 2015 the monitoring well sampling and landfill cap inspections.

- Bristol will answer comments from the ADEC on the 2014 draft-final RA report. Comments will be addressed and a final report will be submitted once comments are received.

Payments and Invoices

- No invoices submitted to USACE during current period.

Work Underway

- Bristol is in the process of addressing comments on the draft-final report.
- Bristol is planning for the upcoming monitoring well sampling and landfill cap inspections slated for 10-17 August 2015.

Work Planned for the Upcoming Month

- Bristol will continue to address stakeholder comments on the draft-final RA Report.
- Bristol will initiate and finish scheduled fieldwork including the NE Cape monitoring well sampling and landfill cap inspections.

Accident/Exposure Hours

- Project accident/exposure hours worked during the period of 16 June 2015 through 31 July 2015 by Bristol and key subcontractors was 191.0. The 2015 project total of hours worked is 2,380.50. The July 2015 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 9 August 2015.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
10 August 2015 through 11 September 2015

Submitted on 11 September 2015

Summary of Work Tasks 10 August 2015 through 11 September 2015

- Primary work tasks during this period focused on the responding to stakeholder comments on the 2014 Draft-Final RA Report (Revision 1).
- Conducted mobilization activities for scoped 2015 groundwater sampling and landfill inspection event.
- Conducted 2015 field effort at NE Cape including MNA groundwater sampling and landfill cap inspection. All scoped project wells were sampled successfully.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 10 August 2015 – Notified by USACE (J. Craner) that 2014 Work Plan Addendum CDs did not contain the final complete .pdf. Re-issued new CDs and delivered to USACE.
- 17 August 2015 – Bristol (E. Barnhill) submittal of DQCR reports to USACE (V. Palmer) for 2015 field effort that occurred 11 August 2015 to 15 August 2015.
- 18 August 2015 – Notified by USACE (V. Palmer) that additional ADEC comments were received by USACE on 17 August 2015. USACE will review comments and forward the ones which Bristol will need to help address.
- 21 August 2015 – USACE (V. Palmer) forwarded remaining ADEC comments that need addressed for the Final HTRW Report.
- 9 September 2015 – Bristol submittal of August 2015 exposure hour report to USACE CEPOASO.
- 9 September 2015 – Bristol submittal of POA 15 (pay estimate 34140087-11) to USACE COR for pre-approval. Received signed POA 15 from USACE COR.

- 11 September 2015 – Submittal of pay estimate 34140087-11 to USACE COR under serial letter H-0019. Also submitted August/September Monthly Status Report and updated schedule.

Project Schedule

- 2015 groundwater sampling and landfill cap inspection field effort is complete. 2015 field effort performed from 10 August to 17 August 2015.
- Bristol will continue to address ADEC comments on the Draft Final HTRW Report. Bristol will prepare and submit Final HTRW Report once responses to comments are accepted.
- Following results of analytical data packages, Bristol will perform chemical data quality review and 2015 reporting.

Payments and Invoices

- Pay Estimate 34140087-11 submitted on 11 September under serial letter H-0019. Pay estimate covers period from 24 June 2015 to 11 September 2015.

Work Underway

- Bristol is in the process of addressing comments on the draft-final report.
- 2015 MNA groundwater sampling and landfill cap inspection field effort is complete. 2015 field effort performed 10 August to 17 August 2015.

Work Planned for the Upcoming Month

- Bristol will continue to address stakeholder comments on the draft-final RA Report.
- Bristol awaiting final data packages from project laboratory for the 2015 field effort. Once data packages are received Bristol will perform chemical data quality review and prepare report.

Accident/Exposure Hours

- Project accident/exposure hours worked during the month of August 2015 by Bristol and key subcontractors was 394.25. The 2015 project total of hours through 31 August 2015 worked is 2,774.75. The August 2015 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 8 September 2015.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
12 September 2015 through 8 October 2015
Submitted on 8 October 2015

Summary of Work Tasks 12 September 2015 through 8 October 2015

- Primary work tasks during this period focused on the responding to stakeholder comments on the 2014 Draft-Final RA Report (Revision 1).
- Conducted demobilization activities for scoped 2015 groundwater sampling and landfill inspection event.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 2 October 2015 – Bristol PM (T. Ellingboe) sent e-mail to USACE COR regarding recommended contract de-obligation amount. CLIN 0040 (-$21,030) and CLIN 0041 (-$2,731).
- 6 October 2015 – Bristol PM sent September 2015 exposure hour report to USACE CEPOASO. Report was corrected and resubmitted on 8 October 2015.
- 6 October 2015 – Bristol Chemist (M. Hannah) e-mailed USACE PM (V. Palmer) regarding 2014 Draft Final RTC #21 and 22. Bristol asking for additional feedback in order to properly address comments.
- 7 October 2015 – Bristol received response back from USACE (L. Geist) regarding ADEC comments 20 and 21 on the Draft Final HTRW Report.

Project Schedule

- Bristol will continue to address ADEC comments on the Draft Final HTRW Report.
- Bristol will soon schedule a comment resolution meeting with the ADEC and USACE for the Draft Final HTRW Report. Bristol will prepare and submit Final HTRW Report once responses to comments are accepted.

- Following results of analytical data packages, Bristol will perform chemical data quality review and 2015 reporting.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol is in the process of addressing comments on the Draft-Final HTRW Report.
- Bristol awaiting final data package for 2015 field effort. Bristol has started preparation of reporting document for the 2015 field effort.

Work Planned for the Upcoming Month

- Bristol will continue to address stakeholder comments on the draft-final RA Report.
- Bristol awaiting final data packages from project laboratory for the 2015 field effort. Once data packages are received Bristol will perform chemical data quality review and prepare report.

Accident/Exposure Hours

- Project accident/exposure hours worked during the month of September 2015 by Bristol and key subcontractors was 64.5. The 2015 project total of personnel hours worked through 30 September 2015 is 2,839.25. The September 2015 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 8 October 2015.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
9 October 2015 through 6 November 2015

Submitted on 6 November 2015

Summary of Work Tasks 9 October 2015 through 6 November 2015

- Primary work tasks during this period focused on the responding to stakeholder comments on the 2014 Draft-Final RA Report (Revision 1).
- Complete demobilization activities for scoped 2015 groundwater sampling and landfill inspection event.
- Begin preparation of 2015 MNA and landfill cap inspection report.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 12 October 2015 – Bristol submitted responses to USACE regarding additional ADEC comments on Draft-Final HTRW Report.
- 16 October 2015 – Bristol received e-mail from USACE PM (Palmer) requesting comment resolution meeting between Bristol/USACE to address ADEC comments. Meeting scheduled for 20 October 2015. USACE also asked about status of Bristol responses to ACAT and TAPP comments.
- 19 October 2015 – Bristol submitted responses to ACAT/TAPP comments on the Draft-Final HTRW Report to the USACE.
- 20 October 2015 – Received previous e-mail backup from USACE (Craner) regarding key 2014 conversations between ADEC (Dunkin) and USACE PM (Palmer).
- 20 October 2015 – Bristol provided USACE with Bristol responses to ACAT comments in table format.
- 27 October 2015 – Bristol submitted revised responses to ADEC comments on the Draft-Final HTRW Report to the USACE for review and forwarding to the ADEC.

- 5 November 2015 – Bristol notified by USACE (Craner) that USACE had forwarded Bristol responses to ADEC comments on the Draft-Final HTRW Report to ADEC for review and acceptance.
- 6 November 2015 – Bristol submittal of October 2015 exposure hours to USACE CEPOASO.

Project Schedule

- Bristol currently awaiting ADEC review of Bristol/USACE comments on the Draft-Final HTRW Report. Bristol will schedule a comment resolution meeting with the ADEC and USACE, if requested.
- Following results of analytical data package from August 2015 NE Cape sampling event, Bristol will perform chemical data quality review and 2015 reporting.
- Schedule update will be provided with next pay estimate.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol awaiting ADEC acceptance/rejection of Bristol/USACE responses to comments on Draft-Final HTRW Report.
- Bristol awaiting final data package for 2015 field effort. Bristol has started preparation of reporting document for the 2015 field effort.

Work Planned for the Upcoming Month

- Bristol will incorporate accepted responses to stakeholder comments on Draft-Final HTRW Report once received and following a potential comment resolution meeting.
- Bristol awaiting final data packages from project laboratory for the 2015 field effort. Once data packages are received Bristol will perform chemical data quality review and prepare report.

Accident/Exposure Hours

- Project accident/exposure hours worked during the month of October 2015 by Bristol and key subcontractors was 136.0. The 2015 project total of personnel hours worked through 31 October 2015 is 2,975.25. The October 2015 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 6 November 2015.

Bristol
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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
7 November 2015 through 8 December 2015

Submitted on 8 December 2015

Summary of Work Tasks 9 October 2015 through 6 November 2015

- Bristol awaiting review of responses to stakeholder (ADEC, ACAT, TAPP Advisor) comments on 2014 Draft-Final RA Report (Revision 1).
- Continue preparation of 2015 MNA and landfill cap inspection report.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 10 November 2015 – Notified by USACE (Craner) that Bristol/USACE responses to ACAT comments on the Draft-Final HTRW Report have been submitted to ACAT for review and approval.
- 13 November 2015 – Notified by USACE (Craner) that Bristol/USACE responses to TAPP Advisor (Scrudato) comments on the Draft-Final HTRW Report have been submitted to TAPP Advisor for review and approval.
- 13 November 2015 - Notified by USACE (Craner) that USACE followed up with ADEC (Dunkin) regarding status of review of Bristol/USACE comments on the Draft-Final HTRW Report. ADEC hopeful to respond during week of 23 November 2015.
- 7 December 2015 – Bristol submittal of November 2015 exposure hours to USACE CEPOASO.

Project Schedule

- Bristol currently awaiting ADEC review of Bristol/USACE comments on the Draft-Final HTRW Report. Bristol will schedule a comment resolution meeting with the ADEC and USACE, if requested.
- Following results of analytical data package from August 2015 NE Cape sampling event, Bristol will perform chemical data quality review and 2015 reporting.

- Schedule update will be provided with next pay estimate.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol awaiting ADEC acceptance/rejection of Bristol/USACE responses to comments on Draft-Final HTRW Report.
- Bristol has started preparation of reporting document for the 2015 groundwater monitoring and landfill cap inspection field effort.

Work Planned for the Upcoming Month

- Bristol will incorporate accepted responses to stakeholder comments on Draft-Final HTRW Report once received and following a potential comment resolution meeting.
- Bristol will continue to prepare 2015 groundwater monitoring and landfill cap inspection reports.

Accident/Exposure Hours

- Project accident/exposure hours worked during the month of November 2015 by Bristol and key subcontractors was 57.0. The 2015 project total of personnel hours worked through 30 November 2015 is 3,032.25. The November 2015 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 7 December 2015.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
9 December 2015 through 8 January 2016

Submitted on 8 January 2016

Summary of Work Tasks 9 December 2015 through 8 January 2016

- Bristol awaiting review of responses to stakeholder (ADEC, ACAT, TAPP Advisor) comments on 2014 Draft-Final RA Report (Revision 1).
- Continued preparation of 2015 MNA and landfill cap inspection report.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 18 December 2015 – Provided brief update to USACE PM (Palmer) that Bristol currently preparing 2015 Annual Groundwater Monitoring and Landfill Inspection Reports. Final data package was delayed and not received from the project laboratory until 16 November 2015 which will delay delivery of the draft deliverables. Draft deliverables should be completed and submitted by early to mid-January.
- 6 January 2016 – Bristol submittal of December exposure hours to USACE CEPOASO.

Project Schedule

- Bristol currently awaiting ADEC review of Bristol/USACE responses to comments on the 2014 Draft-Final HTRW Report. Bristol will schedule a comment resolution meeting with the ADEC and USACE, if requested.
- Bristol currently preparing 2015 Draft Annual Groundwater Sampling and Landfill Inspection Reports.
- Schedule update will be provided with next pay estimate.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol awaiting ADEC acceptance/rejection of Bristol/USACE responses to comments on Draft-Final HTRW Report.
- Bristol in process of completing Draft 2015 Annual Groundwater Monitoring and Landfill Cap Inspection reports.

Work Planned for the Upcoming Month

- Bristol will incorporate accepted responses to stakeholder comments on Draft-Final HTRW Report once received and following a potential comment resolution meeting.
- Bristol will finalize and submit Draft Annual Groundwater Monitoring and Landfill Cap Inspection reports.

Accident/Exposure Hours

- A total of 201 project accident/exposure hours were worked during the month of December 2015 by Bristol and key subcontractors. The 2015 project total of personnel hours worked through 31 December 2015 was 3,233.25. The December 2015 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 5 January 2016.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
9 January 2016 through 8 February 2016

Submitted on 8 February 2016

Summary of Work Tasks 9 January 2016 through 8 February 2016

- Bristol awaiting review of responses to stakeholder (ADEC, ACAT, TAPP Advisor) comments on 2014 Draft-Final RA Report (Revision 1).
- Bristol submitted Draft 2015 Annual Groundwater Monitoring Report and Draft 2015 Landfill Cap Inspection Reports to USACE for review and approval.
- Bristol awaiting ADEC/USACE responses to Draft 2015 Annual Groundwater Monitoring Report and Draft 2015 Landfill Cap Inspection Reports.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 12 January 2016 – Submitted serial letter H-0020 for the submittal of the Draft 2015 Landfill Periodic Visual Inspection Report.
- 12 January 2016 – Notified by USACE PM (Palmer) that ADEC review of the 2014 RA Report should be completed by first week of January. ADEC has not yet completed their review.
- 12 January 2016 – Notified USACE PM that Bristol would be submitting the draft 2015 Groundwater Monitoring Report the week of 18 – 22 of January.
- 19 January 2016 – Submitted serial letter H-0021 for the submittal of the Draft 2015 Annual Groundwater Monitoring Report.
- 8 February 2016 – Bristol submittal of January 2016 exposure hours to USACE CEPOASO.

Project Schedule

- Bristol currently awaiting ADEC review of Bristol/USACE responses to comments on the 2014 Draft-Final HTRW Report. Bristol will schedule a comment resolution meeting with the ADEC and USACE, if requested.
- Bristol currently awaiting ADEC/USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Inspection reports
- Schedule update will be provided with next pay estimate.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol awaiting ADEC acceptance/rejection of Bristol/USACE responses to comments on Draft-Final HTRW Report.
- Bristol awaiting ADEC/USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Inspection reports.

Work Planned for the Upcoming Month

- Bristol will incorporate accepted responses to stakeholder comments on Draft-Final HTRW Report once received and following a potential comment resolution meeting.
- Bristol will incorporate accepted responses to stakeholder comments on Draft Annual Groundwater Monitoring and Landfill Cap Inspection reports.

Accident/Exposure Hours

- A total of 160.25 project accident/exposure hours were worked during the month of January 2016 by Bristol and key subcontractors. The 2016 project total of personnel hours worked through 31 January 2016 was 160.25. The January 2016 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 8 February 2016.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
9 February 2016 through 7 March 2016

Submitted on 7 March 2016

Summary of Work Tasks 9 February 2016 through 7 March 2016

- Bristol awaiting review of responses to stakeholder (ADEC, ACAT, TAPP Advisor) comments on 2014 Draft-Final RA Report (Revision 1).
- Bristol received USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and Draft 2015 Landfill Cap Visual Inspection Reports. Bristol has started to address USACE comments.
- Bristol awaiting ADEC responses to Draft 2015 Annual Groundwater Monitoring Report and Draft 2015 Landfill Cap Visual Inspection Reports.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 29 February 2016 – Received USACE comments on 2015 Draft Groundwater Sampling Report
- 29 February 2016 – Received USACE comments on 2015 Landfill Periodic Visual Inspection Report
- 1 March 2016 – Submitted e-mail to USACE COR (Broyles) indicating that contract period of performance needs to be extended and questioning if it would be a good time to issue contract modification for remaining contract de-obligation amount.
- 7 March 2016 – Submitted project accident/exposure hours worked during the month of February 2016 to USACE CEPOASO.

Project Schedule

- Bristol currently awaiting ADEC review of Bristol/USACE responses to comments on the 2014 Draft-Final HTRW Report. Bristol will schedule a comment resolution meeting with the ADEC and USACE, if requested.

- Bristol recently received USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Visual Inspection reports. Bristol has started addressing USACE comments and is awaiting receipt of ADEC comments on both draft reports.
- Schedule update will be provided with next pay estimate.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol awaiting ADEC acceptance/rejection of Bristol/USACE responses to comments on Draft-Final HTRW Report.
- Bristol is currently addressing USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Inspection reports. Bristol awaiting ADEC comments on both Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Inspection reports.

Work Planned for the Upcoming Month

- Bristol will incorporate accepted responses to stakeholder comments on Draft-Final HTRW Report once received and following a potential comment resolution meeting.
- Bristol will prepare and incorporate accepted responses to stakeholder comments on Draft Annual Groundwater Monitoring and Landfill Cap Inspection reports.

Accident/Exposure Hours

- A total of 19.75 project accident/exposure hours were worked during the month of February 2016 by Bristol and key subcontractors. The 2016 project total of personnel hours worked through 29 February 2016 was 180.0. The February 2016 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 7 March 2016.

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2014 Northeast Cape HTRW Remedial Actions
Contract W911KB-14-D-0006, Task Order 0002
Monthly Status Report
8 March 2016 through 5 April 2016

Submitted on 5 April 2016

Summary of Work Tasks 8 March 2016 through 5 April 2016

- Bristol awaiting ADEC acceptance/rejection of Bristol responses to ADEC comments on 2014 Draft-Final RA Report (Revision 1).
- Bristol awaiting ADEC comments on Draft 2015 Annual Groundwater Monitoring Report and Draft 2015 Landfill Cap Visual Inspection Report.
- Bristol submitted responses to initial USACE comments on the Draft 2014 Landfill Visual Inspection Report.
- Bristol currently in the process of addressing USACE comments on the Draft 2014 Groundwater Monitoring Report.

Subcontractors

- Bristol is self-performing remaining tasks for the Northeast Cape project. No subcontractors used for 2015 field effort.

USACE and ADEC Correspondence

- 9 March 2016 – Bristol PM (Ellingboe) notifying USACE PM (Palmer) that Bristol currently responding to received USACE comments on 2015 Landfill Periodic Visual Inspection Report. Bristol requested and received proper reference for *First Periodic Review Report, Site 7 Cargo Beach Road Landfill (USACE, 2015)*.
- 10 March 2016 – Bristol PM (Ellingboe) e-mail to USACE PM (Palmer) addressing incompletion of field forms and Bristol proposed action to remedy deficiency. Received response from USACE PM (Palmer) agreeing to proposed remedy of completing forms where information is known. Changes to field forms will be initialed and dated accordingly.
- 11 March 2016 – Bristol Chemist (Hannah) e-mail to USACE Chemist (Benjamin) regarding Benjamin Review Comment #1 on 2015 Landfill Visual Inspection Report. Bristol Chemist (Hannah) notified USACE Chemist (Benjamin) that dissolved metals not showing up in SEDD checker although the results are showing up in the xml file. May need input from USACE Chemist (Utley).

- 17 March 2016 – Bristol Chemist (Hannah) e-mail to USACE Chemist (Benjamin) regarding chromatogram interpretations of NE Cape groundwater samples for DRO. Interpretation leads one to believe that low-level DRO contamination appears due to instrument use at the project laboratory and not from pumps used in the field during sample collection.
- 21 March 2016 – Bristol PM (Ellingboe) e-mail to USACE PM (Palmer) regarding status of Bristol RTCs. Bristol awaiting input from USACE Chemist (Benjamin) on Bristol's chromatogram interpretation. Bristol PM (Ellingboe) submitted responses to USACE comments on the 2015 Landfill Visual Inspection Report.
- 21 March 2016 – Bristol PM (Ellingboe) and USACE PM (Palmer) e-mail correspondence regarding status of Bristol responses to ACAT and TAPP comments on 2014 NE Cape HTRW Report. Notified by USACE PM (Palmer) to proceed with incorporating Bristol responses to ACAT/TAPP comments into the report and that ACAT/TAPP acceptance/rejection of Bristol responses will not be forthcoming.
- 25 March 2016 – E-mail correspondence from USACE Chemist (Benjamin) to Bristol Chemist (Hannah) regarding recommended flagging of data.
- 28 March 2016 – Multiple e-mail correspondence between Bristol Chemist (Hannah) and USACE Chemist (Benjamin) regarding interpretation of laboratory data, chromatograms, and proper flagging.
- 5 April 2016 – Submitted project accident/exposure hours worked during the month of March 2016 to USACE CEPOASO.

Project Schedule

- Bristol currently awaiting ADEC review of Bristol/USACE responses to comments on the 2014 Draft-Final HTRW Report. Bristol will schedule a comment resolution meeting with the ADEC and USACE, if requested.
- Bristol received USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and Draft 2015 Landfill Cap Visual Inspection reports. Bristol has started addressing USACE comments and is awaiting receipt of ADEC comments on both draft reports.
- Schedule update will be provided with next pay estimate.

Payments and Invoices

- No pay estimate submitted this period.

Work Underway

- Bristol awaiting ADEC acceptance/rejection of Bristol/USACE responses to comments on Draft-Final HTRW Report.

- Bristol is currently addressing USACE comments on the Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Inspection reports. Bristol awaiting ADEC comments on both Draft 2015 Annual Groundwater Monitoring Report and 2015 Landfill Cap Inspection reports.

Work Planned for the Upcoming Month

- Issue contract modification to extend contract period of performance. Also need contract modification to de-obligate unused remaining contract line items.
- Bristol will incorporate accepted responses to stakeholder comments on 2014 Draft-Final HTRW Report once received and following a potential comment resolution meeting. Bristol still waiting for ADEC comments on the report.
- Bristol will prepare and submit responses to ADEC and USACE comment on the 2015 Groundwater Monitoring Report. Bristol has not yet received ADEC comments on the report.
- Bristol will prepare and submit responses to ADEC comments on the 2015 Landfill Cap Inspection Report once initial comments are received from the ADEC.

Accident/Exposure Hours

- A total of 106.0 project accident/exposure hours were worked during the month of March 2016 by Bristol and key subcontractors. The 2016 project total of personnel hours worked through 31 March 2016 was 286.0. The March 2016 Monthly Record of Work–Related Injuries/Illnesses & Exposure Forms were submitted to cepoaso@usace.army.mil on 5 April 2016.

APPENDIX C

Field Documentation

Eric Barnhill
NE Cape Groundwater monitoring

3440087

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August 10 → August 17

INCH

Rite in the Rain®
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Name Eric Barnhill

Address 111 W 16th Ave
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Phone 907 563 0013

Project NE Cape
3414007

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CONTENTS

PAGE	REFERENCE	DATE

Monday August 10, 2015

0730 – Picking up Lyndsey Kleppin, heading to TTT Environmental to pick up Hach supplies for MNA. Supplies were ordered in time, but had not shown up as of Friday

0800 – @ TTT – Fedex had not yet delivered the Hach/MNA supplies to TTT. It is, we're told, in Anchorage. TTT will call upon receiving the supplies and I will instruct them further.

0820 Airport

1015 – Take off to Nome

In Nome,

August 11, 2015

- Bering Air @ 0800
  - fly to NE Cape

- Walking up to MOC / Landfills for Landfill monitoring inspection and well water/depth measurements and Site 9 landfill surface water sampling

- See L. Kleppin's notes for well water levels

End 2030

[signature]

8/12/14

- Side by Side rental not yet available. Had teleconference with Greg Jarrell and Tyler Ellingboe. The decision was made to stay in Nome and create sampling packages
  - Labels
  - bottles

15NCMOCGW01	26MW1	MS/MSD
15NCMOC GW 02	22MW2	
15NCMOC GW03	20MW-1	
15NCMOC GW 04	17MW1	
15NC MOC GW 05	14MW1	
15NC MOC GW 06	14MW07	
15NC MOC GW 07	MW88-10	
15NC MOC GW 08	14MW03	
15NC MOC GW 09	14MW02	
15NCMOC GW 10	MW88-1	
15NCMOC GW 11	MW88-3	
15NCMOC GW 12	MW 10-1 (MS/MSD VOC + GW01)	
15NCMOC GW 13	14MW04	
15NC MOC GW 14	14MW05	
15NCMOC GW 15	14MW06	
15NCMOC GW 16/17	duplicates	

8-13-15

0900 Bering air - Flight to NE Cape

22MW2 @ 1400
- PCB
- PAH
- BTEX
- GRO
- DRO/RRO

15NCMOC GW02 @ 1400

20MW1 @ 1710

Depth to water - 24.95

Total depth - 28.75

- PCB
- PAH
- BTEX
- GRO
- DRO/RRO
- MNA

15NCMOC GW03 @ 1710

8-14-15

0800 - Bering Air

14MW07 @ 1140

- 15NCMOC GW06 @ 1140

14MW02 @ 1640

- 15NCMOC GW09 @ 1640

8-15-15

0800 Bering Air
- NE Cape

~~14MW07 @ 1110~~

14MW05 @ 1230/1240 (duplicates)
- 15NCMOC GW 14 @ 1230
- 15NCMOC GW 17 @ ~~1300~~ 1240

MW88-3 @ 1300
- 15NCMOC GW 11

8/16/15
Packaging Samples For Shipment
via air.

8/17/15

Travel to Anchorage from Nome

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№ 391

NE Cape Groundwater Supply
8/2015
3414987

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Phone

Project NE Cape # 34140087

CONTENTS

PAGE	REFERENCE	DATE

08/11/15 Travel Day
0730 TTT for Hach kit (colorimeter)
0815 Check In Ak Air 1200 Arrive Nome
Check on side-by-side @ Morgans, Buy supplies
Rent Car, check in to hotel. End 1600
8.5 hours

08/11/15 # 34140087

0800 Arrive Bering Air w/ Noyuk Peacock + Eric Barnhill
0820 Depart Nome
Arrive Northeast Cape Airstrip, sort supplies, walk to MOC

1050	26MW1	38.41' DTW BTOC
1108	22MW2	29.92'
1118	17MW1	13.06'
1125	14MW01	16.44'
1136	20MW1	24.82'
1142	MW88-10	22.82'
1150	14MW07	27.91'
1221	MW88-1	18.97
1228	MW88-3	14.22
1236	14MW03	13.41
1242	14MW02	11.42
1252	14MW04	4.66'
1259	14MW05	4.12
1306	14MW06	4.50
1311	MW10-1	6.85

MOC groundwater well water level survey

water level meter decontaminated after each reading w/ Alconox spray + DI rinse

no ice present in any wells

Surface water sampling at site 9 Landfill

1400 15NC09SW001 MS/MSD 25.6 NTU
GRO, BTEX, DRO/RRO, PCB, PAH, total metals, dissolved metals (8RCRA + Zn)
No sheen, orangish water

1430 15NC09SW02 no sheen, clear 1.19 NTU

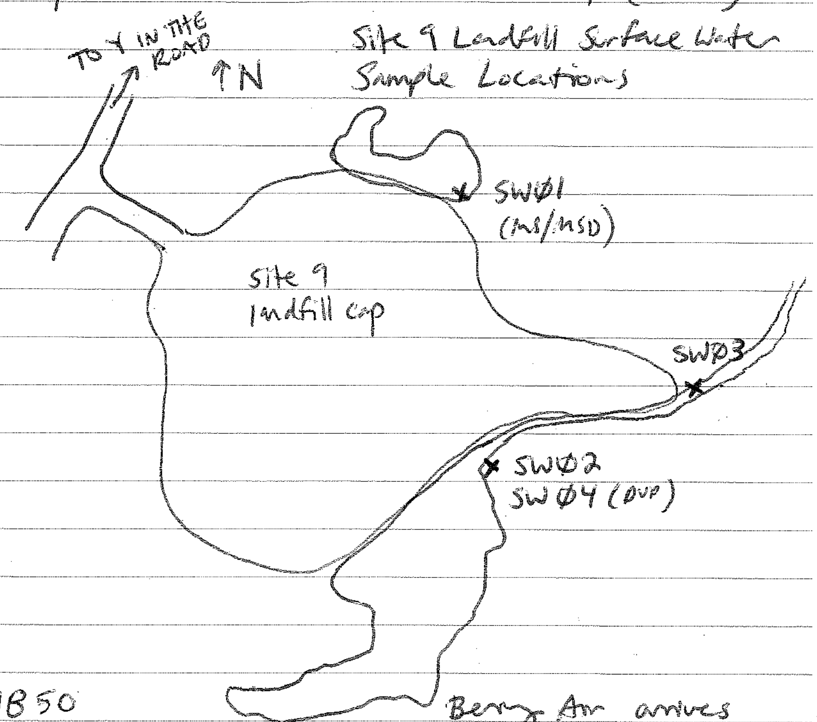
1435 15NC09SW04 DUPLICATE

1450 15NC09SW03 biogenic sheen clear 1.14 NTU

Collected dissolved metals samples in unpreserved polys to be filtered using peristaltic pump during transfer into HNO_3 preserved polys.

Noyuk + Eric conduct landfill survey (Site 7)

Site 9 Landfill Surface Water Sample Locations



1850 Bering Air arrives

2000 Arrive Nome

Purchase 4 gas cans, fill with gas

End 2030 12.5 hours

08/12/15

0800 Arrive Berry Air w/ Noyik and Eric
Adam @ Berry Air let us know Morgan's called to say our side by side will not be ready today.
Return to hotel to write up groundwater sample labels:

	15NCMOCGWØ1	26MW1	MS/MSD
explore equipment transport options, call Greg Jarrell + Tyler Ellingboe about ATV use options/weather delay time	Ø2	22MW2	
	Ø3	20MW-1	
	Ø4	17MW1	
	Ø5	14MW1	
	Ø6	14MWØ7	
	Ø7	MW88-10	
	Ø8	14MWØ3	
	Ø9	14MWØ2	
	1Ø	MW88-1	
	11	MW88-3	
	12	MW10-1	(MS/MSD VOC and g/wl)
	13	14MW04	
	14	14MW05	
	15	14MW06	
	16	DUP	
	17	DUP	

1400 Finish Labels

6 hours

8/13/15 34140087

0800 Arrive at Berry Air King Air + Casa w/ Arctic Cat depart Nome
0900 Arrive NE Cape Unload King Air + Casa
Organize equipment + mobilize to site
Set up on 26MW1 for MS/MSD
38.51' BTW (see gw purge sheet)
39.69 pump set clear, good recharge, no odor
1200 Collect 15NCMOCGWØ1 (MS/MSD)
Move to 17MW1, decontaminate pump + WL meter ZK 3/15/16
Eric + Noyik at 22MW2 → move to 20MW1
Set up on 17MW01, begin purge
17MWØ1 (see gw purge sheet)
~~17.55' BT~~ water
~~1965 BT~~ pump
clear, good recharge, no odor
1430 15NCMOCGWØ4 @ 17MW1
Move to 14MWØ1, decontaminate pump and WL meter ZK 3/15/16
Purge - cloudy, brown, slight fuel odor, no sheen
16.55' depth BTOC to water, 19.65 depth BTOC to pump

1610 15NCMOCGWØ5 @ 14MW01

Berry air arrive 1900
2000 Arrive Nome, sample management
2030 End
13.5 hours

 8/14/15

0800 Arrive Bering Air / Depart Nome 0900 Arrive NE Cape

Calibrate YSI, mobilize to site, decon WLmeter + pump ZK 3/15/16

MW88-10 23.89' to pump

23.20' to water small water column

clear, no odor, good recharge,

1120 15NCMOCGWØ7 @ MW 88-10

~~see~~ gw sample form.

1300 15NCMOCGW1Ø @ MW 88-1

very turbid initially, cleared up well

see groundwater sample form

pump + WL meter decontaminated w/Alconox + DI water

1530 15NCMOCGWØ8 @ 14MWØ3

WL drops at flow rates exceeding 300 mL/min

cloudy, greyish brown with slight fuel odor,

no sheen. See sampling form

ZK 3/14/15

1900 Bering Air Arrives @ NE Cape

2000 Arrive in Nome

3/15/16

8/15/15

0800 Arrive Bering Air / Depart Nome

0900 Arrive NE Cape - calibrate YSI

Mob to site, decontaminate pump and WLmeter ZK 3/15/16

1230 15NCMOCGW13 @ 14MWØ4

good recharge, high turbidity (see form) ZK 3/15/16

1300 15NCMOCGW16 DUPLICATE

Move to MW 10-1, decontaminate pump + WL meter

with Alconox + DI meter.

At lowest possible flow rate (6.4V) = 200 mL/min

Excessive drawdown. Well allowed to recharge

approx 30 minutes, 2 sets of parameters collected

and sampled

ZK 3/15/16

1325 15NCMOCGW12 @ MW 10-1

sample suite included VOC and glycol

(triple volume for MS/MSD collected for VOC +

glycol) Glycol collected into 40 mL VOA with

HCl preservative (no unpreserved VOAs in bottle order)

Bering Air @ NE Cape

Arrive in Nome 2000

3/15/16

8/16/15

1100 Package samples/sample management
at Bering Air. Noyuk Peacock → ANC
surface water and groundwater samples
2 coolers with VOA vials – trip blank
set added to each cooler (7 total)
Goldstreak to TA Tacoma
organize pallets of equipment for
shipment to NAC (2)
batteries and generator separate

standby for evening flight – full
8 hours

8/17/15 standby for morning flight to ANC
Barnhill → ANC
Depart nome → ANC 8:30pm
8 hours

8/17/15 Hach Kit Analysis ZK 3/15/16

	Fe^{2+}	Alkalinity
15NCMOCGWØ1	0.05	0
Ø2	0.06	0
Ø3	0.32	0
Ø4	0.06	0
Ø5*	0.09	0
Ø6	0.07	0
Ø7	0.05	0
Ø8*	2.17	40
Ø9*	3.30 (limit. Dilute/2 2.05 → 4.10 mg/kg)	40
1Ø	0.00	0
11	0.06	0
12	0.09	0
13*	0.51	~~120~~ ~~80~~ 40
14*	2.80	~~240~~ ~~120~~ 40
15	0.09	~~720~~ ~~120~~ 80

* some Fe^{3+} precipitate present prior to Hach test

8/19/15 Hach kit analysis

	Mn	Nitrate	Sulfate
ISNCMOCGWP1	0.2	0.06	9
02	0.6	0.06	13
03	0.3	0.22	14
04	0.2	0.08	10
05	0.2	0.02	8
06	0.4	0.09	4
07	0.4	0.05	6
08	0.4	0.00	6
09	1.1	0.01	7
10	0.0	0.16	9
11	0.5	0.17	8
12	0.5	0.16	5
13	0.4	0.02	27
14	2.2	0.03	10
15	0.5	0.02	6

Mn - acid digestion? Sodium Periodate packets

Nitraver 3 and Nitraver 6 vs Nitraver 5

ok

No

NOYUK PEACOCK
NE CAPE GROUNDWATER
MONITORING 34140087

AUGUST 2015

Rite in the Rain
ALL-WEATHER
JOURNAL
№ 391

INCH

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Rite in the Rain®
ALL-WEATHER WRITING PAPER

Name ______________________________

Address ______________________________

Phone ______________________________

Project ______________________________

CONTENTS

PAGE	REFERENCE	DATE

Nome 8/10/2015

Arrived in Nome at approximately 12:00 pm.

Gathered Materials and food to bring over to Northeast Cape.

Northeast Cape 8/11/2015

Flew to Northeast Cape at approximately 8:00 am

Measured groundwater depth at 15 wells proposed to be sampled.

Took 3 Surface water samples at Site 9 and collected three GPS features using historic locations.

Flew back to Nome at approximately 7:00 pm.

Nome 8/12/2015

Spent the day in Nome writing labels for the proposed Ground Water sample locations while waiting for the side by side to be fixed.

Northeast Cape 8/13/2015
MOC

22MW2
start: 12:15 pm
End: 2:05 pm

20M1
Start: 2:50 pm
End: 5:20 pm

7:00 pm (approximately) Flew back to Nome

Northeast Cape 8/14/2015

8:05 am Take off from Nome
9:00 am Arrived Northeast Cape

MOC
14 MW07
Start: 10:40 am
End: 12:00 pm

MW89-3
Start: 12:30 pm
End: 1:30 pm

14 MW02
Start: 2:00 pm
End: 5:00 pm

7:00 pm Take off from Northeast Cape
8:00 pm Arrived Nome

Northeast Cape 8/15/2015

~8:15 am Take off from Nome
~9:00 am Arrived Northeast Cape

MOC
14MW05
~Start: 10:45
~End: 1:~~10~~15

14 MW06
~Start: 1:45
~End: 3:00

~~Northeast Cape~~ N.P. Nome 8/16/2015

Flew back to Anchorage

Bristol

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Anchorage, AK 99501
phone (907) 563-0013
fax (907) 563-6713
www.bristol-companies.com

TOOLBOX SAFETY MEETING RECORD

DATE: 8-13-15

SUBJECTS:

1. slips trips falls
2. proper UTV usage
3. dress appropriately - layers
4.
5.
6.
7.
8.

	PRINTED NAME	SIGNATURE	COMPANY
1.	Lyndsey Klyppa	[signature]	BERS
2.	Eric Barnhill	[signature]	BERS
3.	Nayuk Peacock	[signature]	BERS
4.			
5.			
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TOOLBOX SAFETY MEETING RECORD

DATE: 8-11-15

SUBJECTS:

1. Slips/trips/falls
2. Airplane Safety
3.
4.
5.
6.
7.
8.

	PRINTED NAME	SIGNATURE	COMPANY
1.	Lyndsey Klepper	[signature]	BERS
2.	Eric Barnhill	[signature]	BERS
3.	Noyuk Peacock	[signature]	BERS
4.			
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TOOLBOX SAFETY MEETING RECORD

DATE: 8-14-15

SUBJECTS:

1. Weather - dress right
2. protect hands - Sampling acids
3. UTV - slower is better
4.
5.
6.
7.
8.

	PRINTED NAME	SIGNATURE	COMPANY
1.	Eric Barnhill	[signature]	BERS
2.	Lyndsey Kleppin	[signature]	BERS
3.	Noyuk Peacock	[signature]	BERS
4.			
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TOOLBOX SAFETY MEETING RECORD

DATE: 8-15-15

SUBJECTS:

1. Slips - trips - falls
2. team carry heavy things
3.
4.
5.
6.
7.
8.

	PRINTED NAME	SIGNATURE	COMPANY
1.	Lyndsey Kloppen	[signature]	BERS
2.	Eric Barnhill	[signature]	BERS
3.	Noyak Peacock	[signature]	BERS
4.	~~Lyn~~		
5.			
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Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Job Number: 34140087
Company: Bristol
Purged by: L Kleppin

Well No.: 26MW1
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Casing Height: Flush
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/13/15 Time: 1128

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 41.46 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 38.50

PURGE METHOD

☐ Pump – Type: Monsoon
☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic
☐ Other – Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other

40 Depth in feet (BTOC): ~~39~~-40 Screen Interval in Feet (BTOC)

Tubing Type/Size: teflon lined poly

PURGE TIME

1128 Start 1200 Stop 32 Elapsed

PURGE RATE

Initial 0.26 gpm ZK 3/15/16 Final 0.26 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

8.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. mS (µS/cm)	pH	ORP (mV)	DO (mg/L) 102%	Turbidity (NTU)	Cumulative Volume Purged
1136	38.52	12.2V	1000	2.74	0.075	5.95	154.3	13.96	0.79	3
1146	38.52	12.2	↓	2.50	0.075	5.99	158.0	13.88	0.92	5
1200	38.52	12.2	↓	2.54	0.075	6.05	160.9	13.67	0.59	8.5
			ZK 3/15/16							

15NCMOCGWØ1 (MS/MSD) 1200

8/13/2015

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs

Job Number: 34140087

Company: Bristol

Purged by: gb

Well No.: 22MW2

Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: Flush

Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8/13/15 ZK 3/15/16 Time: 1230 ZK 3/15/16

— 3-18-16

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 34.19 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 29.

Tubing Type/Size: Teflon lined

PURGE METHOD

☒ Pump – Type: Monsoon

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

PURGE TIME

1230 Start 1327 Stop 57 min Elapsed

PURGE RATE

Initial 0.25 gpm ZK 3/15/16 Final 0.25 gpm ZK/3/15/16

ACTUAL PURGE VOLUME

14 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
35	29.9	16	930	3.28	55	5.89	-47.9	~~[illegible]~~ 10.94 mg/L	28.2	7 Gallon
38	↓	↓	↓	3.52	55	5.98	-57.2	10.65	23.5	8
41	↓	↓	↓	3.38	55	5.93	-65.6	10.72	25.3	9
44	↓	↓	↓	3.40	55	5.92	-76.5	10.66	10.9	10
48	↓	↓	↓	3.30	55	5.89	-85.2	10.48	8.0	11
51	↓	↓	↓	3.24	55	5.88	-77.7	10.64	5.11	12

ZK 3/15/16

15NCMOCGW02 @ 1400

GROUNDWATER LOW-FLOW PURGING FORM (continued)

22MW2

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
54	" "	160	930	3.24	54	5.86	-72.5	10.70	4.66	13
57	" "	↓	930	3.29	55	5.89	-73.5	10.78	3.73	14
			CB 3/15/16							

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs

Job Number: 34140087

Company: Bristol

Purged by: EB

Well No.: 20 MW 1

Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: Ground level

Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8-13-15 Time: 1710

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 28.75

Water Level Depth (WL in feet BTOC): 24.95

PURGE METHOD

☐ Pump – Type: Monsoon

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

Tubing Type/Size: Teflon lined

PURGE TIME

1502 Start 1625 Stop 83 Elapsed

PURGE RATE

Initial 0.14 gpm ZK 3/15/16 Final 0.14 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

11.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
35	25.2	18	530	5.07	96	5.92	-105.1	9.6	32.9	4
38				4.02	93	5.91	-104.5	9.22	182	5.5
41				4.82	96	5.80	-100.6	8.6	88.8	6
45				4.92	97	5.9	-104.7	8.78	94.2	6.5
48				4.20	93	5.82	-104.1	8.45	88.4	7.0
51				4.25	94	5.76	-102.7	8.96	49.1	7.5

15NCMOCGW03 @ 1710

GROUNDWATER LOW-FLOW PURGING FORM (continued) 20MW1

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
55		18	530	4.02	93	5.81	107.9	8.6	24.4	8
58				4.41	94	5.83	-112.7	8.49	14.0	8.5
62				4.44	94	5.84	-120.0	8.37	11.7	9.0
66				4.53	94	5.85	-117.7	8.15	9.28	9.8
70				4.38	94	5.84	-118.3	8.08	7.32	10.0
75				3.23	89	5.75	-147.8	8.39	8.11	10.5
80				4.32	91	5.85	-151.2	9.32	3.71	11.0
83				2.11	87	5.93	-155.3	11.2	5.72	11.5
			ZK 3/15/16							

20 MW 1

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs

Job Number: 34140087

Company: Bristol

Purged by: L. Kleppin

Well No.: 17MW1

Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: flush

Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8/13/15 Time:

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 15.49 LK 3/15/16

Water Level Depth (WL in feet BTOC): 13.22

Tubing Type/Size: teflon lined

PURGE METHOD

☐ Pump – Type: monsoon

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): 13.63 Screen Interval in Feet (BTOC)

PURGE TIME

1350 Start 1415 Stop 25 Elapsed

PURGE RATE

Initial 0.2 gpm Final 0.1 gpm

ACTUAL PURGE VOLUME

5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1400	13.26	0.79	760	2.40	0.100	5.79	160.4	10.85	17.4	1
1408	13.25	0.79	↓	2.35	0.099	5.77	163.5	10.80	8.58	3
1411	13.26	0.79	↓	2.41	0.097	5.79	163.6	10.66	5.20	4
1415	13.26	0.79	400	2.47	0.099	5.83	164.0	10.52	5.52	5

15NCMOCGWØ4 1420

Bristol
ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape
Job Number: 34140087
Company: BERS

Well No.: 14MWØ1
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/13/15 Time: 1540

Purged by: C. Kleppin

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 21.91 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 16.55

19.5

PURGE METHOD

☐ Pump – Type: monsoon

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

PURGE TIME

1540 Start 1656 Stop 76 Elapsed

PURGE RATE

Initial 0.26 gpm ZK 3/15/16 Final 0.26 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

20 gallons

FIELD PARAMETER MEASUREMENT

Cloudy, ~~orangish~~ greyish brown

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1553	19.36	9.7	996	2.15	0.164	6.39	-0.3	2.69	792	4
1608	19.60	9.4	↓	2.68	0.151	6.40	19.5	1.10	146	7
1620	19.31	9.1		2.21	0.153	6.39	24.0	0.85	235	9
1634	18.97	9.1		2.04	0.142	6.36	28.5	0.74	73.0	11
1638	18.98	9.1		2.02	0.138	6.36	30.0	0.87	45.5	13
1644	18.98	9.1		2.02	0.137	6.36	30.9	0.81	33.4	15
1650	18.94	9.1		1.99	0.139	6.35	31.5	0.84	27.0	16
1653	18.95	9.1		2.04	0.136	6.34	32.2	0.76	24.5	17
1656		9.1		2.06	0.135	6.32	32.7	0.77	21.4	20

ZK 3/15/16

EB 9/16/15

15NCMDCGWØ5 1610

8/14/2015

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs

Job Number: 34140087

Company: Bristol

Purged by: E. Barnhill ZK 3/15/16

Well No.: 14MW07

Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: NA - Ground

Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8/14/2015 ZK 3/15/16 Time: 1040 ZK 3/15/16

[Signature] 3-18-16

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 32.90 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 28.06

PURGE METHOD

☐ Pump – Type: SS Monsoon ZK 3/15/16

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

ED 3/16/15

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

Tubing Type/Size: teflon-lined HDPE ZK 3/15/16

PURGE TIME

1040 Start 1132 Stop 52 Elapsed

PURGE RATE

Initial 0.1 gpm ZK 3/15/16 Final 0.1 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

6.0 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
35	29.3	12.5	440	3.53	62	6.44	114.7	7.34	7.83	3.5
39	29.36	12.5	↓	3.48	60	6.42	116.5	7.64	5.15	4.0
44	29.34	12.5		3.42	59	6.4	118.4	7.93	7.16	4.5
48	29.4	12.5		3.4	57	6.38	120.9	8.14	6.93	5.0
52	29.41	12.5		3.38	57	6.37	123	8.32	6.18	5.5
				3.40	56	6.36	125.9	8.47	9.45	6.0

ZK 3/15/16

15NCMOCGW06 @ 1140

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Well No.: MW 88-10

Job Number: 34140087
Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: flush

Company: Bristol
Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8/14/15
Time: 1040

Purged by: L. Kleppin

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 25.38 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 23.20

Tubing Type/Size: teflon lined

PURGE METHOD

☐ Pump – Type: monsoon

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): 23.89 Screen Interval in Feet (BTOC)

PURGE TIME

1040 Start 1124 Stop 44 Elapsed

PURGE RATE

Initial 0.1 gpm ZK 3/15/16 Final 0.1 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

4 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1048	23.78	8.8	340	2.28	0.128	5.28	-149.8	1.82	20.1	↓
1055	23.89	8.3	↓	2.49	0.108	5.53	-168.1	1.61	16.2	↓
1101	23.50	8.3	↓	2.95	0.103	5.64	-157.5	1.56	7.97	↓
1106	23.49	8.3	↓	3.37	0.100	5.68	-158.5	1.57	3.78	↓
1113	23.48	8.4	↓	3.75	0.098	5.68	-160.3	1.45	3.67	↓
1124	23.52	8.4	↓	3.86	0.096	5.67	-158.2	1.64	1.77	4

ZK 3/15/16

15NCMOCGWØ7 1120

Bristol
ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape
Job Number: 3414087
Company: BERS
Purged by: L. Kleppin

Well No.: 14MW03
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/14/15 Time: 1408
XK 3/15/16
(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 23.83
XK 3/15/16
Water Level Depth (WL in feet BTOC): 13.66

PURGE METHOD

☐ Pump – Type: Monsoon

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ~~☒~~ EP 3/16/15 ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

PURGE TIME

1408 Start 1610 Stop 122 Elapsed

PURGE RATE

Initial 0.1 gpm Final 0.07 gpm

ACTUAL PURGE VOLUME

10.5 gallons

FIELD PARAMETER MEASUREMENT

flow stopped, had to increase voltage

voltage must be increased – to maintain static flow rate

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒°C ☐°F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1410	14.37	7.0	380	4.09	0.217	6.77	-199.7	3.69	185	
1418	14.54	7.0		3.45	0.208	6.62	-180.3	0.98	174	
1430	14.76	7.0		3.64	0.211	6.55	-191.5	0.79	101	2
1452	16.11	7.3		3.20	0.233	6.53	-208.2	0.63	280	4
1459	16.10	8.0		3.64	0.245	6.65	-221.8	0.56	352	4
1509	16.50	8.0		3.99	0.243	6.74	-202.8	0.50	226	
1517	16.79	8.2		2.91	0.234	6.61	-203.7	0.67	260	5
1525	—	8.4		2.67	0.231	6.59	-199.1	0.50	830	
1540	17.40	8.4	270	3.22	0.207	6.66	-227.9	0.53	—	8

cloudy, greyish brown, slight fuel odor, no sheen

voltage on flow regulator fluctuates between 8.4 – 8.6 and flow is not stable at 83V there is no flow.

15NCMOC6W08 1530

GROUNDWATER LOW-FLOW PURGING FORM (continued)

14MWØ3 Page 2 of 2

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1553	17.39	8.4	270	3.06	0.202	6.60	-200.9	0.47	1000+	9
1557	16.80	8.4	↓	3.56	0.195	6.64	-196.7	0.49	170	10
1602	16.72	8.4		3.61	0.194	6.64	-196.6	0.43	111	—
1606	16.07	8.4		3.60	0.190	6.62	-177.7	0.40	73.7	10.5
1610	16.39	8.4	270	3.69	0.189	6.43	-193.9	0.37	52.2	—
			ZK 3/15/16							

8/14/15

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Well No.: 14MW02
Job Number: 34140087
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Casing Height: Flush
Company: Bristol
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/14/15 ZK 3/15/16 Time:
Purged by: E. Barnhill ZK 3/15/16 EB 3-18-16
(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 16.68

Water Level Depth (WL in feet BTOC): 14.46

Tubing Type/Size: Teflon lined

PURGE METHOD

☐ Pump – Type: SS Monsoon ZK 3/15/16
☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic
☐ Other – Type:

PUMP INTAKE SETTING

EB 3/16/15
☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC)

PURGE TIME

1415 Start 1603 Stop 108 min Elapsed

PURGE RATE

Initial 0.2 gpm Final 0.43 gpm

ACTUAL PURGE VOLUME

22 gallons

FIELD PARAMETER MEASUREMENT

reduced from 11.5

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
18	11.61	10.1	630	1.92	159	6.16	-50	2.0	38	
25	11.6	9.8		2.33	161	6.41	-40.1	.35	57.7	
28	11.62	9.1		2.46	170	6.44	-37.6	.27	36.3	
32	11.66	10.6		2.05	169	6.46	-45.7	.20	26.7	
36	11.66	10.6		2.16	175	6.47	-50.5	0.19	25.3	
40	11.66	10.6		2.39	180	6.47	-54.2	0.16	18.1	

ZK 3/15/16

15NCMOCGW09 @ 1640

14MW02

GROUNDWATER LOW-FLOW PURGING FORM (continued)

Voltage output keeps changing; likely due to battery use

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
44	11.64	8.3	630	2.37	180	6.47	-56.6	.16	17.9	
47	11.64	8.3	↓	2.44	181	6.45	-53.0	0.9	14.4	
50	11.66	8.3		2.21	183	6.43	-57	.7	14.5	
53	11.62	8.3		2.58	180	6.43	-54.1	.12	17.1	
57	11.62	8.0		2.63	180	6.41	-47.5	0.11	26.9	
60	11.62	8.0		2.63	174	6.43	-40.9	.10	36.5	
64	11.64	8.0		2.63	171	6.42	-37.2	.11	26.3	
69	11.64	8.0		2.59	175	6.40	-44.8	.27	16.2	
73	11.64	8.1		2.71	174	6.43	-49.9	.13	18.7	
76	11.64	8.1		2.68	172	6.43	-51.9	.14	29.6	
79	11.64	7.4	↓	2.57	173	6.42	-47.8	.10	24.9	
83	11.66	7.2	1630	2.48	178	6.41	-49.3	.12	23.9	
86	11.66	7.2	↓ ZB 3/16/15	2.35	177	6.41	-51.1	.11	34.8	
89	11.66	7.2		2.44	180	6.39	-46.4	.7	4.57	
93	11.64	7.2	1630	2.61	177	6.38	-49.7	.11	6.25	15.5
96	11.64	7.6	↓	2.47	169	6.30	-58.6	.10	5.02	
99	11.64	7.4		3.09	163	6.25	-61.5	.16	4.40	
103	11.64	8.2		2.73	162	6.21	-63.5	.14	3.93	20
108	11.64	8.7	↓	2.50	164	6.26	-64.0	.15	3.57	22
			ZK 3/15/16							

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Well No.: MW 88-1
Job Number: 34140087
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Casing Height: flush
Company: Bristol
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/14/15 Time: 1226
Purged by: L. Kloppin
(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 20.49 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 19.35

Tubing Type/Size: teflon lined

PURGE METHOD

☐ Pump – Type: monsoon
☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic
☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): 21 Screen Interval in Feet (BTOC)
ZK 3/15/16

PURGE TIME

1226 Start 1255 Stop 31 Elapsed

PURGE RATE

Initial 0.16 gpm ZK 3/15/16 Final 0.16 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1229	19.38	7.5	610	2.63	0.092	5.69	-162.8	6.67	86.3	
1234	19.37	7.5		2.31	0.093	5.55	-148.4	5.94	10.3	2.5
1246	19.38	7.5		2.27	0.092	5.51	-141.8	6.23	2.43	
1249	19.38	7.5		2.25	0.092	5.50	-140.5	6.20	1.74	4
1252	19.38	7.5		2.22	0.092	5.48	-137.4	6.31	1.34	
1255	19.38	7.5		2.46	0.092	5.50	-136.0	6.49	0.92	5

ZK 3/15/16

15NCMOCGW10 1300

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name	NE Cape HTRW RAs	Well No.:	MW88-3
Job Number	34140087	Well Type:	☒ Monitor ☐ Extraction ☐ Other
		Casing Height:	Flush
Company	Bristol	Well Material	☒ PVC ☐ St. Steel ☐ Other
		Date	8/15/15 ZK 3/15/16 Time: 1225 ZK 3/15/16
Purged by	EB		EB (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other ______

Total Depth of Casing (TD in feet BTOC): 19.31

Water Level Depth (WL in feet BTOC): 14.45

PURGE METHOD

☐ Pump – Type: SS monsoon ZK 3/15/16

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type: ______

PUMP INTAKE SETTING

EB 3/16/15

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): ______ Screen Interval in Feet (BTOC)

Tubing Type/Size: teflon-lined HDPE ZK 3/15/16

PURGE TIME

1230 Start 1300 Stop 35 min Elapsed

PURGE RATE

Initial 0.27 gpm ZK 3/15/16 Final 0.27 gpm ZK 3/15/16

ACTUAL PURGE VOLUME

9.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
20	15.08	10.4	1020	2.20	53	5.62	139	4.5	8.66	5
23	15.04			2.31	52	5.66	142	4.40	3.96	6
26	14.98			2.52	53	5.66	144.9	4.45	2.37	7
29	14.90			2.72	53	5.60	148.0	4.56	1.66	8
32	14.92	11.1		2.65	52	5.67	150.9	4.70	.95	9
35	14.92	11.1		2.62	53	5.66	155.1	4.43	1.38	9.5

ZK 3/15/16

15NCMOCGW11 @ 1300

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Job Number: 34140087
Company: Bristol
Purged by: L. Kleppin

Well No.: MW 10-1
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Casing Height: ~~Flush~~ ~4ft ZK 3/15/16
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/15/15 Time: 1424
(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 10.75 ZK 3/15/16

Water Level Depth (WL in feet BTOC): 7.15

Tubing Type/Size: teflon lined

PURGE METHOD

☒ Pump – Type: Monsoon
☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic
☐ Other – Type:

PUMP INTAKE SETTING

LB 3/16/15
☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): 9.15 Screen Interval in Feet (BTOC)

PURGE TIME

1410 Start 1503 Stop 53 Elapsed

PURGE RATE

Initial 0.12 gpm Final 0.12 gpm

ACTUAL PURGE VOLUME

6.1 gallons

FIELD PARAMETER MEASUREMENT

@ pump at lower – drawdown occurring lowest possible flow rate (no flow @ <6.4V)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1424	9.15	6.4	935	5.76	0.098	5.38	-74.7	1.56	399	3.5
1452		6.4	340	6.57	0.099	5.51	-101.3	2.03	175	6.0
1458	9.15	6.4	34	7.24	0.099	5.50	-100.3	2.06	90.1	6.0
1503	9.15	6.4	34	7.02	0.099	5.52	-101.1	2.44	95.7	6.1
			ZK 3/15/16							

recharging @ 50ml/min. Will allow to recharge + sample
15NCMOCGW10 1325 MS/MSD VOC, glycol

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Job Number: 34140087
Company: Bristol
Purged by: L. Kleppin

Well No.: 14MWØ4
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Casing Height: Flush Mount
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 8/15/15 Time: 1050

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): ☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 14.75

ZK 3/15/16

Water Level Depth (WL in feet BTOC): 4.16

Tubing Type/Size: teflon

PURGE METHOD

☐ Pump – Type: SS monsoon ZK 3/15/16

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

GB 3/16/15

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

PURGE TIME

1050 Start 1237 Stop 47 Elapsed

PURGE RATE

Initial 0.17 gpm Final 0.14 gpm

ACTUAL PURGE VOLUME

15.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1104	6.20	6.4V	670	4.74	0.380	6.00	-41.7	1.29	1000+	2.5
1121	6.10	6.4	↓	4.84	0.351	6.03	-116.9	1.20	1000+	5.0
1145	6.08	6.4		5.10	0.380	6.02	-131.3	1.17	616	9
1204	5.46	5.1	400	5.51	0.291	6.01	-130.2	1.23	393	
1223	5.49	5.1	↓	5.57	0.289	5.97	-119.3	1.20	297	13
1230	5.50	5.1		5.58	0.291	5.98	-123.9	1.11	300	14.5

ZK 3/15/16

15NEMOCGW13/16 1230/1300

GROUNDWATER LOW-FLOW PURGING FORM (continued)

14MW04

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☑ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
1233	5.50	5.1	540	5.97	0.292	5.98	-124.4	1.09	312	
1237	550	5.1	540	5.57	0.294	5.97	-118.1	1.05	287	15.5
			ZK 3/15/16							

8/15/2015

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs

Job Number: 34140087

Company: Bristol

Purged by: EB

Well No.: 14MWØ5

Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: Flush mount

Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8-15-2015 Time: 1230/1240 (Duplicates)

EB (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): ☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 13.36

Water Level Depth (WL in feet BTOC): 4.18'

Tubing Type/Size: teflon-lined HDPE YK 3/15/16

PURGE METHOD

☒ Pump – Type: Monsoon

☐ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

SB 3/16/15

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

PURGE TIME

1050 Start 1205 Stop 65 min Elapsed

PURGE RATE

Initial 0.2 gpm Final 0.5 gpm

ACTUAL PURGE VOLUME

17.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
35	5.08		760	3.95	130	6.17	30.5	.28	28.1	7.5
38	5.09		↓	3.90	130	6.17	34.3	.30	20.6	7.5+1.5
41	5.12			3.90	130	6.18	37.0	.35	17.5	8+1.5
44	5.12			3.95	135	6.18	37.7	.34	14.3	8.5+1.5
47	5.19			3.90	134	6.19	37.7	.34	16.0	9.0+1.5
50	5.18			3.87	130	6.19	38.9	.36	14.3	9.5+1.5

YK 3/15/16

heavy fuel odor
small sheen seen in bucket

15NC MW C GW 14/17

GROUNDWATER LOW-FLOW PURGING FORM (continued)

14MW05 (cont)

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☑ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
53	5.18		1800	3.88	138	6.2	38.9	.36	14.3	10 + 1.5
56	5.18		↓	3.87	138	6.19	38	.38	14.2	13
59	5.18			3.82	138	6.2	35.2	.36	11.9	14.5
62	5.18			3.86	138	6.2	34.3	.34	12.4	16
65	5.18			3.81	138	6.21	31.8	.32		17.5
			ZK 3/15/14							

8/15/2015

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: NE Cape HTRW RAs
Well No.: 14MW06

Job Number: 34140087
Well Type: ☒ Monitor ☐ Extraction ☐ Other

Casing Height: Flush Mount

Company: Bristol
Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 8-15-15
Time: 1500

Purged by: EB

(Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 14.68

Water Level Depth (WL in feet BTOC): 4.81'

PURGE METHOD

☒ Pump – Type: Monsoon

☐ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic

☐ Other – Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): Screen Interval in Feet (BTOC)

Tubing Type/Size: Teflon lined

PURGE TIME

1246 Start Stop Elapsed

PURGE RATE

Initial 0.2 gpm Final gpm

2k 3/15/16

ACTUAL PURGE VOLUME

11 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
15	5.08	6.4	630	5.82	222	6.61	37.2	.36	9.1	2.5
	5.08	6.4	↓	5.80	221	6.61	34.7	.28	6.67	3.5
25	5.10	6.4		5.85	222	6.60	32.7	.20	4.89	4.5
	5.10	6.4		5.92	219	6.60	28.9	.18	4.03	5.5
	5.08	↓		5.97	221	6.60	28.0	.17	2.83	6.5
	5.08			5.95	221	6.6	27.0	.20	3.44	7.5

15NCMOCGW15 @ 1500

GROUNDWATER LOW-FLOW PURGING FORM (continued)

14MW06

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
	5.08			5.98	220	6.6	25.7	.17	3.17	10
	5.09			5.95	222	6.61	24.9	.18	2.85	11

APPENDIX D

Photograph Log

Northeast Cape Groundwater Sampling 2015 Photo Log

View from runway up Cargo Beach Road

IMG_001

August 11, 2015 South

Photographer: E. Barnhill

Stream crossing Cargo Beach Road at runway

IMG_028

August 11, 2015 Northwest

Photographer: E. Barnhill

Northeast Cape Groundwater Sampling 2015 Photo Log

View of site from runway August 11, 2015 Southwest

20150811_161606 Photographer: N. Peacock

Groundwater sampling August 14, 2015 Down

IMG_040 Photographer: E. Barnhill

Northeast Cape Groundwater Sampling 2015 Photo Log

Water sampling in background and foreground

20150814_131853

August 14, 2015 Southwest

Photographer: N. Peacock

Collecting water sampling parameters

IMG_043

August 14, 2015 close up

Photographer: E. Barnhill

Northeast Cape Groundwater Sampling 2015 Photo Log

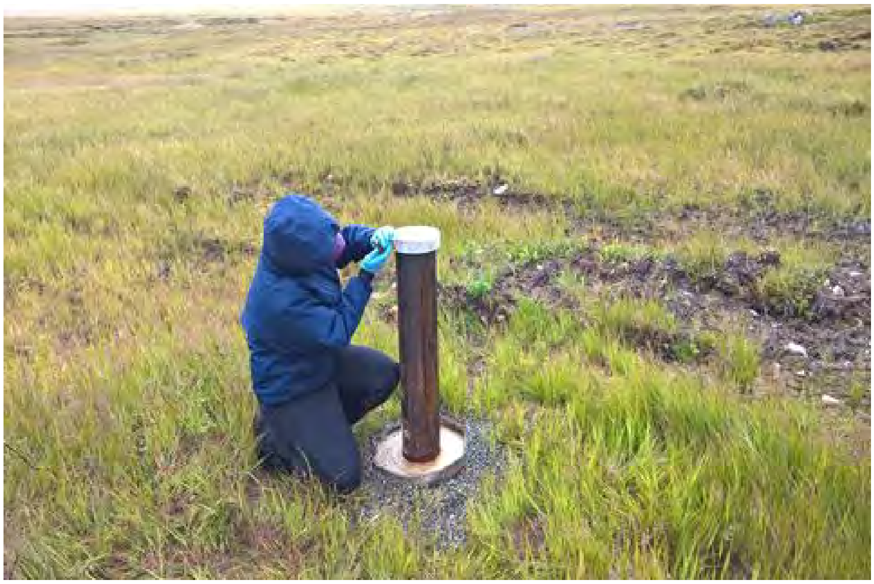
Sample collection setup
IMG_041

August 14, 2015 Down
Photographer: E. Barnhill

Overview of MOC
IMG_069

August 15, 2015 East
Photographer: E. Barnhill

Northeast Cape Groundwater Sampling 2015 Photo Log



Opening stickup well casing August 15, 2015 Northeast

IMG_044 Photographer: E. Barnhill

Overview of MOC looking toward well North of Site 10 August 15, 2015 East

Photographer: E. Barnhill

IMG_070

Northeast Cape Groundwater Sampling 2015 Photo Log

Project ATV at runway with resident 4 wheeler in background

IMG_074

August 15, 2105 East

Photographer: E. Barnhill

Supplies prepared to overnight in wind

IMG_031

September 23, 2015 Down

Photographer: E. Barnhill

APPENDIX E

Bristol Standard Operating Procedures
for Groundwater Sampling

BRISTOL ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER SAMPLING

STANDARD OPERATING PROCEDURE BERS-02

Record of Changes

Revision No.	Date	Prepared by	Approved by
1	10/14/09	B. Allen	L. Maserjian
2	02/16/2010	J. Clark	B. Allen/ J. Clark

GROUNDWATER SAMPLING

STANDARD OPERATING PROCEDURE

Summary: Groundwater samples are usually obtained from either temporarily or permanently installed groundwater monitoring wells. In order to obtain a representative groundwater sample, the stagnant water in the well casing and the water immediately adjacent to the well are purged before sample collection. Depending on the needs of the project, purging can be performed either by traditional methods (purging several full well volumes), or by the low stress/low flow method. Once purging is complete, samples are collected using a sampling device that does not affect the integrity or representativeness of the sample.

Health and Safety: Sampling activity should only be conducted in accordance with an approved Site Health and Safety Plan. Electric generators must be grounded to prevent possible electrical shock.

Interferences and Potential Problems: The primary problems associated with groundwater sampling are the collection of non-representative samples, and sample contamination from equipment or the environment. These can be eliminated or minimized through implementation of strict well purging and sample collection and handling procedures, and by the use of qualified personnel.

To safeguard against collecting non-representative stagnant water, the following guidelines and techniques should be adhered to during sampling:

- Monitoring wells should be pumped or bailed prior to sampling. This should be done in a manner that minimizes alterations to the water chemistry.
- The well should be sampled as soon as possible after purging and stabilization of indicator field parameters.
- Analytical parameters typically dictate whether the sample should be collected through the purging device or through separate sampling equipment.
- Portions of water that have been tested with a field meter probe will not be collected for chemical analysis.
- Excessive pre-pumping of the well should be avoided.

Personnel Qualifications: Sampling personnel will be trained and certified as hazardous site workers per Title 29 Code of Federal Regulations, Part 1910.120e [29 CFR 1910.120(e)]. If applicable, additional qualification requirements will be specified by the Bristol Quality Control Manager prior to any on-site sampling activity.

Equipment and Materials: Prior to deployment in the field, the requisite sampling equipment and materials will be identified, secured, and inspected for signs of damage or potential contamination.

- Ideally, purging and sample withdrawal equipment should be completely inert, economical, easily cleaned, reusable, able to operate at remote sites in the absence of power resources, and capable of delivering variable rates for sample collection. Adjustable rate, submersible and peristaltic pumps are preferred. Peristaltic pumps are only effective if groundwater depths are approximately 25 feet below the ground surface or shallower. When sampling for volatile contaminants, a pump that minimizes or eliminates volatilization should be selected. The use of inertial pumps is discouraged because of their tendency to cause greater disturbance during purging and sampling.
- Sampling and purging equipment (e.g., bailers, bladders, pumps, and tubing) should be made from stainless steel, Teflon®, polypropylene, or glass.
- The use of 1/4 or 3/8-inch inner diameter tubing is preferred. Clean, pharmaceutical grade tubing should be used in drawing and sampling groundwater. Water level measuring devices should be capable of measuring to 0.01-foot accuracy.
- In addition to groundwater sampling equipment, sampling support equipment may include water level indicators, depth sounder, water quality meter (such as YSI), keys for well caps, organic vapor screening device (such as photoionization detector [PID]), plastic sheeting, tubing, pre-cleaned sample containers, sample preservatives, decontamination supplies and equipment, safety equipment, logbooks, field forms, camera, chain- of-custody forms and seals, coolers and ice packs, and labeling, packaging, and shipping supplies. Sample containers will be of the type and size specified in the governing Quality Assurance Project Plans (QAPPs).

Field Preparation: Perform the following steps before any purging or sampling activities:

1. Pre-label and ready all the required sample containers.
2. To the extent known, plan to sample wells in order of increasing contamination.
3. Check the well for security damage or evidence of tampering, and record observations.
4. Record location, time of day, and date in field notebook.
5. Remove locking well cap and well casing cap.
6. Screen well headspace with a PID or equivalent, to determine the presence or absence of volatile organic compounds. Record instrument readings in the field logbook or field form.
7. Lower a water-level measuring device into the well until water surface is encountered and the instrument alarms.

8. Measure distance from water surface to reference measuring point on well casing or protective barrier post, and record in the field logbook or on the field form. If there is no reference point, measure from the top of the steel casing, top of PVC riser pipe, from ground surface, or some other position on the wellhead, and note in the field logbook or field form.
9. Measure the total depth of the well and record in the field logbook or field form. Measure well depth either the day before sampling or after all sampling in that well has been completed. Take care to minimize disturbance of the water column.
10. Calculate the volume of water in the well using the following calculations and data reduction:

    Well volume: $V = 0.041d^2h$

    V = volume of one well casing of water in *gallons*

    d = inner diameter of the well casing in *inches*

    h = total height of the water column in *feet*

    Based on this equation, one well volume can be calculated simply by multiplying the height of the water column in feet by the appropriate conversion factor, which is based on the casing diameter as follows:

Diameter	2-inch	3-inch	4-inch	5-inch	6-inch
Volume (gal/ft.):	0.1632	0.3672	0.6528	1.02	1.4688

11. Select the appropriate purging and sampling equipment based on requirements in the site-specific QAPP.

Purging: To ensure that a representative groundwater sample is collected, a well is typically purged prior to sample collection. Well purging is accomplished either by using low-flow procedures or removing a prescribed volume of water from the well (usually a minimum of three to five well volumes). During both purging methods, water quality parameters should be monitored for stabilization.

Purging may be performed by using bailers or pumping mechanisms. In general, a pump is preferred over a bailer for purging and sampling because it will not stress the well like dropping a bailer into the well. If using a pump, select a low removal rate in order to not stress the well. Tubing should remain filled with water, so as to minimize possible changes in water chemistry upon contact with the atmosphere.

If possible, avoid purging wells to dryness by slowing the purge rate. If the well has a poor recharge rate and is purged dry, sample the well once the water level has recovered sufficiently to collect the appropriate volumes for all required analyses. Record in the field logbook or on the field form that samples were collected, even though water quality parameters did not stabilize or the required volume of water was not removed.

If water quality parameters have not stabilized after 1 hour of purging, options include continued purging until stabilization is achieved, or collecting samples although stabilization has not been achieved. Record all actions taken in the field logbook or field form.

Once the purging requirements have been met, the groundwater sample can be collected. Collect and dispose of purge water and solid investigation-derived waste (IDW) as prescribed in the site-specific QAPP.

These procedures are used for sampling events that require purging prior to sampling. For some projects, sampling may be performed without purging the well first. Refer to the non-purge sampling procedures.

Low-Flow Purging

For low-flow purging and sampling, the Region 1 U.S. EPA Low Flow Guidance Document [*Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, July 30, 1996, Revision 2] will be followed, and is summarized below.

1. After the water level and total well depth have been measured, lower the submersible pump or tubing (Teflon, polyethylene, or other approved material) for peristaltic pump slowly (to minimize disturbance) into the well to the middle of the submerged, screened interval of the well, or appropriate depth based on site-specific conditions. Placing the pump or tubing in this manner will reduce the risk of drawing down the water table to below the pump intake, thus preventing the introduction of air into the sample tubing.
2. Before starting the pump, measure the water level and record it on the Groundwater Low Flow Purging Form.
3. Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging until indicator field parameters stabilize (described in Number 5, below).
4. Monitor and record water level and pumping rate every 3 to 5 minutes during purging. If a flow rate meter is present, record the pumping rate every 3 to 5 minutes as well. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump to ensure stabilization of indicator parameters. Adjustments are best made in the first 15 minutes of pumping. The final purge volume must be greater than the stabilized drawdown, plus the extraction tubing volume.
5. Monitor indicator field parameters every 3 to 5 minutes during purging, with a calibrated combination type meter (i.e., YSI, etc.). The following field parameters will be monitored: turbidity, temperature, specific conductance, pH, oxidation-reduction potential (ORP), and dissolved oxygen (DO). All measurements, except

turbidity, must be obtained using a flow-through cell. Transparent flow-through cells are preferred. This allows the field personnel to watch particulate buildup within the cell. If the cell needs to be cleaned during purging, continue pumping and disconnect the cell for cleaning. Then reconnect and continue monitoring.

6. Groundwater samples can be collected after the field parameters stabilize within the following limits:
   - Turbidity: ± 10% for values greater than 1 nephelometric turbidity units (NTUs)
   - DO: ± 10 %. Note: DO may not stabilize unless using a flow-thru cell. If not using a flow-thru cell, disregard this parameter for the purpose of establishing stability
   - Specific conductance: ± 3%
   - Temperature: ± 3%
   - pH: ± 0.1 pH units
   - ORP: ± 10 millivolts

Purging is considered complete and sampling may begin when all of the above indicator field parameters have stabilized. Do not change the flow rate of the pump prior to sampling. Remove the flow through cell prior to collecting the groundwater samples, and collect directly from the pump discharge.

General Well Purging – Removing Specified Volume of Water

During general well purging, a specified minimum volume of water (usually three to five well casing volumes) should be purged prior to sampling. Water temperature, pH, turbidity, DO, ORP, and specific conductance should be periodically measured during purging using a calibrated combination type meter (i.e., YSI, etc.). These parameters should be measured and recorded approximately every three to five minutes, or after each well volume is removed. The sample can be collected after the required volume of water has been purged and the parameters have stabilized within the limits described above in Number 6 of the low-flow purging section.

Purging Methods

Pumping mechanisms – peristaltic pumps, submersible pumps, non-contact gas bladder pumps, and suction pumps, etc.

1. Assemble the pumping unit. For more information on pump assembly and operation, refer to the specific user’s manual for the type of pump used.
2. Lower the tubing (peristaltic pump) or pump/tubing assembly (submersible pumps) into the well to the midpoint of the zone to be sampled. If possible, keep the tubing or pump intake at least 2 feet above the bottom of the well, to minimize mobilization

of particulates present in the bottom of the well.

3. Attach a water quality meter to the outlet tubing to monitor water quality parameters.
4. If required, attach a flow meter to the outlet tubing to measure the volume and rate of water purged.
5. Attach the power supply (typically a battery, generator, etc.). Use a ground fault circuit interrupter (GFCI), or ground the generator to avoid electric shock.
6. Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Adjust the pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet, but remains stable, continue purging until indicator field parameters stabilize.
7. During purging, monitor water quality parameters and water level drawdown.
8. After water parameters have stabilized, disconnect the water quality meter and flow meter, then collect sample.

Bailer Purging

1. Attach the line to the bailer and slowly lower until completely submerged, be careful not to drop the bailer to the water, which would cause turbulence and the possible loss of volatile contaminants.
2. Pull bailer out, while ensuring that the line either falls onto a clean area of the plastic sheeting or that it never touches the ground.
3. Empty the bailer into a pail of known volume (for example, a five-gallon bucket, preferably graduated). Use the volume of the pail to estimate the amount of water removed.
4. During purging, monitor water quality parameters.
5. Remove the required amount of water.
6. If water quality parameters have stabilized, the sample can be collected. If parameters have not stabilized, continue purging until stabilization has been achieved, or collect sample if directed to do so by the project manager.

Sampling: Sampling may be accomplished using pumping mechanisms or bailers. Care must be exercised during the use of bailers because of their tendency to disturb sediment, leading to increased turbidity.

General Procedures

1. If using a pumping mechanism, do not change the flow rate maintained during purging.
2. Remove the water quality and flow rate meters, if used.
3. If using a pumping mechanism, collect non-filtered samples directly from the outlet tubing into the sample bottle. For filtered samples, connect the pump outlet tubing directly to the filter unit. The pump pressure should remain decreased so that the pressure buildup on the filter does not blow out the pump bladder, or displace the filter.
4. For certain projects, sampling may be performed without purging the well first, typically using a bailer. It is preferable to record the water quality parameters (turbidity, DO, specific conductance, temperature, pH, and ORP) before the sample is collected. Non-purge sampling will be performed in accordance with the steps below.
5. If using a bailer, lower the bailer slowly and gently into the well, taking care not shake the casing sides or to splash the bailer into the water. Stop lowering at a point adjacent to the screen. Allow the bailer to fill and then slowly and gently retrieve the bailer from the well, avoiding contact with the casing, so as not to knock flakes of rust or other foreign materials into the bailer. If the bailer comes with a Bottom Emptying Devise (BED), place the BED into the bottom of the bailer. Fill the sample containers from the BED. A specific BED for volatile samples is recommended because it reduces the outflow to a very low laminar rate. This device is typically purchased separately from the bailers.
6. Collect samples in appropriate containers in order of volatility, with the most volatile samples collected first. Containers should be either pre-labeled or labeled immediately after sample collection. For collecting volatile samples using the zero-headspace procedure, follow procedures specified at the end of this section.
7. Fill containers slowly (avoid turbulence).
8. Filter and preserve samples as specified in the site-specific QAPP.
9. If duplicate samples, split samples, or other quality assurance/quality control (QA/QC) samples are required, collect them at the same time as the primary sample.
10. Cap sample containers tightly and place into a sample cooler. Samples must be chilled and maintained at a temperature of 4 degrees Celsius. Do not allow samples to freeze.
11. Replace the well cap.
12. Log all samples in the field notebook or on field forms.
13. Package samples and complete requisite paperwork.
14. Dispose of all liquid and solid IDW in accordance with project planning documents.

Volatile Sampling Using Zero-Headspace Procedure

1. Open the sample vial, set cap in clean place, and fill the vial just to overflowing. Do not rinse the vial or allow excessive overflowing. There should be a meniscus on the top of the filled vial.
2. Check that the cap has not been contaminated and carefully cap the vial. Slide the cap directly over the top and screw down firmly. Do not over tighten because the cap may break.
3. Invert the vial and tap gently. It is imperative that no air is entrapped in the sample vial. If an air bubble appears that is smaller than approximately 1.0 millimeter, the sample is still viable. If the bubble(s) are larger, discard the sample and begin again.
4. Place the vial in a protective foam sleeve, and then place into the cooler.

Quality Control: The following procedures apply:

- Samples will be packaged, handled, and shipped as prescribed in BERS-03 *Sample Management Standard Operating Procedure.*
- Equipment will be operated and used in accordance with the manufacturer's instructions, unless otherwise specified in the site-specific QAPP.
- Equipment examination activities should occur prior to field deployment, and they should be documented. It is especially important to check that the correct number and type of sample bottles are being sent/taken to the field prior to starting the field activities.
- Depending on the needs of the project, if using non-disposable equipment, collect an equipment rinsate blank to evaluate the potential for cross contamination from the purging or sampling equipment. Collect equipment rinsate blanks by pouring analyte-free water over the decontaminated sampling equipment.
- Depending on the needs of the project, a field blank may be required per matrix and for each sampling event to evaluate whether contaminants have been introduced into the samples during the sampling process. Field blank samples will be obtained by pouring laboratory-grade, certified organic-free water (for organics) or deionized water (for metals) into a sampling container at the sampling point.
- One trip blank per cooler is required when submitting samples for volatile organic analysis. Trip blanks for water and soil samples are prepared and sealed by the laboratory. They are transported to the field and returned, unopened, to the laboratory in the same cooler as the samples collected for volatile organic compound (VOC) analysis.
- Blanks will be collected at the frequency and locations specified in the site-specific QAPP. Blanks are analyzed for the same target analytes as the associated field samples. Each blank receives a unique sample number and is submitted blind to the laboratory.

APPENDIX F

Sample Data Tables

Table F1 MOC MNA Groundwater Parameters 2010-2015

		Well ID	26MW1						22MW2					
		Sample ID	26WA01	WA02	WA02	13NCMOCGW-01	14NCMOCGW01	15NCMOCGW01	22WA01	WA03	WA01	13NCMOCGW-02	14NCMOCGW02	15NCMOCGW02
		Date	8/16/2010	7/16/2011	7/8/2012	7/19/2013	8/20/2014	8/13/2015	8/14/2010	7/16/2011	7/8/2012	7/19/2013	8/20/2014	8/13/2015
Analyte	Units	Method Detection Limit												
Ferrous Iron	mg/L	0.01	<0.01	0.05	<0.03	0.05	0.02	0.05	<0.01	<0.01	<0.03	ND	0.02	0.06
Manganese	mg/L	0.2	<0.2	0.2	0.2	0.5	0.2	0.2	<0.2	<0.2	0.1	0.2	0	0
Sulfate	mg/L	2	6.0	10	6	10	6	9	12	7	12	16	6	13
Nitrate	mg/L	0.4	0.3	1.3	0.26	0.12	0.05	0.06	0.6	1	0.34	0.16	0.08	0.06
Alkalinity	mg/L	0	0.0	40	40	40	80	0	0	40	40	30	60	0
Temperature	°C	NA	3.0	3.47	3.22	4.19	2.83	2.54	3.9	6.4	3.54	5.42	2.85	3.29
Specific Conductivity	µS/cm	NA	47.0	61	84	50	74	75	65	60	108	69	97	55
pH	NA	NA	6.8	5.74	5.79	5.49	5.63	6.05	6.09	5.63	5.79	5.92	5.75	5.89
Oxidation-Reduction Potential	mV	NA	202.1	202.8	197.2	222.7	230.1	160.9	234.2	53.7	204.6	129.5	165.3	-73.5
Dissolved Oxygen	mg/L	NA	11.5	12.63	12.4	13.99	13.47	13.67	10.07	10.99	12.45	14.82	13.14	10.78
Methane	µg/L	NA	0.4	ND (0.29)	ND (0.29)	ND (0.37)	ND (0.37)	ND (0.80)	0.76	ND (0.29)	ND (0.29)	ND (0.37)	ND (0.37)	ND (0.80)

Notes:
*Well was decommissioned in 2012
< = less than
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
[D]sample is a duplicate of the previous sample
J = result is an estimate
mg/L = milligrams per liter
MNA = monitored natural attenuation
MOC = Main Operations Complex
mV = millivolts
NA = not applicable
ND = non-detect; limit of detection in parentheses
NM = not measured
NR = not reported
pH = potential hydrogen

Table F1 MOC MNA Groundwater Parameters 2010-2015 (continued)

		Well ID	20MW1						14MW07		MW88-10						
		Sample ID	20WA01	WA04	WA03	13NCMOCGW-05	14NCMOCGW04	15NCMOCGW03	14NCMOCGW07	15NCMOCGWO6	19WA02	WA10	WA05	13NCMOCGW-06	13NCMOCGW-07[D]	14NCMOCGW05	15NCMOCGWO7
		Date	8/4/2010	7/17/2011	7/9/2012	7/20/2013	8/21/2014	8/13/2015	8/21/2014	8/14/2015	8/15/2010	7/18/2011	7/9/2012	7/21/2013	7/21/2013	8/21/2014	8/14/2015
Analyte	**Units**	**Method Detection Limit**							low recovery/high turbidity								
Ferrous Iron	mg/L	0.01	NR	<0.01	<0.03	ND	---	0.32	0.25	0.07	<0.01	0.02	0.49	1.04	1.08	---	0.05
Manganese	mg/L	0.2	NR	<0.2	0.3	0.2	0	0.3	0.3	0.4	1.0	0.40	1.00	2.9	1.1	0.2	0.4
Sulfate	mg/L	2	NR	24	16	22	6	14	1	4	6.0	8.00	16.00	8	8	5	6
Nitrate	mg/L	0.4	NR	1.3	0.23	0.26	0.2	0.22	<0.01	0.09	0.1	0.90	0.56	0.03	0.03	0.02	0.05
Alkalinity	mg/L	0	NR	80	40	45	80	0	40	0	40.0	40	40	70	30	40	0
Temperature	°C	NA	3.61	2.33	3.39	3.58	2.37	2.11	6.49	3.4	2.9	4.43	1.61	3.64	2.66	2.86	3.86
Specific Conductivity	µS/cm	NA	63	82	143	83	131	87	275	56	65.0	61	124	75	68	101	96
pH	NA	NA	6.29	5.89	5.76	5.65	5.68	5.93	6.90	6.36	7.6	5.78	5.74	5.82	5.31	5.55	5.67
Oxidation-Reduction Potential	mV	NA	101.4	125.8	231.5	62.4	180	-155.3	-385.4	125.9	146.0	47.7	146.6	129.6	114.3	148.7	-158.2
Dissolved Oxygen	mg/L	NA	3.96	10.78	9.04	10.45	11.85	11.2	4.52	8.47	0.8	1.55	0.66	0.37	0.37	1.63	1.64
Methane	µg/L	NA	ND (0.19)	ND (0.29)	ND (0.29)	ND (0.37)	ND (0.37)	ND (0.80)	30	1.6 J	0.4	1.8	32.0	54	61	14	6.2

Notes:
*Well was decommissioned in 2012
< = less than
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
[D]sample is a duplicate of the previous s
J = result is an estimate
mg/L = milligrams per liter
MNA = monitored natural attenuation
MOC = Main Operations Complex
mV = millivolts
NA = not applicable
ND = non-detect; limit of detection in
NM = not measured
NR = not reported
pH = potential hydrogen

Table F1 MOC MNA Groundwater Parameters 2010-2015 (continued)

		Well ID	**MW88-1**							**MW88-3**		**MW10-1**					
		Sample ID	**19WA01**	**WA09**	**WA06**	**13NCMOCGW-08**	**14NCMOCGW08**	**14NCMOCGW09**	**15NCMOCGW10**	**14NCMOCGW10**	**15NCMOCGW11**	**10WA01**	**WA01**	**WA07**	**13NCMOCGW-04**	**14NCMOCGW17**	**15NCMOCGW12**
		Date	**8/4/10**	**7/18/11**	**7/9/12**	**7/21/13**	**8/22/14**	**8/22/14**	**8/14/15**	**8/22/2014**	**8/24/2015**	**8/14/10**	**7/15/11**	**7/10/12**	**7/20/2013**	**8/23/2014**	**8/15/2015**
Analyte	**Units**	**Method Detection Limit**															
Ferrous Iron	mg/L	0.01	<0.01	0.04	< 0.03	0.03	0.03	0.04	0	0.11	0.06	<0.01	0.09	<0.03	0.23	0.00	0.09
Manganese	mg/L	0.2	0.3	0.30	<0.2	0.4	0.0	0.0	0.0	0.0	0.5	<0.2	0.10	<0.2	ND	0.1	0.5
Sulfate	mg/L	2	7	8.00	8.00	9	3	3	9	4	8	3.0	4.00	3.00	3	3	5
Nitrate	mg/L	0.4	0.3	1.50	0.20	0.29	0.07	0.12	0.16	0.03	0.17	0.3	0.40	<0.01	0.11	0.07	0.16
Alkalinity	mg/L	0	40	40	40	40	40	70	0	70	0	0.0	40	40	50	NM	0
Temperature	°C	NA	2.85	2.30	3.27	2.66	2.18	2.18	2.46	2.89	2.62	6.6	6.03	4.42	3.79	6.62	7.02
Specific Conductivity	µS/cm	NA	68	60	111	68	0.089	89.00	92.00	87	53	63.0	56	0	78	109	99
pH	NA	NA	5.59	5.75	5.52	5.31	5.38	5.38	5.50	5.36	5.66	5.6	5.45	5.37	5.43	5.35	5.52
Oxidation-Reduction Potential	mV	NA	190.1	70.90	225.90	114.3	231.6	231.6	-136.0	175.5	155.1	202.5	85.50	251.60	68.9	185.1	-101.1
Dissolved Oxygen	mg/L	NA	1.26	2.09	1.58	2.23	6.43	6.43	6.49	4.73	4.43	5.6	4.74	2.93	1.26	2.83	2.44
Methane	µg/L	NA	0.34	0.44 J	0.37J	ND (0.37)	ND (0.37)	ND (0.37)	ND (0.80)	1.8 J	1.6 J	0.5	0.29 J	0.85	26	1 J	ND (0.80)

Notes:
*Well was decommissioned in 2012
< = less than
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
[D]sample is a duplicate of the previous s
J = result is an estimate
mg/L = milligrams per liter
MNA = monitored natural attenuation
MOC = Main Operations Complex
mV = millivolts
NA = not applicable
ND = non-detect; limit of detection in
NM = not measured
NR = not reported
pH = potential hydrogen

Table F1 MOC MNA Groundwater Parameters 2010-2015 (continued)

		Well ID	14MW06		17MW1						14MW01		14MW02		14MW03	
		Sample ID	14NCMOCGW16	15NCMOCGW15	17WA01	WA05	WA04	13NCMOCGW-03	14NCMOCGW03	15NCMOCGW04	14NCMOCGW06	15NCMOCGW05	14NCMOCGW12	15NCMOCGW09	14NCMOCGW13	15NCMOCGW08
		Date	8/23/2014	8/15/2015	8/4/2010	7/17/2011	7/9/2012	7/20/2013	8/20/2014	8/13/2015	8/21/2014	8/13/2015	8/22/2014	8/14/2015	8/23/2014	8/14/2015
Analyte	Units	Method Detection Limit													low recovery/high turbidity	
Ferrous Iron	mg/L	0.01	1.75	0.09	0.01	0.06	<0.03	0.01	---	0.06	0.85	0.09	0.86	3.3	0.89	2.17
Manganese	mg/L	0.2	1.6	0.5	<0.2	0.10	<0.2	0.3	0	0.2	0	0.2	0.9	1.1	0.9	0.4
Sulfate	mg/L	2	3	6	16	15.00	16.00	20	5	10	7	8	3	7	8	6
Nitrate	mg/L	0.4	0.00	0.02	0.2	0.70	0.19	0.11	0.11	0.08	0	0.02	0.00	0.01	---	0
Alkalinity	mg/L	0	NM	80	0	40	40	37	60	0	80	0	80	40	180	40
Temperature	°C	NA	2.57	5.95	3.09	2.73	2.74	3.45	2.35	2.47	2.89	2.06	1.38	2.5	3.41	3.89
Specific Conductivity	µS/cm	NA	1429	222	68	67	108	65	96	99	148	135	0.183	164	481	189
pH	NA	NA	6.21	6.61	5.76	5.78	5.45	5.45	5.65	5.83	6.51	6.32	6.39	6.26	6.65	6.63
Oxidation-Reduction Potential	mV	NA	-68.5	24.9	160.8	237.10	205.50	149.2	166.6	164	-191.9	32.7	-103.8	-64	-404.9	-193.9
Dissolved Oxygen	mg/L	NA	0.32	0.18	7.32	4.47	9.22	9.77	11.15	10.52	3.78	0.77	1.17	0.15	8.03	0.37
Methane	µg/L	NA	160	110	ND (0.19)	ND (0.29)	ND (0.29)	ND (0.37)	ND (0.37)	ND (0.80)	83	54	200	240	47	88

Notes:
*Well was decommissioned in 2012
< = less than
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
[D]sample is a duplicate of the previous s
J = result is an estimate
mg/L = milligrams per liter
MNA = monitored natural attenuation
MOC = Main Operations Complex
mV = millivolts
NA = not applicable
ND = non-detect; limit of detection in
NM = not measured
NR = not reported
pH = potential hydrogen

Table F1 MOC MNA Groundwater Parameters 2010-2015 (continued)

		Well ID	14MW04			14MW05			MW88-4*					MW88-5*			
		Sample ID	14NCMOCGW14	15NCMOCGW13	15NCMOCGW16[D]	14NCMOCGW15	15NCMOCGW14	15NCMOCGW17[D]	27WA01	27WA02	WA08	WA08	WA09[D]	27WA03	WA06	WA07[D]	WA10
		Date	8/23/2014	8/15/2015	8/15/2015	8/23/2014	8/15/2015	8/15/2015	8/3/2010	8/3/2010	7/17/2011	7/10/2012	7/10/2012	8/15/2010	7/17/2011	7/17/2011	7/10/2012
Analyte	Units	Method Detection Limit															
Ferrous Iron	mg/L	0.01	0.81	0.51	---	0.95	2.8	---	21.40	20.00	3.30	12.25	10.80	45.50	3.30	3.30	11.45
Manganese	mg/L	0.2	0.6	0.4	---	0.7	2.2	---	0.3	0.5	0.40	1.10	1.00	<0.2	0.30	0.70	1.30
Sulfate	mg/L	2	12	27	---	6	10	---	4	1	1.00	3.00	3.00	6	46.00	42.00	18.00
Nitrate	mg/L	0.4	0.00	0.02	---	0.00	0.03	---	2.0	<0.4	0.20	<0.01	0.19	0.3	0.90	0.50	0.02
Alkalinity	mg/L	0	140	40	---	NM	40	---	120	120	180	80	80	80	180	180	80
Temperature	°C	NA	5.90	5.57	5.57	3.61	3.81	3.81	3.28	3.28	1.16	2.01	2.01	2.21	2.59	2.59	2.63
Specific Conductivity	µS/cm	NA	819	294	294	219	138	138	190	190	173	230	230	221	241	241	262
pH	NA	NA	5.92	5.97	5.97	6.23	6.21	6.21	6.93	6.93	6.80	6.41	6.41	8.25	6.64	6.64	6.18
Oxidation-Reduction Potential	mV	NA	27.3	-118.1	-118.1	-39.3	31.8	31.8	-72.1	-72.1	-86.20	-51.70	-51.70	-69.3	-100.30	-100.30	-25.40
Dissolved Oxygen	mg/L	NA	0.33	1.05	1.05	3.50	0.32	0.32	0.68	0.68	0.27	0.35	0.35	0.81	0.58	0.58	0.49
Methane	µg/L	NA	25	110	100	33	99	120	1,900	2,100	2,100	2,300	2,000	99	630	620	360

Notes:
*Well was decommissioned in 2012
< = less than
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
[D]sample is a duplicate of the previous s
J = result is an estimate
mg/L = milligrams per liter
MNA = monitored natural attenuation
MOC = Main Operations Complex
mV = millivolts
NA = not applicable
ND = non-detect; limit of detection in
NM = not measured
NR = not reported
pH = potential hydrogen

Table F2 MOC Groundwater Sample Results

				Sample ID	15NCMOCGW01	15NCMOCGW02	15NCMOCGW03	15NCMOCGW04	15NCMOCGW05	15NCMOCGW06	15NCMOCGW07	15NCMOCGW08	15NCMOCGW09	15NCMOCGW10
				Lab Sample ID	580-52566-1	580-52566-2	580-52566-3	580-52566-4	580-52566-5	580-52566-6	580-52566-7	580-52566-8	580-52566-9	580-52566-10
				Well ID	26MW1	22MW2	20MW1	17MW1	14MW01	14MW07	MW88-10	14MW03	14MW02	MW88-1
				Collection Date/Time	8/13/2015 12:00	8/13/2015 14:00	8/13/2015 17:10	8/13/2015 14:30	8/13/2015 16:10	8/14/2015 11:40	8/14/2015 11:20	8/14/2015 15:30	8/14/2015 16:40	8/14/2015 13:00
Analytical Method	**Analyte**	**Units**	**Site Specific Cleanup Levels[2]**	**ADEC Evaluation Criteria[1]**	**ANALYTICAL RESULTS**									
6020A	Arsenic-Total	mg/L	0.01[2]	NA	ND (0.0040)	ND (0.0040)	0.0014 J	ND (0.0040)	0.0042 J	ND (0.0040)	ND (0.0040)	0.0034 J	0.0056	ND (0.0040)
6020A	Barium-Total	mg/L	NA	2.0[1]	0.0038 J	0.0064	0.036	0.012	0.029	0.0071	0.013	0.042	0.044	0.0052 J
6020A	Cadmium-Total	mg/L	NA	0.005[1]	ND (0.00030)	ND (0.00030)	0.00022 J	ND (0.00030)	0.00016 J	ND (0.00030)	0.00044 J	ND (0.00030)	ND (0.00030)	ND (0.00030)
6020A	Chromium-Total	mg/L	NA	0.1[1]	ND (0.0015)	0.0055	0.0089	ND (0.0015)	0.0024	ND (0.0015)	ND (0.0015)	0.014	0.0019 J	ND (0.0015)
6020A	Lead-Total	mg/L	0.015[2]	NA	ND (0.00050)	0.00066 J	0.0057	0.00021 J	0.0056	0.00069 J	0.0015 J	**0.015**	0.0010 J	ND (0.00050)
6020A	Nickel-Total	mg/L	NA	0.1[1]	ND (0.0050)	0.0037 J	0.0062 J	ND (0.0050)	0.0021 J	0.022	0.0030 J	0.0048 J	0.0023 J	ND (0.0050)
6020A	Selenium-Total	mg/L	NA	0.5[1]	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)	ND (0.0040)
6020A	Silver-Total	mg/L	NA	0.1[1]	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)
6020A	Vanadium-Total	mg/L	NA	0.26[1]	ND (0.010)	ND (0.010)	0.0052 J	ND (0.010)	ND (0.010)	ND (0.010)	ND (0.010)	0.0085 J	ND (0.010)	ND (0.010)
6020A	Zinc-Total	mg/L	NA	5.0[1]	ND (0.020)	ND (0.020)	0.020 J	0.016 J	0.011 J	ND (0.020)	0.027 J	0.026 J	ND (0.020)	ND (0.020)
7470A	Mercury-Total	mg/L	NA	0.002[1]	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.00013 J	ND (0.00010)
6020A	Arsenic-Dissolved	mg/L	NA	NA	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	0.0040 J	ND [0.0040]	ND [0.0040]	0.0024 J	0.0056	ND [0.0040]
6020A	Barium-Dissolved	mg/L	NA	NA	0.0042 J QH	0.0055 J	0.019	0.013	0.018	0.0079	0.013	0.014	0.047	0.0059 J
6020A	Cadmium-Dissolved	mg/L	NA	NA	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]
6020A	Chromium-Dissolved	mg/L	NA	NA	ND [0.0015]	ND [0.0015]	ND [0.0015]	ND [0.0015]	0.0016 J	ND [0.0015]	ND [0.0015]	0.0076 J	ND [0.0015]	ND [0.0015]
6020A	Lead-Dissolved	mg/L	NA	NA	ND [0.00050]	ND [0.00050]	ND [0.00050]	ND [0.00050]	ND [0.00050]	0.00069 J	0.00026 J	0.00049 J	ND [0.00050]	ND [0.00050]
6020A	Nickel-Dissolved	mg/L	NA	NA	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	0.023	0.0026 J	ND [0.0050]	ND [0.0050]	0.0038 J
6020A	Selenium-Dissolved	mg/L	NA	NA	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]
6020A	Silver-Dissolved	mg/L	NA	NA	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]
6020A	Vanadium-Dissolved	mg/L	NA	NA	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]
6020A	Zinc-Dissolved	mg/L	NA	NA	ND [0.020]	ND [0.020]	0.011 J	0.021 J	0.0096 J	ND [0.020]	0.028 J	0.0098 J	ND [0.020]	0.017 J
7470A	Mercury-Dissolved	mg/L	NA	NA	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	0.000043 J	ND [0.00010]
8015C	Diethylene glycol	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8015C	Ethylene glycol	mg/L	73	NA	---	---	---	---	---	---	---	---	---	---
8015C	Propylene glycol	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8015C	Triethylene glycol	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8082A	PCB-1016 (Aroclor 1016)	mg/L	NA	0.0005[1]	ND [0.000084] QL	ND [0.0001]	ND [0.000086]	ND [0.000083]	ND [0.000083]	ND [0.000092]	ND [0.000083]	ND [0.000087]	ND [0.000092]	ND [0.000084]
8082A	PCB-1221 (Aroclor 1221)	mg/L	NA	0.0005[1]	ND [0.000063]	ND [0.000075]	ND [0.000065]	ND [0.000062]	ND [0.000062]	ND [0.000069]	ND [0.000063]	ND [0.000065]	ND [0.000069]	ND [0.000063]
8082A	PCB-1232 (Aroclor 1232)	mg/L	NA	0.0005[1]	ND [0.0001]	ND [0.00012]	ND [0.00011]	ND [0.0001]	ND [0.0001]	ND [0.00011]	ND [0.0001]	ND [0.00011]	ND [0.00011]	ND [0.00011]
8082A	PCB-1242 (Aroclor 1242)	mg/L	NA	0.0005[1]	ND [0.0001]	ND [0.00012]	ND [0.00011]	ND [0.0001]	ND [0.0001]	ND [0.00011]	ND [0.0001]	ND [0.00011]	ND [0.00011]	ND [0.00011]
8082A	PCB-1248 (Aroclor 1248)	mg/L	NA	0.0005[1]	ND [0.000084]	ND [0.0001]	ND [0.000086]	ND [0.000083]	ND [0.000083]	ND [0.000092]	ND [0.000083]	ND [0.000087]	ND [0.000092]	ND [0.000084]
8082A	PCB-1254 (Aroclor 1254)	mg/L	NA	0.0005[1]	ND [0.000063]	ND [0.000075]	ND [0.000065]	ND [0.000062]	ND [0.000062]	ND [0.000069]	ND [0.000063]	ND [0.000065]	ND [0.000069]	ND [0.000063]
8082A	PCB-1260 (Aroclor 1260)	mg/L	NA	0.0005[1]	ND [0.000084]	ND [0.0001]	ND [0.000086]	ND [0.000083]	ND [0.000083]	ND [0.000092]	ND [0.000083]	ND [0.000087]	ND [0.000092]	ND [0.000084]
8260C	1,1,1,2-Tetrachloroethane	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	1,1,1-Trichloroethane	mg/L	NA	0.2[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,1,2,2-Tetrachloroethane	mg/L	NA	0.0043[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,1,2-Trichloroethane	mg/L	NA	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,1-Dichloroethane	mg/L	NA	7.3[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,1-Dichloroethene	mg/L	NA	0.007[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,1-Dichloropropene	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	1,2,3-Trichlorobenzene	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	1,2,3-Trichloropropane	mg/L	NA	0.00012[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,2,4-Trichlorobenzene	mg/L	NA	0.07[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,2,4-Trimethylbenzene	mg/L	NA	1.8[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,2-Dibromo-3-chloropropane	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---

Table F2 MOC Groundwater Sample Results (continued)

Analytical Method	Analyte	Units	Site Specific Cleanup Levels[2]	ADEC Evaluation Criteria[1]	15NCMOCGW11	15NCMOCGW12	15NCMOCGW13	15NCMOCGW16[D]	15NCMOCGW14	15NCMOCGW17[D]	15NCMOCGW15
				Lab Sample ID	580-52566-11	580-52566-12	580-52566-13	580-52566-16	580-52566-14	580-52566-17	580-52566-15
				Well ID	MW88-3	MW10-1	14MW04	14MW04	14MW05	14MW05	14MW06
				Collection Date/Time	8/14/2015 13:00	8/14/2015 13:25	8/15/2015 12:30	8/15/2015 12:30	8/15/2015 15:00	8/15/2015 13:00	8/15/2015 12:40
					ANAYLTICAL RESULTS						
6020A	Arsenic-Total	mg/L	0.01[2]	NA	ND (0.0040)	0.0014 J	0.0024 J	0.0022 J	0.0031 J	0.0032 J	0.0026 J
6020A	Barium-Total	mg/L	NA	2.0[1]	0.016	0.053	0.11	0.10	0.052	0.053	0.062
6020A	Cadmium-Total	mg/L	NA	0.005[1]	ND (0.00030)	ND (0.00030)	0.00039 J	0.00034 J	ND (0.00030)	ND (0.00030)	ND (0.00030)
6020A	Chromium-Total	mg/L	NA	0.1[1]	ND (0.0015)	0.0067	0.0017 J	0.0021	0.0029	0.0034	0.00072 J
6020A	Lead-Total	mg/L	0.015[2]	NA	0.00019 J	0.0040	0.0063	0.0064	0.012	0.013	0.00064 J
6020A	Nickel-Total	mg/L	NA	0.1[1]	0.0024 J	0.0049 J	0.0085 J	0.0087 J	0.0054 J	0.0058 J	ND (0.0050)
6020A	Selenium-Total	mg/L	NA	0.5[1]	ND (0.0040)	ND (0.0040)	0.0023 J	0.0018 J	ND (0.0040)	ND (0.0040)	ND (0.0040)
6020A	Silver-Total	mg/L	NA	0.1[1]	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00035)
6020A	Vanadium-Total	mg/L	NA	0.26[1]	ND (0.010)	0.0097 J	ND (0.010)	ND (0.010)	0.0064 J	0.0072 J	ND (0.010)
6020A	Zinc-Total	mg/L	NA	5.0[1]	0.021 J	0.027 J	0.024 J	0.026 J	0.023 J	0.023 J	ND (0.020)
7470A	Mercury-Total	mg/L	NA	0.002[1]	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)
6020A	Arsenic-Dissolved	mg/L	NA	NA	ND [0.0040]	ND [0.0040]	0.0014 J	0.0014 J	0.0028 J	0.0026 J	0.0024 J
6020A	Barium-Dissolved	mg/L	NA	NA	0.027	0.022	0.059	0.055	0.04	0.039	0.062
6020A	Cadmium-Dissolved	mg/L	NA	NA	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]	ND [0.00030]
6020A	Chromium-Dissolved	mg/L	NA	NA	0.0026	ND [0.0015]	0.00075 J	ND [0.0015]	0.00095 J	0.00082 J	ND [0.0015]
6020A	Lead-Dissolved	mg/L	NA	NA	0.0031	0.00028 J	0.00050 J	0.00033 J	0.003	0.0023	ND [0.00050]
6020A	Nickel-Dissolved	mg/L	NA	NA	0.0037 J	0.0024 J	0.0075 J	0.0078 J	0.0044 J	0.0041 J	ND [0.0050]
6020A	Selenium-Dissolved	mg/L	NA	NA	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]
6020A	Silver-Dissolved	mg/L	NA	NA	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]	ND [0.00035]
6020A	Vanadium-Dissolved	mg/L	NA	NA	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]	ND [0.010]
6020A	Zinc-Dissolved	mg/L	NA	NA	0.054	0.020 J	0.021 J	0.022 J	0.013 J	0.023 J	ND [0.020]
7470A	Mercury-Dissolved	mg/L	NA	NA	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]	ND [0.00010]
8015C	Diethylene glycol	mg/L	NA	NA	---	ND [50]	---	---	---	---	---
8015C	Ethylene glycol	mg/L	73	NA	---	ND [50]	---	---	---	---	---
8015C	Propylene glycol	mg/L	NA	NA	---	ND [50]	---	---	---	---	---
8015C	Triethylene glycol	mg/L	NA	NA	---	ND [50]	---	---	---	---	---
8082A	PCB-1016 (Aroclor 1016)	mg/L	NA	0.0005[1]	ND [0.000086]	ND [0.000083]	ND [0.000089]	ND [0.000088]	ND [0.000093]	ND [0.000091]	ND [0.000088]
8082A	PCB-1221 (Aroclor 1221)	mg/L	NA	0.0005[1]	ND [0.000064]	ND [0.000063]	ND [0.000067]	ND [0.000066]	ND [0.000069]	ND [0.000068]	ND [0.000066]
8082A	PCB-1232 (Aroclor 1232)	mg/L	NA	0.0005[1]	ND [0.00011]	ND [0.0001]	ND [0.00011]	ND [0.00011]	ND [0.00012]	ND [0.00011]	ND [0.00011]
8082A	PCB-1242 (Aroclor 1242)	mg/L	NA	0.0005[1]	ND [0.00011]	ND [0.0001]	ND [0.00011]	ND [0.00011]	ND [0.00012]	ND [0.00011]	ND [0.00011]
8082A	PCB-1248 (Aroclor 1248)	mg/L	NA	0.0005[1]	ND [0.000086]	ND [0.000083]	ND [0.000089]	ND [0.000088]	ND [0.000093]	ND [0.000091]	ND [0.000088]
8082A	PCB-1254 (Aroclor 1254)	mg/L	NA	0.0005[1]	ND [0.000064]	ND [0.000063]	ND [0.000067]	ND [0.000066]	0.000083 J QH	ND [0.000068]	ND [0.000066]
8082A	PCB-1260 (Aroclor 1260)	mg/L	NA	0.0005[1]	ND [0.000086]	ND [0.000083]	ND [0.000089]	ND [0.000088]	ND [0.000093]	ND [0.000091]	ND [0.000088]
8260C	1,1,1,2-Tetrachloroethane	mg/L	NA	NA	---	ND [0.001]	---	---	---	---	---
8260C	1,1,1-Trichloroethane	mg/L	NA	0.2[1]	---	ND [0.002]	---	---	---	---	---
8260C	1,1,2,2-Tetrachloroethane	mg/L	NA	0.0043[1]	---	ND [0.0005]	---	---	---	---	---
8260C	1,1,2-Trichloroethane	mg/L	NA	0.005[1]	---	ND [0.0005]	---	---	---	---	---
8260C	1,1-Dichloroethane	mg/L	NA	7.3[1]	---	ND [0.001]	---	---	---	---	---
8260C	1,1-Dichloroethene	mg/L	NA	0.007[1]	---	ND [0.001]	---	---	---	---	---
8260C	1,1-Dichloropropene	mg/L	NA	NA	---	ND [0.001]	---	---	---	---	---
8260C	1,2,3-Trichlorobenzene	mg/L	NA	NA	---	ND [0.001]	---	---	---	---	---
8260C	1,2,3-Trichloropropane	mg/L	NA	0.00012[1]	---	**ND [0.001]**	---	---	---	---	---
8260C	1,2,4-Trichlorobenzene	mg/L	NA	0.07[1]	---	ND [0.0005]	---	---	---	---	---
8260C	1,2,4-Trimethylbenzene	mg/L	NA	1.8[1]	---	ND [0.001]	---	---	---	---	---
8260C	1,2-Dibromo-3-chloropropane	mg/L	NA	NA	---	ND [0.001]	---	---	---	---	---

Table F2 MOC Groundwater Sample Results (continued)

				Sample ID	15NCMOCGW01	15NCMOCGW02	15NCMOCGW03	15NCMOCGW04	15NCMOCGW05	15NCMOCGW06	15NCMOCGW07	15NCMOCGW08	15NCMOCGW09	15NCMOCGW10
				Lab Sample ID	580-52566-1	580-52566-2	580-52566-3	580-52566-4	580-52566-5	580-52566-6	580-52566-7	580-52566-8	580-52566-9	580-52566-10
				Well ID	26MW1	22MW2	20MW1	17MW1	14MW01	14MW07	MW88-10	14MW03	14MW02	MW88-1
				Collection Date/Time	8/13/2015 12:00	8/13/2015 14:00	8/13/2015 17:10	8/13/2015 14:30	8/13/2015 16:10	8/14/2015 11:40	8/14/2015 11:20	8/14/2015 15:30	8/14/2015 16:40	8/14/2015 13:00
Analytical Method	**Analyte**	**Units**	**Site Specific Cleanup Levels[2]**	**ADEC Evaluation Criteria[1]**	**ANALYTICAL RESULTS**									
8260C	1,2-Dibromoethane	mg/L	NA	0.00005[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,2-Dichlorobenzene	mg/L	NA	0.6[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,2-Dichloroethane	mg/L	NA	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,2-Dichloropropane	mg/L	NA	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,3,5-Trimethylbenzene	mg/L	NA	1.8[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,3-Dichlorobenzene	mg/L	NA	3.3[1]	---	---	---	---	---	---	---	---	---	---
8260C	1,3-Dichloropropane	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	1,4-Dichlorobenzene	mg/L	NA	0.075[1]	---	---	---	---	---	---	---	---	---	---
8260C	2,2-Dichloropropane	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	2-Butanone	mg/L	NS	22[1]	---	---	---	---	---	---	---	---	---	---
8260C	2-Chlorotoluene	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	2-Hexanone	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	4-Chlorotoluene	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	4-Isopropyltoluene	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	4-Methyl-2-pentanone	mg/L	NA	2.9[1]	---	---	---	---	---	---	---	---	---	---
8260C	Acetone	mg/L	NA	33[1]	---	---	---	---	---	---	---	---	---	---
8260C	Benzene	mg/L	0.005[2]	NA	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
8260C	Bromobenzene	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	Bromochloromethane	mg/L	NS	NS	---	---	---	---	---	---	---	---	---	---
8260C	Bromodichloromethane	mg/L	NA	0.014[1]	---	---	---	---	---	---	---	---	---	---
8260C	Bromoform	mg/L	NA	0.110[1]	---	---	---	---	---	---	---	---	---	---
8260C	Bromomethane	mg/L	NA	0.051[1]	---	---	---	---	---	---	---	---	---	---
8260C	Carbon disulfide	mg/L	NA	3.7[1]	---	---	---	---	---	---	---	---	---	---
8260C	Carbon tetrachloride	mg/L	NA	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	Chlorobenzene	mg/L	NA	0.1[1]	---	---	---	---	---	---	---	---	---	---
8260C	Chloroethane	mg/L	NA	0.290[1]	---	---	---	---	---	---	---	---	---	---
8260C	Chloroform	mg/L	NA	0.140[1]	---	---	---	---	---	---	---	---	---	---
8260C	Chloromethane	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	cis-1,2-Dichloroethene	mg/L	NA	0.007[1]	---	---	---	---	---	---	---	---	---	---
8260C	cis-1,3-Dichloropropene	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	Dibromochloromethane	mg/L	NA	0.01[1]	---	---	---	---	---	---	---	---	---	---
8260C	Dibromomethane	mg/L	NA	NA	---	---	---	---	---	---	---	---	---	---
8260C	Dichlorodifluoromethane	mg/L	NA	7.3[1]	---	---	---	---	---	---	---	---	---	---
8260C	Ethylbenzene	mg/L	0.7[2]	0.7[1]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	0.002 J	0.0022 J	ND [0.001]
8260C	Hexachlorobutadiene	mg/L	NA	0.0073[1]	---	---	---	---	---	---	---	---	---	---
8260C	Isopropylbenzene	mg/L	NS	3.7[1]	---	---	---	---	---	---	---	---	---	---
8260C	Methylene chloride	mg/L	NS	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	Methyl-tert-butyl ether	mg/L	NA	0.470[1]	---	---	---	---	---	---	---	---	---	---
8260C	Naphthalene	mg/L	NA	0.730[1]	---	---	---	---	---	---	---	---	---	---
8260C	n-Butylbenzene	mg/L	NA	0.370[1]	---	---	---	---	---	---	---	---	---	---
8260C	n-Propylbenzene	mg/L	NA	0.370[1]	---	---	---	---	---	---	---	---	---	---
8260C	o-Xylene	mg/L	NA	NS	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
8260C	sec-Butylbenzene	mg/L	NA	0.370[1]	---	---	---	---	---	---	---	---	---	---
8260C	Styrene	mg/L	NA	0.1[1]	---	---	---	---	---	---	---	---	---	---
8260C	tert-Butylbenzene	mg/L	NA	0.370[1]	---	---	---	---	---	---	---	---	---	---
8260C	Tetrachloroethene (PCE)	mg/L	NA	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	Toluene	mg/L	NA	1.0[1]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
8260C	trans-1,2-Dichloroethene	mg/L	NA	0.10[1]	---	---	---	---	---	---	---	---	---	---
8260C	trans-1,3-Dichloropropene	mg/L	NA	NS	---	---	---	---	---	---	---	---	---	---
8260C	Trichloroethene (TCE)	mg/L	NA	0.005[1]	---	---	---	---	---	---	---	---	---	---
8260C	Trichlorofluoromethane	mg/L	NS	11[1]	---	---	---	---	---	---	---	---	---	---

Table F2 MOC Groundwater Sample Results (continued)

				Sample ID	15NCMOCGW11	15NCMOCGW12	15NCMOCGW13	15NCMOCGW16[D]	15NCMOCGW14	15NCMOCGW17[D]	15NCMOCGW15
				Lab Sample ID	580-52566-11	580-52566-12	580-52566-13	580-52566-16	580-52566-14	580-52566-17	580-52566-15
				Well ID	MW88-3	MW10-1	14MW04	14MW04	14MW05	14MW05	14MW06
				Collection Date/Time	8/14/2015 13:00	8/14/2015 13:25	8/15/2015 12:30	8/15/2015 12:30	8/15/2015 15:00	8/15/2015 13:00	8/15/2015 12:40
Analytical Method	**Analyte**	**Units**	**Site Specific Cleanup Levels[2]**	**ADEC Evaluation Criteria[1]**	**ANAYLTICAL RESULTS**						
8260C	1,2-Dibromoethane	mg/L	NA	0.00005[1]	---	**ND [0.0005]**	---	---	---	---	---
8260C	1,2-Dichlorobenzene	mg/L	NA	0.6[1]	---	ND [0.001]	---	---	---	---	---
8260C	1,2-Dichloroethane	mg/L	NA	0.005[1]	---	ND [0.0005]	---	---	---	---	---
8260C	1,2-Dichloropropane	mg/L	NA	0.005[1]	---	ND [0.0005]	---	---	---	---	---
8260C	1,3,5-Trimethylbenzene	mg/L	NA	1.8[1]	---	ND [0.001]	---	---	---	---	---
8260C	1,3-Dichlorobenzene	mg/L	NA	3.3[1]	---	ND [0.001]	---	---	---	---	---
8260C	1,3-Dichloropropane	mg/L	NA	NA	---	ND [0.0005]	---	---	---	---	---
8260C	1,4-Dichlorobenzene	mg/L	NA	0.075[1]	---	ND [0.001]	---	---	---	---	---
8260C	2,2-Dichloropropane	mg/L	NS	NS	---	ND [0.002]	---	---	---	---	---
8260C	2-Butanone	mg/L	NS	22[1]	---	ND [0.004]	---	---	---	---	---
8260C	2-Chlorotoluene	mg/L	NS	NS	---	ND [0.002]	---	---	---	---	---
8260C	2-Hexanone	mg/L	NS	NS	---	ND [0.008]	---	---	---	---	---
8260C	4-Chlorotoluene	mg/L	NS	NS	---	ND [0.001]	---	---	---	---	---
8260C	4-Isopropyltoluene	mg/L	NS	NS	---	ND [0.002]	---	---	---	---	---
8260C	4-Methyl-2-pentanone	mg/L	NA	2.9[1]	---	ND [0.008]	---	---	---	---	---
8260C	Acetone	mg/L	NA	33[1]	---	ND [0.02]	---	---	---	---	---
8260C	Benzene	mg/L	0.005[2]	NA	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
8260C	Bromobenzene	mg/L	NS	NS	---	ND [0.001]	---	---	---	---	---
8260C	Bromochloromethane	mg/L	NS	NS	---	ND [0.001]	---	---	---	---	---
8260C	Bromodichloromethane	mg/L	NA	0.014[1]	---	ND [0.001]	---	---	---	---	---
8260C	Bromoform	mg/L	NA	0.110[1]	---	ND [0.0005]	---	---	---	---	---
8260C	Bromomethane	mg/L	NA	0.051[1]	---	ND [0.001]	---	---	---	---	---
8260C	Carbon disulfide	mg/L	NA	3.7[1]	---	ND [0.0005]	---	---	---	---	---
8260C	Carbon tetrachloride	mg/L	NA	0.005[1]	---	ND [0.002]	---	---	---	---	---
8260C	Chlorobenzene	mg/L	NA	0.1[1]	---	ND [0.001]	---	---	---	---	---
8260C	Chloroethane	mg/L	NA	0.290[1]	---	ND [0.001]	---	---	---	---	---
8260C	Chloroform	mg/L	NA	0.140[1]	---	ND [0.0005]	---	---	---	---	---
8260C	Chloromethane	mg/L	NA	NA	---	ND [0.002]	---	---	---	---	---
8260C	cis-1,2-Dichloroethene	mg/L	NA	0.007[1]	---	ND [0.0005]	---	---	---	---	---
8260C	cis-1,3-Dichloropropene	mg/L	NA	NA	---	ND [0.0005]	---	---	---	---	---
8260C	Dibromochloromethane	mg/L	NA	0.01[1]	---	ND [0.0005]	---	---	---	---	---
8260C	Dibromomethane	mg/L	NA	NA	---	ND [0.0005]	---	---	---	---	---
8260C	Dichlorodifluoromethane	mg/L	NA	7.3[1]	---	ND [0.001]	---	---	---	---	---
8260C	Ethylbenzene	mg/L	0.7[2]	0.7[1]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	0.0027 J	0.0026 J	ND [0.001]
8260C	Hexachlorobutadiene	mg/L	NA	0.0073[1]	---	ND [0.001]	---	---	---	---	---
8260C	Isopropylbenzene	mg/L	NS	3.7[1]	---	ND [0.001]	---	---	---	---	---
8260C	Methylene chloride	mg/L	NS	0.005[1]	---	ND [0.002]	---	---	---	---	---
8260C	Methyl-tert-butyl ether	mg/L	NA	0.470[1]	---	ND [0.0005]	---	---	---	---	---
8260C	Naphthalene	mg/L	NA	0.730[1]	---	ND [0.001]	---	---	---	---	---
8260C	n-Butylbenzene	mg/L	NA	0.370[1]	---	ND [0.002]	---	---	---	---	---
8260C	n-Propylbenzene	mg/L	NA	0.370[1]	---	ND [0.002]	---	---	---	---	---
8260C	o-Xylene	mg/L	NA	NS	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
8260C	sec-Butylbenzene	mg/L	NA	0.370[1]	---	ND [0.002]	---	---	---	---	---
8260C	Styrene	mg/L	NA	0.1[1]	---	ND [0.002]	---	---	---	---	---
8260C	tert-Butylbenzene	mg/L	NA	0.370[1]	---	ND [0.002]	---	---	---	---	---
8260C	Tetrachloroethene (PCE)	mg/L	NA	0.005[1]	---	ND [0.002]	---	---	---	---	---
8260C	Toluene	mg/L	NA	1.0[1]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
8260C	trans-1,2-Dichloroethene	mg/L	NA	0.10[1]	---	ND [0.0005]	---	---	---	---	---
8260C	trans-1,3-Dichloropropene	mg/L	NA	NS	---	ND [0.0005]	---	---	---	---	---
8260C	Trichloroethene (TCE)	mg/L	NA	0.005[1]	---	ND [0.001]	---	---	---	---	---
8260C	Trichlorofluoromethane	mg/L	NS	11[1]	---	ND [0.002]	---	---	---	---	---

Table F2 MOC Groundwater Sample Results (continued)

				Sample ID	15NCMOCGW01	15NCMOCGW02	15NCMOCGW03	15NCMOCGW04	15NCMOCGW05	15NCMOCGW06	15NCMOCGW07	15NCMOCGW08	15NCMOCGW09	15NCMOCGW10
				Lab Sample ID	580-52566-1	580-52566-2	580-52566-3	580-52566-4	580-52566-5	580-52566-6	580-52566-7	580-52566-8	580-52566-9	580-52566-10
				Well ID	26MW1	22MW2	20MW1	17MW1	14MW01	14MW07	MW88-10	14MW03	14MW02	MW88-1
				Collection Date/Time	8/13/2015 12:00	8/13/2015 14:00	8/13/2015 17:10	8/13/2015 14:30	8/13/2015 16:10	8/14/2015 11:40	8/14/2015 11:20	8/14/2015 15:30	8/14/2015 16:40	8/14/2015 13:00
Analytical Method	**Analyte**	**Units**	**Site Specific Cleanup Levels[2]**	**ADEC Evaluation Criteria[1]**	**ANALYTICAL RESULTS**									
8260C	Vinyl chloride	mg/L	NA	0.002[1]	---	---	---	---	---	---	---	---	---	---
8260C	Xylene, Isomers m & p	mg/L	NA	11	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	0.00015 J	ND [0.0005]	ND [0.0005]	0.0004 J	0.0017 J	ND [0.0005]
8270DSIM	1-Methylnaphthalene	mg/L	NA	0.15[1]	ND [0.0000051]	ND [0.0000058]	ND [0.0000052]	ND [0.0000051]	0.0027	ND [0.0000055]	ND [0.0000052]	ND [0.0000053]	0.004	ND [0.0000053]
8270DSIM	2-Methylnaphthalene	mg/L	NS	0.15[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	0.00059	ND [0.000011]
8270DSIM	Acenaphthene	mg/L	NS	2.2[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	0.00019 [0.00001]	ND [0.000011]	ND [0.00001]	0.0003	0.00021	ND [0.000011]
8270DSIM	Acenaphthylene	mg/L	NS	2.2[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011] QL	ND [0.00001] QL	ND [0.000011] QL	0.000049 QL	0.000034 QL
8270DSIM	Anthracene	mg/L	NS	11[1]	ND [0.0000051] QL	ND [0.0000058]QL	ND [0.0000052] QL	ND [0.0000051]QL	ND [0.000005] QL	ND [0.0000055]QL	ND [0.0000052]QL	ND [0.0000053]QL	ND [0.0000054]QL	ND [0.0000053]QL
8270DSIM	Benzo(a)anthracene	mg/L	NA	0.0012[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Benzo(a)pyrene	mg/L	NA	0.0002[1]	ND [0.00001] QL	ND [0.000012] QL	ND [0.00001] QL	ND [0.00001] QL	ND [0.00001] QL	ND [0.000011] QL	ND [0.00001] QL	ND [0.000011] QL	ND [0.000011] QL	ND [0.000011] QL
8270DSIM	Benzo(b)fluoranthene	mg/L	NA	0.0012[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Benzo(g,h,i)perylene	mg/L	NA	1.1[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Benzo(k)fluoranthene	mg/L	NA	0.012[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Chrysene	mg/L	NA	0.12[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Dibenzo(a,h)anthracene	mg/L	NA	0.00012[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Fluoranthene	mg/L	NA	1.5[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Fluorene	mg/L	NA	1.5	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	0.00035	ND [0.000011]	ND [0.00001]	0.00034	0.00045	ND [0.000011]
8270DSIM	Indeno(1,2,3-cd)pyrene	mg/L	NA	0.0012[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Naphthalene	mg/L	NA	0.73[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	0.0018	ND [0.000011]	ND [0.00001]	0.00062	0.005	ND [0.000011]
8270DSIM	Phenanthrene	mg/L	NA	11[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
8270DSIM	Pyrene	mg/L	NA	1.1[1]	ND [0.00001]	ND [0.000012]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.000011]
AK101	GRO (C6-C10)	mg/L	1.3[2]	NA	ND [0.044]	ND [0.044]	ND [0.044]	ND [0.044]	0.026 J	ND [0.044]	ND [0.044]	0.12	0.18	ND [0.044]
AK102	DRO (C10-C25)	mg/L	1.5[2]	NA	ND (0.10) QN	ND (0.10) QN	ND (0.10) QN	ND (0.10) QN	0.51	ND (0.10) QN	0.43	1.3	**1.6**	0.1 B
AK103	RRO (C25-C36)	mg/L	1.1[2]	NA	ND [0.072]	ND [0.074]	ND [0.071]	ND [0.071]	ND [0.071]	ND [0.073]	ND [0.071]	0.041 J	0.13	ND [0.071]
RSK-175	Methane	mg/L	NS	NS	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]	0.054	0.0016 J	0.0062	0.088	0.24	ND [0.0008]

Notes:

[1] Groundwater Evaluation Criteria from Title 18 Alaska Administrative Code (AAC), Chapter 75, Section 345, Table C (ADEC, 2014)

[2] Cleanup Levels Established in 2009 Decision Document (USACE, 2009)

[D] Field Dup - Sample is a field duplicate of preceding sample.

--- = analysis not requested

AK = Alaska Test Method

B = Analyte detected in a QC blank, sample result may have potential high bias

J = Result is an estimate

mg/L= milligrams per liter

NA = not applicable

ND = result is non-detect with Limit of Detection (LOD) in parentheses

NS = not specified in the 2009 Decision Document or ADEC regulations

QL = analyte result is considered an estimate value with potential low bias to laboratory control failure

QN = analyte result is considered an estimated value due to uncertain laboratory control failure

Table F2 MOC Groundwater Sample Results (continued)

				Sample ID	15NCMOCGW11	15NCMOCGW12	15NCMOCGW13	15NCMOCGW16[D]	15NCMOCGW14	15NCMOCGW17[D]	15NCMOCGW15
				Lab Sample ID	580-52566-11	580-52566-12	580-52566-13	580-52566-16	580-52566-14	580-52566-17	580-52566-15
				Well ID	MW88-3	MW10-1	14MW04	14MW04	14MW05	14MW05	14MW06
				Collection Date/Time	8/14/2015 13:00	8/14/2015 13:25	8/15/2015 12:30	8/15/2015 12:30	8/15/2015 15:00	8/15/2015 13:00	8/15/2015 12:40
Analytical Method	**Analyte**	**Units**	**Site Specific Cleanup Levels[2]**	**ADEC Evaluation Criteria[1]**	**ANAYLTICAL RESULTS**						
8260C	Vinyl chloride	mg/L	NA	0.002[1]	---	ND [0.0005]	---	---	---	---	---
8260C	Xylene, Isomers m & p	mg/L	NA	11	ND [0.0005]	ND [0.0005]	0.00018 J	0.00016 J	0.0018 J	0.0017 J	0.00037 J
8270DSIM	1-Methylnaphthalene	mg/L	NA	0.15[1]	ND [0.0000051]	ND [0.0000052]	0.00057 QN	0.0009 QN	0.019 QN	0.013 QN	0.00051
8270DSIM	2-Methylnaphthalene	mg/L	NS	0.15[1]	ND [0.00001]	ND [0.00001]	0.00029	0.00027	0.0025	ND [0.000011]	ND [0.00001]
8270DSIM	Acenaphthene	mg/L	NS	2.2[1]	ND [0.00001]	ND [0.00001]	ND [0.00001] QL	ND [0.00001] QL	0.00042	0.0004	ND [0.00001]
8270DSIM	Acenaphthylene	mg/L	NS	2.2[1]	ND [0.00001] QL	ND [0.00001] QL	ND [0.00001] QL	0.00018 QL	0.0001 QL, QN	ND [0.000011] QL,QN	ND [0.00001] QL
8270DSIM	Anthracene	mg/L	NS	11[1]	ND [0.0000051]QL	ND [0.0000052]QL	ND [0.0000051]QL	ND [0.0000051]QL	ND [0.0000053]QL	ND [0.0000054]QL	ND [0.0000052]QL
8270DSIM	Benzo(a)anthracene	mg/L	NA	0.0012[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Benzo(a)pyrene	mg/L	NA	0.0002[1]	ND [0.00001] QL	ND [0.00001] QL	ND [0.00001] QL	ND [0.00001] QL	ND [0.000011] QL	ND [0.000011] QL	ND [0.00001] QL
8270DSIM	Benzo(b)fluoranthene	mg/L	NA	0.0012[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Benzo(g,h,i)perylene	mg/L	NA	1.1[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Benzo(k)fluoranthene	mg/L	NA	0.012[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Chrysene	mg/L	NA	0.12[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Dibenzo(a,h)anthracene	mg/L	NA	0.00012[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Fluoranthene	mg/L	NA	1.5[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Fluorene	mg/L	NA	1.5	ND [0.00001]	ND [0.00001]	ND [0.00001] QL	ND [0.00001] QL	0.0013	0.0011	ND [0.00001]
8270DSIM	Indeno(1,2,3-cd)pyrene	mg/L	NA	0.0012[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
8270DSIM	Naphthalene	mg/L	NA	0.73[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	0.013 QN	0.0059 QN	ND [0.00001]
8270DSIM	Phenanthrene	mg/L	NA	11[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	0.00028 QN	0.00015 QN	ND [0.00001]
8270DSIM	Pyrene	mg/L	NA	1.1[1]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.000011]	ND [0.000011]	ND [0.00001]
AK101	GRO (C6-C10)	mg/L	1.3[2]	NA	ND [0.044]	ND [0.044]	ND [0.044]	ND [0.044]	0.13	0.11	0.040J
AK102	DRO (C10-C25)	mg/L	1.5[2]	NA	0.38	0.39	**1.6 QL QN**	**2.8 QN**	**12**	**11**	**2.3**
AK103	RRO (C25-C36)	mg/L	1.1[2]	NA	ND [0.073]	0.14	0.18 QL QN	0.37 QN	0.48	0.51	0.27
RSK-175	Methane	mg/L	NS	NS	0.0016 J	ND [0.0008]	0.11	0.1	0.099	0.12	0.11

Notes:

[1] Groundwater Evaluation Criteria from Title 18 Alaska Administrative Code (AAC), Chapter 75, Section 345, Table C (ADEC, 2014)

[2] Cleanup Levels Established in 2009 Decision Document (USACE, 2009)

[D] Field Dup - Sample is a field duplicate of preceding sample.

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B = Analyte detected in a QC blank, sample result may have potential high bias

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mg/L= milligrams per liter

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QL = analyte result is considered an estimate value with potential low bias to laboratory control failure

QN = analyte result is considered an estimated value due to uncertain laboratory control failure

APPENDIX G

Chemical Data Quality Review

TABLE OF CONTENTS

TABLES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

%	percent
ADEC	Alaska Department of Environmental Conservation
Bristol	Bristol Environmental Remediation Services, LLC
BTEX	benzene, toluene, ethylbenzene, and xylenes
CCV	continuing calibration verification
CDQR	chemical data quality review
CoC	chain-of-custody
DoD	Department of Defense
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
GRO	gasoline range organics
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
mg/L	milligrams per liter
MOC	Main Operations Complex
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
QC	quality control
RPD	relative percent difference
RRO	residual range organics
SDG	sample delivery group
SIM	selected ion mode
TestAmerica	TestAmerica Laboratories, Inc.
USACE	US Army Corps of Engineers
VOC	volatile organic compound
SW-846	EPA publication Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

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1.0 DATA VERIFICATION

Bristol Environmental Remediation Services, LLC (Bristol) composed this chemical data quality review (CDQR) in accordance with US Army Corps of Engineers (USACE), Alaska District requirements. All laboratory results pertain to the collection of groundwater samples from project monitoring wells located at Northeast Cape, St. Lawrence Island, Alaska. Bristol performed this work under USACE Contract No. W911KB-14-D-0006, Task Order 0002.

Bristol verified sample data collected from groundwater monitoring wells at the Main Operations Complex (MOC). The verification process evaluates data completeness, correctness, consistency, and compliance with method procedures and quality control (QC) requirements; it also identifies anomalous data. The reported project sample values and any method laboratory control samples extracted or prepared with the project samples were reviewed. Data verification considers potentially influential conditions and procedures:

- Sample receipt conditions
  - Sample preservation
  - Cooler temperatures upon receipt
  - Chain-of-custody (CoC) condition/correspondence to submitted sample set
  - Presence/absence of custody seals
- Extraction and analytical procedures
  - Holding times
  - Method blanks (MBs)
  - Laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs)
  - Matrix spike (MS) and matrix spike duplicate (MSD)
  - Duplicate/replicate samples
  - Surrogate recoveries

- Sampling procedures
  - Field duplicates
  - Trip blanks
  - Field duplicate/replicate samples
- Correspondence related to method criteria and project data quality objectives

This CDQR does not include internal standards, calibrations, instrument tunes, chromatograms, quantitation reports, spectra, summaries identifying any analytical irregularities (and the subsequent corrective action taken by the laboratories), or anything not listed above. Laboratory report case narratives were examined and any documented calibration or other QC outliers were included when appropriate.

Control limits are specified in the *2014 Northeast Cape HTRW Remedial Actions Work Plan, Revision 1*, dated December 2014 (USACE, 2014) and 2015 field activities are described in the 2015 Northeast Cape Work Plan Addendum (USACE, 2015). Unless otherwise stated, data fell within control limits. If control limits were not specified in the Quality Assurance Project Plan (QAPP), in-house laboratory control limits were used for review. In some instances, quality control information beyond QAPP specifications was reported (e.g., additional surrogates). This information was also used for data review unless specifically noted.

Data verification satisfied standards established in the Department of Defense (DoD) *Quality Systems Manual*, Version 5.0 (DoD, 2013) and the Alaska Department of Environmental Conservation (ADEC) Technical Memorandum: Environmental Laboratory and Quality Assurance Requirements (ADEC, 2009).

The data verifier assessed precision and accuracy by comparing surrogate, MS/MSD, and LCS/LCSD recoveries and relative percent differences (RPDs) to the QAPP-specified control limits. The frequency of QC samples was compared to the frequency specified in the QAPP. The MS/MSDs performed on non-project samples are not applicable, and were not evaluated.

The reviewed data sets include sample data collected during the August 2015 field effort. TestAmerica Laboratories Inc. (TestAmerica), Tacoma, Washington analyzed the samples and reported the data under Sample Delivery Group (SDG) No. 580-52566-1. Glycol and methane analyses were subcontracted to TestAmerica-Denver, Colorado using intralaboratory procedures. Those results were also presented in SDG No. 580-52566-1.

TestAmerica used several methods for sample analysis:

- Gasoline range organics (GRO) by ADEC Method AK101
- Diesel range organics (DRO) and residual range organics (RRO) by ADEC Method AK102/AK103
- Volatile Organic Compounds (VOCs) by including benzene, toluene, ethylbenzene, and xylenes (BTEX) by U.S. Environmental Protection Agency (EPA) publication Test Methods for Evaluating Solid Waste, Physical/Chemical Methods 846 (SW-846) Method 5030B and 8260C
- Polynuclear aromatic hydrocarbons (PAHs) by SW 3520C/8270D in selected ion mode (SIM)
- Polychlorinated biphenyls (PCBs) by SW8082A
- Total and dissolved metals by SW3005A/6020A.
- Total and dissolved mercury by SW7470A.
- Methane analysis by Method RSK-175 was performed by TestAmerica-Denver, Colorado.
- Glycol analysis by SW8015C-direct aqueous injection (DAI)-TestAmerica-Denver, Colorado.

Analytical results tables are presented in Appendix F of the 2015 Northeast Cape Groundwater Sampling Report.

Data qualifiers assigned during the data review are included on the analytical results tables in Appendix F of the 2015 Northeast Cape Annual Groundwater Sampling Report.

1.1 DATA QUALIFIERS

The following data qualifiers may be used to identify data points when data verification determines that results should be qualified because of a potential bias in the result, or a deviation from method or QAPP QC procedures:

- B – Analyte result is considered a high estimated value due to contamination present in the method blank, instrument blank, or trip blank. Results less than 10 times the reported method blank concentration will be B flagged to indicate bias.
- J – Positive result is less than the limit of quantitation (LOQ) and is considered an estimate.
- ND (LOD) – Analyte result is less than the detection limit (DL). The non-detected result (ND) has the limit of detection (LOD) in parentheses.
- ND (LOQ) – Analyte result is less than the LOQ.
- QH, QL, QN – Analyte result is considered an estimated value biased (high [H], low [L], uncertain [N]) due to a laboratory quality control failure (Q) such as LCS/LCSD, MS/MSD or surrogate recoveries outside of acceptance limits. Field duplicates that do not meet RPD limits but meet other acceptance criteria are also flagged QN.
- H – Sample extracted or analyzed outside of holding time. Results have potential low bias.

Data verification was performed for samples collected at Northeast Cape in August 2015. Field sample duplicate pairs are specified in the QAPP at a minimum rate of 10 percent (%) per matrix and analytical suite. Field duplicates were collected at a frequency of greater than 10%.

Field sample identification, corresponding laboratory identification, and analytical results are presented in the analytical results tables in Appendix E of the 2015 Northeast Cape Annual Groundwater Sampling Report.

The sample summary sheet which lists all project samples and their respective analyses is presented as Attachment 1 to this CDQR. The ADEC Laboratory Data Review Checklist is presented in Attachment 2. Bristol-to-USACE Variance-Request correspondence is presented in Attachment 3. Laboratory certifications are included in Attachment 4.

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2.0 DATA VERIFICATION RESULTS

2.1 SAMPLE RECEIPT CONDITIONS AND PRESERVATION

Samples were shipped from the Northeast Cape site by field personnel via Alaska Airlines, Goldstreak. Custody seals remained intact until receipt by the laboratory. The SDG arrived at the lab at a temperature of 4 (+/- 2) degrees Celsius and in good condition. Exceptions are noted below:

- Seven coolers were shipped that included both MOC groundwater and Site 9 surface water samples. The cooler temperatures were 0.8, 1.0, 1.1, 1.6, 2.0, 4.7, and 4.8 degrees Celsius. None of the samples were frozen and the slightly depressed temperatures had no effect on results.
- The trip blanks were not listed on the CoC for analysis, but were noted on the CoC for cooler 081515-01 that it contained surface water volatile samples and a trip blank and the CoC for cooler 081515-02 noted it contained groundwater volatile samples and additional trip blanks. The cooler contents were listed on each CoC submitted with each cooler.
- The glycol sample containers for samples collected from well MW10-1 at Site 10 were improperly preserved with hydrochloric acid. No unpreserved sample containers were provided by the lab. The analysts diluted samples prior to analysis to protect the instrumentation. The diluted sample still had the LOD less than the ADEC cleanup level for groundwater, so the non-detect sample results were usable for project purposes.
- The cooler receipt form noted that some dates and times on containers did not match the CoC. Samples were logged in per the CoC.
- The sample receipt form for an unspecified cooler noted that a zero headspace (VOC) sample had ¼-inch or larger bubbles in one or more vials and also noted that one vial had acceptable “zero” headspace. The case narrative did not specify which sample had headspace so it is assumed that analysis was performed on a sample with no headspace.

2.2 VOC ANALYSES (BTEX AND FULL LIST VOCS)

TestAmerica analyzed samples for BTEX and one volatile sample from well MW10-1 and its trip blank were analyzed for full list VOCs by SW 8260C. The laboratory report case narrative noted several analytes that were out of control; however; on most instances the samples were only being analyzed for BTEX. QAPP specified QC for an analytical batch of up to 20 samples includes an MB, LCS/LCSD, and MS/MSD pair. An MB, LCS/LCSD, and project MS/MSD were analyzed and within control limits with each batch with exceptions noted below:

(**Note**: Only sample 15NCMOCGW12, collected from well MW10-1 was analyzed for full VOCs, along with the trip blank. All other water samples were analyzed for BTEX only; however, the QC issues are still presented.)

- Dichlorodifluoromethane failed recovery high in the continuing calibration verification (CCV), LCS/LCSD, and MS/MSD in batch 580-198866. The MS/MSD recoveries exceeded the upper control limit, the parent sample for the MS/MSD was from a non-project sample, and only the VOC water trip blank was analyzed in this batch. The MS/MSD parent sample was non-detect for dichlorodifluoromethane, so results were not qualified. A variance was approved by the USACE project chemist for reporting.
- The method blank 580-199896 had methylene chloride detected at less than one-half the LOQ. Only the trip blank submitted with groundwater volatile samples was analyzed in this batch and was non-detect, so no qualification are necessary.
- The MS/MSD recoveries in sample 15NCMOCGW01 exceeded the upper recovery limit for benzene and m,p-xylene recoveries in batch 580-199061. The parent sample results were non-detect so no flags were assigned.
- The LCS and/or LCSD in batch 580-199315 had recoveries exceed the upper control limit for 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, 1,2-dibromo-3-chloropropane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, naphthalene and t-butylbenzene in the LCS (580-199315/5). 1,3,5-trimethylbenzene, benzene, bromochloromethane, chloroform, methylene chloride, t-butylbenzene and trans-1,2-dichloroethene recoveries exceeded the upper control limit in LCSD 580-199315/6. These analytes were not detected in the associated samples; therefore, the data have been reported with client approval. Only sample 15NCMOCGW12 from well MW10-1 was analyzed for full VOCs. Samples 15NCMOCGW13,-GW14, -GW15, -GW16 and –GW17 were only analyzed for BTEX and their benzene results were non-detect. Because the bias was high in the CCV and LCS, no flags were assigned to the benzene results for the other samples analyzed in the batch.

- The CCV associated with batch 580-199315 recovered above the upper control limit for vinyl chloride (+37.2%), trichlorofluoromethane (+20.7%), chloromethane (+26.8%) and Dichlorodifluoromethane (+85.8%). These analytes were all detected in the CCV, and were not detected in the sample associated with this CCV; therefore, the data have been reported with client approval. The following samples are impacted: 15NCMOCGW12 (580-52566-12) and (CCV580-199315/2). No flags were assigned for the out of control CCV as all potentially affected results were non-detect.
- The minimum response factor (RF) criteria for the CCV analyzed in batch 580-199315 was outside criteria for 2-butanone and chloroethane. They were not detected in the sample associated with this CCV so no flags were assigned.

2.3 GRO ANALYSES

TestAmerica analyzed GRO by ADEC Method AK101. Required QC for an analytical batch of up to 20 samples includes an MB, LCS/LCSD, and MS/MSD pair. An MB, LCS/LCSD pair and project MS/MSD pair were performed with each QC batch.

Holding times, method blanks, LCS/LCSD recoveries and RPDs, and MS/MSD recoveries and RPDs were reviewed and met all QAPP and method criteria.

2.4 PAH ANALYSES

TestAmerica analyzed samples by SW 8270C-SIM for PAHs. Required QC for an analytical batch of up to 20 samples includes an MB, LCS/LCSD, and MS/MSD pair. A MB, LCS/LCSD, and project MS/MSD pair were performed with each QC batch and met criteria with some exceptions:

- Anthracene and benzo[a]pyrene failed the recovery criteria low for the LCS and LCSD in batch 580-198441/2-A and also exceeded the RPD limit. These analytes were outside the marginal exceedance limits and were indicative of a systematic problem; therefore, re-extraction and re-analysis was performed. However, since the re-analysis yielded no improvement, the in-hold data was qualified and reported.
- Anthracene and benzo[a]pyrene failed the recovery criteria low for the MS/MSD of sample 15NCMOCGW01 (580-52566-1) in batch580-199581. The analytical

results have already been flagged QL due to recoveries in the LCS/LCSD that were below the lower acceptance limit.

- Acenaphthylene, anthracene, and benzo[a]pyrene failed the recovery criteria low in the LCS/LCSD in batch 580-198677. Acenaphthylene, anthracene, and benzo[a]pyrene also exceeded the RPD limit. Sample results associated with batch 580-198677 have been qualified QL for quality issue with potential low bias.

2.5 DRO / RRO ANALYSES

TestAmerica analyzed samples for DRO/RRO following ADEC methods AK102/AK103. Required QC for a batch of up to 20 samples includes a MB, LCS /LCSD, and MS/MSD pair. A MB, LCS/LCSD, and project MS/MSD pair were performed with each QC batch and met acceptance criteria, with some exceptions:

- DRO was detected in method blank MB 580-199084/1-A at 0.0334 milligrams per liter (mg/L), which is above the detection limit but below ½ the LOQ. Samples 15NCMOCGW01 through –GW05 were included in preparation batch 580-199084. Samples –GW01, -GW02, -GW03 and –GW04 were initially B flagged as their DRO concentrations were less than 10 times the blank concentration. However, a review of the chromatograms indicates that most of the low hits were distinct peaks with no hump or weathering evident. The peaks matched up with the same retention times as MB 580-199084 that exhibited a hit above the DL. Samples –GW01, -GW02, -GW03, and -GW04 have been reported as ND at the LOQ with QN flags. The DRO results for sample –GW05 was greater than 10 times the blank concentration and its DRO result was not flagged.
- DRO and RRO surrogates o-terphenyl and n-Triacontane-d62 failed the surrogate recovery criteria low at 38 and 42% respectively for sample 15NCMOCGW13 (580-52566-13). Evidence of matrix interference due to non-target analytes is present, as noted in the preparation batch; therefore, re-extraction and/or re-analysis was not performed. The DRO and RRO results were flagged QL for quality issue with potential low bias.

Note: Chromatograms were examined by the data reviewer to determine if the chromatograms reflect diesel patterns. Many of the DRO chromatograms exhibited several distinct peaks that do not resemble petroleum hydrocarbons in the diesel range. A review of groundwater and method blank chromatograms led to the conclusion that the low-level DRO contamination exhibited in groundwater samples analyzed from wells 26MW1

(-GW01), 22MW2 (-GW02), 20MW1 (-GW03), 17MW1 (-GW04), and 14MW07 (-GW06) is a result of laboratory contamination. The DRO results for these wells have been reported as non-detect at the LOQ and flagged QN (as per discussions between the Bristol and USACE Chemists. Bristol and USACE Chemist correspondence regarding the review of the interpretation of DRO chromatograms is included in Attachment 3 of this CDQR.

- In analytical batch 580-199155, the following samples from preparation batch 580-199084 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NCMOCGW07 (580-52566-7), 15NCMOCGW10 (580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12) and 15NCMOCGW15 (580-52566-15).
- In analytical batch 580-199155, the following samples from preparation batch 580-199084 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was earlier than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW14 (580-52566-14) and 15NCMOCGW17 (580-52566-17).
- In analytical batch 580-198993, the following sample from preparation batch 580-199008 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was earlier than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NCMOCGW05 (580-52566-5). ** Reviewer's note: the elution patterns for 580-52566-1 through -4 (-GW01 thru -GW04), which were analyzed with –GW05, also did not resemble any diesel or hydrocarbon pattern, but did contain distinct peaks that eluted just prior to the surrogate o-terphenyl. It is not believed to be diesel.

2.6 PCBs BY METHOD 8082A

Surrogate Tetrachloro-m-xylene (TCMX) recovery was outside lower control limits for the MB 580-198500/1-A, LCS 580-198500/2-A, and some samples. The samples were re-extracted due to low surrogate recoveries and both sets of results have been reported. Re-extracted samples were: 15NCMOCGW01 (580-52566-1), 15NCMOCGW01 (580-52566-1[MS]), 15NCMOCGW01 (580-52566-1[MSD]), 15NCMOCGW02(580-52566-2), 15NCMOCGW03 (580-52566-3), 15NCMOCGW04

(580-52566-4), 15NCMOCGW05 (580-52566-5), 15NCMOCGW06 (580-52566-6), 15NCMOCGW07 (580-52566-7), 15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW10(580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12), 15NCMOCGW13 (580-52566-13),15NCMOCGW14 (580-52566-14), 15NCMOCGW15 (580-52566-15), 15NCMOCGW16 (580-52566-16), 15NCMOCGW17(580-52566-17), (LCS 580-198500/2-A), (MB 580-198500/1-A), (580-52566-B-12-B MS), and (580-52566-B-12-C MSD).

PCB-1016 failed the recovery criteria low for the MS of sample 15NCMOCGW01MS (580-52566-1) in batch 580-198786. PCB-1016 exceeded the RPD limit for the MS/MSD of sample 15NCMOCGW01MSD (580-52566-1) in batch 580-198786. The associated lab control sample met the acceptance criteria. The PCB-1016 result for 15NCMOCGW01 was flagged QL for quality issue with potential low bias. The result was non-detect.

The CCV 580-198786/34 associated with analytical batch 580-198786 recovered above the upper control limit for PCBs 1016 and 1260 as well as the surrogates TCMX and DCB. The samples associated with this CCV were non-detects for the affected analytes and surrogate recoveries weren't adversely affected; therefore, the data have been reported without qualification. The following samples were potentially impacted: 15NCMOCGW06 (580-52566-6),15NCMOCGW07 (580-52566-7), 15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW10 (580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12), 15NCMOCGW13 (580-52566-13), 15NCMOCGW15(580-52566-15), 15NCMOCGW16 (580-52566-16), (CCB 580-198786/35), (CCB 580-198786/41), (CCV 580-198786/34), (CCV 580-198786/40), (580-52566-B-12-B MS) and (580-52566-B-12-C MSD). Because the results were non-detect and the instrument was capable of detecting PCBs down to the detection limit no flags were assigned.

The PCB surrogate decachlorobiphenyl failed the surrogate recovery criteria high for samples 15NCMOCGW03 (580-52566-3) 15NCMOCGW07 (580-52566-7), 15NCMOCGW08 (580-52566-8, 15NCMOCGW09 (580-52566-9), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12), 15NCMOCGW13 (580-52566-13), 15NCMOCGW15 (580-52566-15), 15NCMOCGW16 (580-52566-16), 15NCMOCGW17 (580-52566-17). These samples did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed. No flags were assigned for the high surrogate recovery as the non-detect results were not affected by the high recovery.

DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW14 (580-52566-14). PCB-1254 was detected in this sample just above 1/2 the LOQ. The re-extracted sample recovery of PCB-1254 is similar in quantity in the original and the re-extraction batches. The PCB 1254 result for sample 15NCMOCGW14 was flagged QH for the high surrogate recovery, all other PCB results were non-detect in this sample. The data have been reported with an approved variance.

2.7 METALS BY EPA METHOD 6020A

2.7.1 Dissolved Metals

Cadmium was detected in the dissolved method blank MB 580-199196/9-B at 0.000286 mg/L, which was above the detection limit but below 0.5 the LOQ. Dissolved cadmium was not detected in any samples so no flags were applied for method blank contamination.

Dissolved barium failed the recovery criteria high for the MS sample 15NCMOCGW01MS (580-52566-1) in batch 580-199268. The associated lab control sample met the acceptance criteria. The dissolved barium result for sample 15NCMOCGW01 was flagged QH for quality issue with potential high bias.

2.7.2 Total Metals

Total metals analysis met all criteria in groundwater samples.

2.8 MERCURY BY EPA METHOD 7470A

Total and dissolved mercury met all QC criteria.

2.9 FIELD QA/QC

Field QC samples included field duplicate pairs, MS/MSD pairs, and trip blanks. Field QC samples were analyzed in the same manner and in the same extraction and analytical batches as primary field samples. Field duplicate samples were submitted "blind" to the lab with similar sample identification numbers (IDs) as primary field samples, so the lab could not identify which samples were duplicates.

2.9.1 Field Sample Duplicates

The comparison of field sample duplicate results provides for the evaluation of precision as measured by RPD for the overall sample collection and analytical process. The precision between the field duplicate samples may be influenced by the unequal distribution of target analyte concentrations within a matrix. The RPD assessment criteria of 30% RPD for groundwater samples (as specified in the QAPP) were used to evaluate the field duplicates. This variability is assessed by evaluating the calculated RPDs between the field duplicate sample results. If target analytes were detected in one sample greater than the LOQ and not detected in the duplicate, both detected and non-detected results were flagged QN to indicate imprecision. Data which was J flagged and detected between the LOQ and the DL had the RPD calculated but analytical results were not flagged for out of control RPDs.

Field Duplicate Frequencies

Field sample duplicate pairs are specified the QAPP at a minimum rate of 10% per matrix and analytical suite. Two sets of field duplicates were collected at the MOC along with fifteen primary samples. The field duplicate pairs are noted below:

- 15NCMOCGW13 and 15NCMOCGW16 (Well 14MW04)
- 15NCMOCGW14 and 15NCMOCGW17 (Well 14MW05)

Field Duplicate RPDs

Table 2-1 lists the calculated RPDs between the field duplicate and parent sample results for target analytes that were outside of the 30% RPD for water samples. RPDs out of precision control and detected above the LOQ in both the parent and field duplicate sample were flagged QN. Analytes with one or both results below the LOQ had the RPDs calculated but neither result was flagged due to the inherent imprecision of the multiple methods below the LOQ.

Table 2-1 Field Sample Duplicate Pair Results

Parent Sample ID / Laboratory Sample ID	Field duplicate Sample ID / Laboratory Sample ID	Compound	Units	Parent Field Sample Result	Field duplicate Result	RPD (%)
15NCMOCGW13 (580-52566-13)	15NCMOCGW16 (580-52566-16)	1-Methylnaphthylene	mg/L	0.00057	0.0009	**45**
		DRO	mg/L	**1.6 QL**	**2.8**	**55**
		RRO	mg/L	0.18	0.37	**69**
15NCMOCGW14 (580-52566-14)	15NCMOCGW17 (580-52566-17)	1-Methylnaphthylene	mg/L	0.019	0.013	**37.5**
		Acenaphthylene	mg/L	0.0001 QL	ND[0.000011] QL	**160**
		Naphthalene	mg/L	0.013	0.0059	**75**
		Phenanthrene	mg/L	0.00028	0.00015	**60**

Notes:
BOLD = Exceeds RPD acceptance criteria.
DRO = diesel range organics
ID = identification
mg/L = milligrams per liter
RPD (%) = relative percent difference
RRO = residual range organics

The field duplicate RPDs were within control limits with the exceptions shown in bold on Table 2-1. A total of 7 out of 167 duplicate results (4.2%) did not meet RPD criteria. The out of control results for the parent and duplicate sample results were QN qualified to indicate estimated results with an unknown bias. In addition, if one of the pair had a detection above the LOQ and the duplicate result was less than the LOQ, the RPD was calculated but not flagged for results outside of RPD acceptance limits, as there is a lower degree of analytical accuracy at concentrations less than the LOQ. No results were flagged if one or both results were reported at less than the LOQ. All other results were also usable for project decisions to demonstrate that none of the precision biased sample results were greater than or anywhere near site-specific cleanup levels. The overall field duplicate imprecision was 4.2%, well below the 10% data quality objective for usable results.

2.9.2 Trip Blanks

Water trip blanks were included in the two coolers containing samples which were submitted to the laboratory for VOC and GRO analyses. Trip blanks were submitted with project samples to assess the potential for VOC or GRO cross-contamination introduced by laboratory provided sample containers, storage during field operations, sample shipment and storage and analysis at the laboratory.

Trip blanks were included with shipments containing samples for VOC and GRO analyses. Trip blanks were free of target analytes.

2.9.3 Equipment Blanks

The primary purposes of equipment blanks are to trace sources of artificially introduced contamination. The requirement for the collection of equipment blanks were unintentionally omitted from the approved QAPP. Although disposable pump tubing was used, and although field personnel decontaminated the sampling pumps before the sampling of each well, field personnel inadvertently failed to collect equipment blanks from the pumps that were used during the 2015 sampling effort. This was a deviation from requirements listed in the *ADEC Draft Field Sampling Guidance* document (ADEC, 2010). Future groundwater sampling events should include the collection of equipment blanks as per ADEC guidance.

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3.0 SENSITIVITY AND QUANTITATION LIMITS

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses that represent different levels (e.g., concentrations) of a variable or analyte of interest. Examples of QC measures for determining sensitivity include laboratory-fortified blanks at the LOQ/ LOD studies, and the lowest calibration standards at or below the LOQ. In order to meet the needs of the data users, the project data must meet the measurement performance criteria for sensitivity and project LOQs. Analytical factors, such as dilutions or high percent soil moisture, may elevate the reporting limits for all target constituents.

Overall sensitivity and reporting for the project met quantitation reporting limits with one minor exception noted below:

- Sample 15NCMOCGW12 (580-52566-12), collected from well MW10-1, was analyzed for full VOCs. The limit of detection for two analytes, 1,2 dribromoethane (EDB) and 1,2,3 trichloropropane, did not meet ADEC evaluation criteria in groundwater. Neither analyte was ever detected in soil or drum contents removed from Site 10. The well MW10-1, which is adjacent to Site 10, has also never had detections of these two analytes. While sensitivity was not met for these two analytes, the overall sensitivity for this sample and the other nineteen samples was met. No other samples were analyzed for full VOCs.

3.1 SENSITIVITY SUMMARY

Overall project sensitivity was met. Two VOC analytes with non-detect results exceeded cleanup levels for compounds of particular concern though they were never detected in soil or groundwater at the site.

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4.0 REFERENCES

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ATTACHMENT 1

Sample Summary Table

2015 NE Cape MOC Groundwater Sampling Sample Summary Table

SDG	LocationID	ClientSampleID	LabSampleID	CollectedDate	MatrixID	Sample Depth (feet)	QC	ResultBasis	LabName	6020A	7470A	8015C	8082A	8260C	8270DSIM	AK101	AK102_103	RSK-175	Sampler Initials	Field Preservation	Container Type	Turnaround	Cooler ID
580-52566-1	26MW1	15NCMOCGW01	580-52566-1	08/13/2015 12:00:00	Water	38.41	MS/MSD	Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	26MW1	15NCMOCGW01	580-52566-1	08/13/2015 12:00:00	Water	38.41	MS/MSD	Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	26MW1	15NCMOCGW01	580-52566-1	08/13/2015 12:00:00	Water	38.41	MS/MSD	Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	22MW2	15NCMOCGW02	580-52566-2	08/13/2015 14:00:00	Water	29.92	MS/MSD	Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	22MW2	15NCMOCGW02	580-52566-2	08/13/2015 14:00:00	Water	29.92	MS/MSD	Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	22MW2	15NCMOCGW02	580-52566-2	08/13/2015 14:00:00	Water	29.92	MS/MSD	Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	20MW1	15NCMOCGW03	580-52566-3	08/13/2015 17:10:00	Water	24.82		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	20MW1	15NCMOCGW03	580-52566-3	08/13/2015 17:10:00	Water	24.82		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	20MW1	15NCMOCGW03	580-52566-3	08/13/2015 17:10:00	Water	24.82		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	17MW1	15NCMOCGW04	580-52566-4	08/13/2015 14:30:00	Water	13.06		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	17MW1	15NCMOCGW04	580-52566-4	08/13/2015 14:30:00	Water	13.06		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	17MW1	15NCMOCGW04	580-52566-4	08/13/2015 14:30:00	Water	13.06		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW01	15NCMOCGW05	580-52566-5	08/13/2015 16:10:00	Water	16.44		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW01	15NCMOCGW05	580-52566-5	08/13/2015 16:10:00	Water	16.44		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW01	15NCMOCGW05	580-52566-5	08/13/2015 16:10:00	Water	16.44		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW07	15NCMOCGW06	580-52566-6	08/14/2015 11:40:00	Water	27.91		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW07	15NCMOCGW06	580-52566-6	08/14/2015 11:40:00	Water	27.91		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW07	15NCMOCGW06	580-52566-6	08/14/2015 11:40:00	Water	27.91		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	MW88-10	15NCMOCGW07	580-52566-7	08/14/2015 11:20:00	Water	22.82		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	MW88-10	15NCMOCGW07	580-52566-7	08/14/2015 11:20:00	Water	22.82		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	MW88-10	15NCMOCGW07	580-52566-7	08/14/2015 11:20:00	Water	22.82		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW03	15NCMOCGW08	580-52566-8	08/14/2015 15:30:00	Water	13.41		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW03	15NCMOCGW08	580-52566-8	08/14/2015 15:30:00	Water	13.41		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW03	15NCMOCGW08	580-52566-8	08/14/2015 15:30:00	Water	13.41		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW02	15NCMOCGW09	580-52566-9	08/14/2015 16:40:00	Water	11.42		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW02	15NCMOCGW09	580-52566-9	08/14/2015 16:40:00	Water	11.42		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW02	15NCMOCGW09	580-52566-9	08/14/2015 16:40:00	Water	11.42		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	MW88-1	15NCMOCGW10	580-52566-10	08/14/2015 13:00:00	Water	18.97		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	MW88-1	15NCMOCGW10	580-52566-10	08/14/2015 13:00:00	Water	18.97		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	MW88-1	15NCMOCGW10	580-52566-10	08/14/2015 13:00:00	Water	18.97		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	MW88-3	15NCMOCGW11	580-52566-11	08/14/2015 13:00:00	Water	14.22		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	MW88-3	15NCMOCGW11	580-52566-11	08/14/2015 13:00:00	Water	14.22		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	MW88-3	15NCMOCGW11	580-52566-11	08/14/2015 13:00:00	Water	14.22		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	MW10-1	15NCMOCGW12	580-52566-12	08/14/2015 13:25:00	Water	6.85	MS/MSD	Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	MW10-1	15NCMOCGW12	580-52566-12	08/14/2015 13:25:00	Water	6.85	MS/MSD	Total	TestAmerica Denver			X						X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	MW10-1	15NCMOCGW12	580-52566-12	08/14/2015 13:25:00	Water	6.85	MS/MSD	Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW04	15NCMOCGW13	580-52566-13	08/15/2015 12:30:00	Water	4.66		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW04	15NCMOCGW13	580-52566-13	08/15/2015 12:30:00	Water	4.66		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW04	15NCMOCGW13	580-52566-13	08/15/2015 12:30:00	Water	4.66		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW05	15NCMOCGW14	580-52566-14	08/15/2015 12:30:00	Water	4.12		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW05	15NCMOCGW14	580-52566-14	08/15/2015 12:30:00	Water	4.12		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW05	15NCMOCGW14	580-52566-14	08/15/2015 12:30:00	Water	4.12		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW06	15NCMOCGW15	580-52566-15	08/15/2015 15:00:00	Water	4.5		Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW06	15NCMOCGW15	580-52566-15	08/15/2015 15:00:00	Water	4.5		Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW06	15NCMOCGW15	580-52566-15	08/15/2015 15:00:00	Water	4.5		Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW04	15NCMOCGW16	580-52566-16	08/15/2015 13:00:00	Water	4.66	FD of GW13	Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW04	15NCMOCGW16	580-52566-16	08/15/2015 13:00:00	Water	4.66	FD of GW13	Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW04	15NCMOCGW16	580-52566-16	08/15/2015 13:00:00	Water	4.66	FD of GW13	Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	14MW05	15NCMOCGW17	580-52566-17	08/15/2015 12:40:00	Water	4.12	FD of GW14	Dissolved	TestAmerica Tacoma	X	X								EB,LK, NP	1	A	21 days	Lg. blue/white
580-52566-1	14MW05	15NCMOCGW17	580-52566-17	08/15/2015 12:40:00	Water	4.12	FD of GW14	Total	TestAmerica Denver									X	EB,LK, NP	2	B	21 days	Lg. blue/white
580-52566-1	14MW05	15NCMOCGW17	580-52566-17	08/15/2015 12:40:00	Water	4.12	FD of GW14	Total	TestAmerica Tacoma	X	X		X	X	X	X	X		EB,LK, NP	2,3	B,C	21 days	Lg. blue/white
580-52566-1	Trip Blank	Trip Blank	580-52566-22	08/11/2015 00:01:00	Water	NA	Trip blank	Total	TestAmerica Tacoma					X		X			EB,LK, NP	2	B	21 days	Lg. blue/white

Preservative Key
1=nitic acid
2=hydrochloric acid
3=cool
Container Key
A= 250 mL poly
B=40 mL VOA Vial
C= 250 mL amber glass

ATTACHMENT 2

ADEC Laboratory Data Review Checklist

Laboratory Data Review Checklist

Completed by: Marty Hannah/Tyler Ellingboe

Title: Project Chemist/Project Manager

Date: 4/19/2016

CS Report Name: 2015 NE Cape Groundwater Report

Report Date: 10/30/15

Consultant Firm: Bristol Environmental Remediation Services, LLC

Laboratory Name: TestAmerica-Tacoma

Laboratory Report Number: 580-52566-1

ADEC File Number:

ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      x☐Yes ☐ No ☐NA (Please explain.) 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?
      x☐Yes ☐ No ☐NA (Please explain.) Comments:

      Samples were shipped directly to TA-Tacoma via Alaska Airlines Goldstreak for analysis. Samples for methane by Method RSK-175 and glycol by Method 8015C-DAI were subcontracted to TA-Denver using intralaboratory subcontracting.

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☐xYes ☐ No ☐NA (Please explain.) Comments:

   b. Correct analyses requested?
      x☐Yes ☐ No ☐NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☐x No ☐NA (Please explain.) Comments:

      Seven coolers were shipped that included both MOC groundwater and Site 9 surface water samples. The cooler temperatures were 0.8, 1.0, 1.1, 1.6, 2.0, 4.7 and 4.8 degrees. None of the samples were frozen and the slightly depressed temperatures had no effect on results.

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

☐Yes ☐x No ☐NA (Please explain.) Comments:

The glycol sample containers for samples collected from well MW10-1 at Site 10 were improperly preserved with hydrochloric acid. No unpreserved sample containers were provided by the lab. The analysts diluted samples prior to analysis to protect the instrumentation. The diluted sample still had the LOD less than the ADEC cleanup level for groundwater so the non-detect sample results were usable for project purposes.

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

☐Yes ☐x No ☐NA (Please explain.) Comments:

The sample receipt form for an unspecified cooler noted that a zero headspace (VOC) sample had ¼" or larger bubbles in one or more vials and also noted that one vial had acceptable "zero" headspace. The case narrative did not specify which sample had headspace, so it is assumed that analysis was performed on a sample with no headspace. However, hand written cooler receipt form 081515-02 indicated that only one VOA vial had headspace (bubble).

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.?

x☐Yes ☐ No ☐NA (Please explain.) Comments:

The improper preservation of glycol samples was noted above.

e. Data quality or usability affected? (Please explain.)

Comments:

While there were several potential issues that could have affected results, examination of sample receipt forms and results did not indicate that the results were impacted by quality or sample handling and preservation issues. Sample results were usable without qualification with respect to sample receipt conditions and preservation.

4. Case Narrative

a. Present and understandable?

x☐Yes ☐ No ☐NA (Please explain.) Comments:

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

x☐Yes ☐ No ☐NA (Please explain.) Comments:

Too many to list, see attached page at end of this checklist for full description of QC failures.

c. Were all corrective actions documented?
x☐Yes ☐ No ☐NA (Please explain.) Comments:

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

While there were numerous QC failures that lessened the data quality to some degree, the results were still usable to demonstrate groundwater and surface water conditions at NE Cape. Some results were qualified (flagged) for out of control analyses.

5. <u>Samples Results</u>
a. Correct analyses performed/reported as requested on COC?
x☐Yes ☐ No ☐NA (Please explain.) Comments:

b. All applicable holding times met?
x ☐Yes ☐ No ☐NA (Please explain.) Comments:

All MOC groundwater sample holding times (the focus of this report) were met with the exception of the trip blank. Surface water samples collected at Site 9 (which were submitted as part of the SDG, but not covered in this groundwater monitoring report) had PAH holding times expire as the samples were received at the lab on the same day the 7 day holding times expired. Results were flagged QH. PCBs were noted as exceeding hold times in the surface water MS/MSD in the case narrative, but there is no hold time requirement for PCBs. The 2015 Landfill Visual Inspection Report (a separate deliverable from this one) will address the surface water samples.

c. All soils reported on a dry weight basis?
☐Yes ☐ No ☐x NA (Please explain.) Comments:

All samples were water samples.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
☐Yes ☐x No ☐NA (Please explain.) Comments:

A groundwater sample collected from well MW10-1 for full VOCs did not meet ADEC groundwater cleanup levels for 1,2-dibromoethane (EDB) and 1,2,3-trichloropropane. Neither analyte was ever detected in groundwater, nearby excavated soil nor in nearby drum contents which were removed in 2013 and 2014 and characterized for disposal.

e. Data quality or usability affected?

Comments:

While the holding time exceedences have a potential effect on data quality, all potentially affected PAH results were non-detect. The results were usable for project purposes to demonstrate that the former Site 9 landfill was not leaching contents into nearby surface waters.

6. QC Samples
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?

x☐Yes ☐ No ☐NA (Please explain.) Comments:

ii. All method blank results less than PQL?

☐Yes ☐x No ☐NA (Please explain.) Comments:

Methylene chloride was detected in MB 580-199896. Only the trip blank was analyzed in this batch and was non-detect for methylene chloride so no flags were assigned. DRO was detected in method blank MB 580-199084/1-A at 0.0334 mg/L, which is above the detection limit but below ½ the limit of quantitation. Cadmium was detected in the dissolved method blank MB 580-199196/9-B at 0.000286 mg/L.

iii. If above PQL, what samples are affected?

Methylene chloride was detected in MB 580-199896. Only the trip blank was analyzed in this batch and was non-detect for methylene chloride so no flags were assigned. Samples 15NCMOCGW01 through –GW05 were included in preparation batch 580-199084. Samples –GW01, -GW02, -GW03 and –GW04 were B flagged as their DRO concentrations were less than 10 times the blank concentration. Sample –GW05 was greater than 10 times the blank concentration and its DRO result was not flagged. Dissolved cadmium was not detected in any samples so no flags were applied for method blank contamination.

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

☐x Yes ☐ No ☐NA (Please explain.) Comments:

The DRO results for samples 15NCMOCGW01 thru GW04 were B flagged for blank contamination.

v. Data quality or usability affected? (Please explain.)

Comments:

The only potentially impacted data results were the DRO results. Previous results were non-detect in some samples. Laboratory contamination appears to be the cause of the DRO detections. The DRO chromatograms do not resemble weathered fuel. Per USACE Chemist feedback, low level DRO detections in wells 26MW1, 22MW2, 20MW1, 17MW1, and 14MW07 will be changed to non-detect at the LOQ.

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)

x☐Yes ☐ No ☐NA (Please explain.) Comments:

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

x☐Yes ☐ No ☐NA (Please explain.) Comments:

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 x☐ No ☐NA (Please explain.) Comments:

See notes at end of checklist for full description. VOC LCS/LCSDs, PAHs and PCBs MS/MSDs did not meet recovery limits.

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 ☐x No ☐NA (Please explain.) Comments:

Anthracene and benzo[a]pyrene failed to meet RPD limits in 2 batches. PCB 1016 failed RPD limits in the MS/MSD of sample 15NCMOCGW01.

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

Comments:

All anthracene and benzo[a]pyrene results were flagged QL for low LCS/LCSD recoveries.

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

x☐Yes ☐ No ☐NA (Please explain.) Comments:

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

Comments:

While there were multiple QC failures and flags which could potentially impact data quality. All results were usable for project purposes of monitoring groundwater at the MOC.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
x☐Yes ☐ No ☐NA (Please explain.) 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 x☐ No ☐NA (Please explain.) Comments:

The DRO RRO surrogates o-terphenyl and n-Triacontane-d62 failed the surrogate recovery criteria low at 38 and 42% respectively for sample 15NCMOCGW13 (580-52566-13). Nearly all PCB samples had high surrogate recoveries for TCMX and decachlorobiphenyl. All results except sample 15NCMOCGW14 were non-detect for PCBs

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
x☐Yes ☐ No ☐NA (Please explain.) Comments:

The PCB 1254 result for 15NCMOCGW14 was flagged QH for quality issue with potential high bias. The DRO/RRO results for 15NCMOCGW13 were flagged QL for low surrogate recoveries.

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

While many surrogate recoveries were out of control for PCBs, including lab QC, the results were still usable to demonstrate that PCBs were not present in the majority of wells with the exception of PCB 1254 in sample 15NCMOCGW14.

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.)
x☐Yes ☐ No ☐NA (Please explain.) 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)
x☐Yes ☐ No ☐NA (Please explain.) Comments:

Noted on bottom of respective CoCs.

iii. All results less than PQL?

x☐Yes ☐ No ☐NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

Not applicable, all results were ND.

v. Data quality or usability affected? (Please explain.)

Comments:

Sample results were usable for project purposes without qualification with respect to trip blank inclusion and reporting.

e. Field Duplicate

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

x☐Yes ☐ No ☐NA (Please explain.) Comments:

Two sets of trip blanks were submitted with the MOC groundwater samples. Duplicate pairs were 15NCMOCGW13/15NCMOCGW16 and 15NCMOCGW14/15NCMOCGW17.

ii. Submitted blind to lab?

x☐Yes ☐ No ☐NA (Please explain.) Comments:

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

☐Yes ☐x No ☐NA (Please explain.) Comments:

7 out of 167 analytes did not meet RPD criteria. Those results were noted in the CDQR.

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

Comments:

The overall 90% precision criteria was met for field duplicates. Only DRO exceeded cleanup criteria and it was above cleanup levels in both duplicate samples so results were usable as intended.

f. Decontamination or Equipment Blank (If not used explain why).

□Yes □ No x□NA (Please explain.) Comments:

Samples were collected with disposable tubing and the submersible pump was decontaminated after each well. An equipment blank was inadvertently omitted from the approved QAPP, but should have been collected. This project deviation will be mentioned in Section 2.9.3 of the text of the CDQR (Appendix G).

i. All results less than PQL?

□Yes □ No x□NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

Comments:

Not applicable

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable

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

a. Defined and appropriate?

x□Yes □ No □NA (Please explain.) Comments:

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

x□Yes □ No □NA (Please explain.) Comments

VOC Analysis

Dichlorodifluoromethane failed recovery high in the CCV, LCS/LCSD and MS/MSD in batch 580-198866. The MS/MSD recoveries exceeded the upper control limit, the parent sample for the MS/MSD was from a non-project sample and only the VOC water trip blank was analyzed in this batch.

Only sample 15NCMOCGW12 and its MS/MSD from Site 10 were analyzed for full VOCs. The sample was non-detect for dichlorodifluoromethane so results were not qualified. A variance was approved by the USACE project chemist for reporting. The method blank 580-199896 had methylene chloride detected at less thant half the LOQ. Only the trip blank submitted with groundwater volatile samples was analyzed in this batch and was non-detect so no qualification was necessary. The MS/MSD recoveries in sample 15NCMOCGW01 exceeded the upper recovery limit for benzene and m,p-xylene recoveries in batch 580-199061. The parent sample results were non-detect so no flags were assigned.

1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, 1,2-dibromo-3-chloropropane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, naphthalene and t-butylbenzene failed the recovery criteria high for LCS 580-199315/5. 1,3,5-trimethylbenzene, benzene, bromochloromethane, chloroform, methylene chloride, t-butylbenzene and trans-1,2-dichloroethene failed the recovery criteria high for LCSD 580-199315/6. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported with

client approval.Only sample 15NCMOCGW12 was analyzed for full VOCs. Sample 15NCMOCGW12 was collected from well MW10-1, adjacent to site 10. Samples 15NCMOCGW13,-GW14, -GW15, -GW16 and –GW17 were only analyzed for BTEX and their benzene results were non-detect. Because the bias was high in the CCV and LCS, no flags were assigned to the benzene results.
The continuing calibration verification (CCV) associated with batch 580-199315 recovered above the upper control limit for vinyl chloride(+37.2%), trichlorofluoromethane (+20.7%), chloromethane (+26.8%) and Dichlorodifluoromethane (+85.8%). These analytes were all detected in the CCVL, and were not detected in the sample associated with this CCV; therefore, the data have been reported with client approval. The following samples are impacted: 15NCMOCGW12 (580-52566-12) and (CCV580-199315/2). No flags were assigned for the out of control CCV as all potentially affected results were non-detect.
The minimum response factor (RF) criteria for the continuing calibration verification (CCV) analyzed in batch 580-199315 was outside criteria for the following analytes: 2-butanone & chloroethane. They were not detected in the sample associated with this CCV so no flags were assigned.

PAHs by 8270-SIM

Anthracene and Benzo[a]pyrene failed the recovery criteria low for LCS 580-198441/2-A. Anthracene and Benzo[a]pyrene failed the recovery criteria low for LCSD 580-198441/3-A. These analytes were outside the Marginal Exceedance Limits and were indicative of a systematic problem; therefore, re-extraction and/or re-analysis was performed. However, since the re-analysis yielded no improvement, the inhold data is qualified and reported. IN addition, Anthracene and Benzo[a]pyrene exceeded the RPD limit.
Anthracene and Benzo[a]pyrene failed the recovery criteria low for the MS/MSD of sample 15NCMOCGW01 (580-52566-1) in batch580-199581.
Anthracene and Benzo[a]pyrene failed the recovery criteria low for the MS/MSD of sample 15NC09SW001 (580-52566-18) in batch580-199581.
Acenaphthylene, Anthracene and Benzo[a]pyrene failed the recovery criteria low for LCS 580-198677/2-A. Anthracene and Benzo[a]pyrene failed the recovery criteria low for LCSD 580-198677/3-A. Acenaphthylene, Anthracene and Benzo[a]pyrene exceeded the RPD limit. The data have been qualified and reported.
The following samples were analyzed outside of holding time due to being received on the day they expired: 15NC09SW001(580-52566-18), 15NC09SW002 (580-52566-19), 15NC09SW003 (580-52566-20), 15NC09SW004 (580-52566-21).

PCBs by 8082A

Surrogate Tetrachloro-m-xylene recovery was outside lower control limits for the MB 580-198500/1-A. , LCS 580-198500/2-A, and some samples. The samples were re-extracted outside of holding time and both sets of data have been reported. Affected samples: 15NCMOCGW01 (580-52566-1), 15NCMOCGW01 (580-52566-1[MS]), 15NCMOCGW01 (580-52566-1[MSD]), 15NCMOCGW02 (580-52566-2), 15NCMOCGW03 (580-52566-3), 15NCMOCGW04 (580-52566-4), 15NCMOCGW05 (580-52566-5), 15NCMOCGW06 (580-52566-6), 15NCMOCGW07 (580-52566-7), 15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW10 (580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12), 15NCMOCGW13 (580-52566-13), 15NCMOCGW14 (580-52566-14), 15NCMOCGW15 (580-52566-15), 15NCMOCGW16 (580-52566-16), 15NCMOCGW17 (580-52566-17), (LCS 580-198500/2-A), (MB 580-198500/1-A), (580-52566-B-12-B MS) and (580-52566-B-12-C MSD) PCB-1016 failed the recovery criteria low for the MS of sample 15NCMOCGW01MS (580-52566-1) in batch 580-198786. PCB-1016 exceeded the RPD limit for the MSD of sample 15NCMOCGW01MSD (580-52566-1) in batch 580-198786. The associated lab control sample met the acceptance criteria.
The continuing calibration verification (CCV) associated with batch 580-198786 recovered above the upper control limit for multiple analytes. The samples associated with this CCV were non-detects for the affected analytes and surrogate recoveries weren't adversely affected; therefore, the data have been reported. The following samples are impacted: 15NCMOCGW06 (580-52566-6), 15NCMOCGW07 (580-52566-7), 15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW10 (580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12), 15NCMOCGW13 (580-52566-13), 15NCMOCGW15 (580-52566-15), 15NCMOCGW16 (580-52566-16), (CCB 580-198786/35), (CCB 580-

198786/41), (CCV 580-198786/34), (CCV 580-198786/40), (580-52566-B-12-B MS) and (580-52566-B-12-C MSD).
PCB-1016 failed the recovery criteria high for the MS of sample 15NC09SW001MS (580-52566-18) in batch 580-199221. PCB-1016 and PCB-1260 exceeded the RPD limit for the MSD of sample 15NC09SW001MSD (580-52566-18) in batch 580-199221. The associated lab control sample met the acceptance criteria. These samples were analyzed outside of holding time.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW03 (580-52566-3). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW07 (580-52566-7). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW08 (580-52566-8). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW09 (580-52566-9). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW11 (580-52566-11). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
Tetrachloro-m-xylene failed the surrogate recovery criteria low for 15NCMOCGW12 (580-52566-12). DCB Decachlorobiphenyl failed the surrogate recovery criteria high. This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW13 (580-52566-13). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW14 (580-52566-14) with an exception of a hit for PCB-1254 just above 1/2 the LOQ. The recovery of PCB-1254 is similar in quantity in the original and the out of hold re-extraction batches. The data have been reported with client approval.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW15 (580-52566-15). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW16 (580-52566-16. This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for 15NCMOCGW17 (580-52566-17). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.
The following samples were analyzed outside of holding time due to being received on the day they expired: 15NC09SW001 (580-52566-18), 15NC09SW002 (580-52566-19), 15NC09SW003 (580-52566-20), 15NC09SW004 (580-52566-21).

DRO/RRO by AK102 and AK103

DRO was detected in method blank MB 580-199084/1-A at a level that was above the detection limit but below ½ the limit of quantitation (LOQ). The value should be considered an estimate, and has been flagged.
n-Triacontane-d62 and o-Terphenyl failed the surrogate recovery criteria low for 15NCMOCGW13 (580-52566-13).
Evidence of matrix interference due to non-target analytes is present, as noted in the preparation batch; therefore, re-extraction and/or re-analysis was not performed.
In analytical batch 580-199155, the following samples from preparation batch 580-199084 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NCMOCGW07 (580-52566-7), 15NCMOCGW10 (580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12) and 15NCMOCGW15 (580-52566-15).
In analytical batch 580-199155, the following samples from preparation batch 580-199084 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was earlier than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW14 (580-52566-14) and 15NCMOCGW17 (580-52566-17).
In analytical batch 580-198993, the following sample from preparation batch 580-199008 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was earlier than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NCMOCGW05 (580-52566-5).

In analytical batch 580-198997, the following samples from preparation batch 580-198927 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes: 15NC09SW001 (580-52566-18), 15NC09SW002 (580-52566-19), 15NC09SW003 (580-52566-20) and 15NC09SW004 (580-52566-21).

Glycols by 8015C DAI

1,4-Butanediol failed the surrogate recovery criteria low for 15NCMOCGW12 (580-52566-12). This sample was preserved with HCL (NCM 239572) which may have interfered with surrogate recovery.
Sample 15NCMOCGW12 (580-52566-12)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.
The following sample was diluted due to preservative: 15NCMOCGW12 (580-52566-12). The sample was improperly preserved with HCL, samples for 8015 DAI glycol analysis should be unpreserved. The sample was diluted to protect the instrument.
The continuing calibration verification (CCV) associated with batch 280-292294 recovered outside acceptance criteria, low biased, for triethylene glycol on the confirmation column. Since the primary column is within control limits and the associated sample was non-detect for this analyte, the data has been reported from the primary column.

Dissolved Metals

Cadmium was detected in method blank MB 580-199196/9-B at a level that was above the detection limit but below ½ the limit of quantitation (LOQ). The value should be considered an estimate, and has been flagged.
Barium failed the recovery criteria high for the MS sample 15NCMOCGW01MS (580-52566-1) in batch 580-199268. The associated lab control sample met the acceptance criteria.

Total Metals

Silver failed the recovery criteria low for the MS of sample 15NC09SW001MS (580-52566-18) in batch 580-199268. The associated lab control sample met the acceptance criteria.

Mercury

Mercury failed the recovery criteria low for the MSD of sample 15NC09SW001MSD (580-52566-18) in batch 580-198638. The associated lab control sample met the acceptance criteria.

ATTACHMENT 3

USACE-Approved Variance Requests and Correspondence

From:	Utley, Michael D POA
To:	Hannah, Marty; Benjamin, Sean P POA
Subject:	RE: NE Cape Variance Requests (UNCLASSIFIED)
Date:	Thursday, September 24, 2015 3:53:25 PM

Classification: UNCLASSIFIED
Caveats: NONE

Variance granted.

-----Original Message-----
From: Hannah, Marty [mailto:mhannah@bristol-companies.com]
Sent: Thursday, September 24, 2015 2:11 PM
To: Utley, Michael D POA; Benjamin, Sean P POA
Subject: [EXTERNAL] FW: NE Cape Variance Requests

OK, I looked at the actual sample result for the full VOC sample and its ND. Sample 52566-12 (15NCMOCGW12). It's a groundwater sample from Site 10, the only NE Cape GW sample to get full VOCs, all the rest are just BTEX and are fine. There are only xylene and ethybenzene detections in the project samples but QC is ND including the trip blank so I'm just ignoring the detections below the RL. It's a fuel site.

Can we get a variance?

Marty Hannah
Project Chemist/Environmental Scientist
Bristol Environmental Remediation Services, LLC Phone : (907) 743-9369

From: Greer, Robert A. [mailto:Robert.Greer@testamericainc.com]
Sent: Thursday, September 24, 2015 12:12 PM
To: Hannah, Marty; Ellingboe, Tyler
Subject: RE: NE Cape Variance Requests

ROBERT GREER

Project Manager II

TestAmerica

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From: Hannah, Marty [mailto:mhannah@bristol-companies.com]
Sent: Thursday, September 24, 2015 9:33 AM
To: Greer, Robert A.; Ellingboe, Tyler
Subject: RE: NE Cape Variance Requests

Rob can I get preliminary results? Utley will not grant a variance without them. CCVs, MB, LCS/LCSD and sample results please.

Marty Hannah
Project Chemist/Environmental Scientist
Bristol Environmental Remediation Services, LLC Phone : (907) 743-9369

From: Greer, Robert A. [mailto:Robert.Greer@testamericainc.com]
Sent: Wednesday, September 23, 2015 2:18 PM
To: Ellingboe, Tyler; Hannah, Marty
Subject: NE Cape Variance Requests

Hi Tyler,

I have some variance requests for SDG 580-52566 listed below. Can we narrate and report?

* The continuing calibration verification (CCV) recovered above the upper control limit for Vinyl chloride (37.2), Trichlorofluoromethane (20.7), Chloromethane (26.8%) and Dichlorodifluoromethane (85.8%). These analytes were all detected in the CCVL, and the sample associated with this CCV were detected below half of the RL for the affected analytes.
* The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) recovered outside control limits for the following analytes: multi analyte. These analytes were biased high in the LCS and were not detected in the associated samples.

LCS

Analyte	%	%R Lmt
1,1,2,2-Tetrachloroethane	125	71-121
1,2,3-Trichloropropane	129	73-122
1,2-Dibromo-3-Chloropropane	142	62-128
1,2-Dichlorobenzene	122	80-119

1,3-Dichlorobenzene	121	80-119
Naphthalene	130	61-128
tert-Butylbenzene	129	78-124

LCSD

Analyte	%R	Lmt
1,3,5-Trimethylbenzene	125	75-124
Benzene	121	79-120
Chlorobromomethane	125	78-123
Chloroform	127	79-124
Methylene Chloride	126	74-124
tert-Butylbenzene	130	78-124
trans-1,2-Dichloroethene	125	75-124

* The continuing calibration verification (CCV) recovered above the upper control limit for Vinyl chloride and Dichlorodifluoromethane . The samples associated with this CCV were non-detects for the affected analytes

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Classification: UNCLASSIFIED
Caveats: NONE

Ellingboe, Tyler

From: Hannah, Marty
Sent: Monday, March 28, 2016 2:46 PM
To: Benjamin, Sean P POA
Cc: Ellingboe, Tyler
Subject: RE: Low level hits and MB contamination on NE Cape Waters 2015

Sounds good Sean. That should make a lot of the comments go away too.

Marty Hannah
Project Chemist/Environmental Scientist
Bristol Environmental Remediation Services, LLC Phone : (907) 743-9369

-----Original Message-----
From: Benjamin, Sean P POA [mailto:Sean.P.Benjamin@usace.army.mil]
Sent: Monday, March 28, 2016 2:44 PM
To: Hannah, Marty
Cc: Ellingboe, Tyler
Subject: RE: Low level hits and MB contamination on NE Cape Waters 2015

Let's go with that. Report to the LOQ, and then we'll just state that we think it is lab contamination and qualify the Site 9 water accordingly.

Sean Benjamin, P.E.
907-753-5514

-----Original Message-----
From: Hannah, Marty [mailto:mhannah@bristol-companies.com]
Sent: Monday, March 28, 2016 9:19 AM
To: Benjamin, Sean P POA <Sean.P.Benjamin@usace.army.mil>
Cc: Ellingboe, Tyler <tellingboe@bristol-companies.com>
Subject: [EXTERNAL] RE: Low level hits and MB contamination on NE Cape Waters 2015

No lab interpretation on the low hits other than earlier or later than typical diesel. The following is from the DRO portion of the case narrative:

In analytical batch 580-199155, the following samples from preparation batch 580-199084 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes:
15NCMOCGW07 (580-52566-7), 15NCMOCGW10 (580-52566-10), 15NCMOCGW11 (580-52566-11), 15NCMOCGW12 (580-52566-12) and 15NCMOCGW15 (580-52566-15).
In analytical batch 580-199155, the following samples from preparation batch 580-199084 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was earlier than the typical diesel fuel pattern used by the laboratory for quantitative purposes:
15NCMOCGW08 (580-52566-8), 15NCMOCGW09 (580-52566-9), 15NCMOCGW14 (580-52566-14) and 15NCMOCGW17 (580-52566-17).
In analytical batch 580-198993, the following sample from preparation batch 580-199008 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was earlier than the typical diesel fuel pattern used by the laboratory for quantitative purposes:
15NCMOCGW05 (580-52566-5).
In analytical batch 580-198997, the following samples from preparation batch 580-198927 contained a hydrocarbon pattern in the diesel range; however, the elution pattern was later than the typical diesel fuel pattern used by the laboratory for quantitative purposes:
15NC09SW001 (580-52566-18), 15NC09SW002 (580-52566-19), 15NC09SW003 (580-52566-20) and 15NC09SW004 (580-52566-21).

I had attached chromatograms in the email sent on 3/17 for your review. Most of the low hits were distinct peaks and no hump or weathering evident. The peaks matched up with the same retention times as the one DRO MB with a hit above the DL. I would be fine with reporting the samples with distinct peaks ND at the LOQ with QN flags. I would modify the ADEC checklist and CDQR to note the NDs and the justification. Sound good to you? I've reattached the sheet with the chrom interpretations and the sample results that are yellow highlighted would have their values changed to ND at the LOQ. The only problem is the Site 9 surface water results and the sample from well MW88-1 were greater than the LOQ. My best guess is the contamination came from the lab based on hits in the Site 9 surface waters, which were collected using unpreserved containers without a pump, which rules out the pump as the source.

Marty Hannah
Project Chemist/Environmental Scientist
Bristol Environmental Remediation Services, LLC Phone : (907) 743-9369 -----Original Message-----
From: Benjamin, Sean P POA [mailto:Sean.P.Benjamin@usace.army.mil]
Sent: Friday, March 25, 2016 11:51 AM
To: Hannah, Marty
Cc: Craner, Jeremy POA; Shewman, Aaron F POA; Palmer, Valerie Y POA; Ellingboe, Tyler; Kleppin, Lyndsey
Subject: RE: Low level hits and MB contamination on NE Cape Waters 2015

Hi Marty,

Sorry it took so long to get to. Because the detections were in three batches, it would be hard to B flag that data. I am thinking that we should either/or report to the LOQ and flag the data QN. The checklists and the CDQR will also have to be modified to reflect this, and the "possible cross contamination" taken out of the executive summary and report.

Does the lab have an interpretation of the peaks as to what they might be?

Sean Benjamin, P.E.
907-753-5514

-----Original Message-----
From: Hannah, Marty [mailto:mhannah@bristol-companies.com]
Sent: Thursday, March 17, 2016 11:59 AM
To: Benjamin, Sean P POA <Sean.P.Benjamin@usace.army.mil>
Cc: Craner, Jeremy POA <Jeremy.D.Craner@usace.army.mil>; Shewman, Aaron F POA <Aaron.F.Shewman@usace.army.mil>; Palmer, Valerie Y POA <Valerie.Y.Palmer@usace.army.mil>; Ellingboe, Tyler <tellingboe@bristol-companies.com>; Kleppin, Lyndsey <lkleppin@bristol-companies.com>
Subject: [EXTERNAL] Low level hits and MB contamination on NE Cape Waters 2015

I did some further examinations of the DRO chromatograms from NE Cape 2015 GW sampling and noticed that one of the 3 DRO method blanks had a DRO detection at 0.0334 mg/L with 6 distinct peaks in the chromatogram and used the attached PDFs to document chromatographic interpretations of DRO analysis. I found that ten of the samples had the same type of contamination (6 or 7 peaks) as the one method blank. The other 2 DRO method blanks were non-detect. Basically the 10 project samples and one MB had 4 distinct peaks before the surrogate and 2 after the surrogate, none of the affected samples looked anything like diesel but the concentrations were fairly low (less than the LOQ). That said, I believe the actual contamination/artifact was at the instrument and resulted in the detections in the one DRO method blank and also in the 10 project samples. The attached Word document contains my interpretations of the chroms and the PDFs are sample and QC chromatograms.

Also, because 2 separate pumps were used for groundwater sampling and no pumps were used for the surface water sample collection at Site 9 the line of evidence shows that the contamination came from the lab and not from the pumps.

My real question is how do we want to treat the affected DRO results? The 2 main options I see are B flag the 10 affected results even though they were extracted in 3 separate batches and don't necessarily link directly to each MB or report most results ND at the LOQ though the 4 Site 9 surface water results are greater than the LOQ. Just let me know how you would like to proceed. It will help us quite a bit in our response to comments.

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Chromatographic interpretations of NE Cape Water samples for DRO

The DRO concentrations reported below are from the initial results reported in the draft NE Cape Groundwater and Site 9 Surface water results. The chromatographic interpretations were performed by the Bristol chemist using the attached PDFs of the chromatograms from the lab report. Based on the chromatogram interpretations the reviewer believes the yellow highlighted results are due to lab contamination/artifact introduced either during extraction or analysis. One of three DRO/RRO method blanks had DRO detected at 0.0334 mg/L, the other 2 were ND. The chromatographic pattern in MB 199084 which had the detection was very similar to the chromatographic patterns in samples GW01, GW02, GW03, GW04, GW06, GW10, 09SW001, 09SW002, 09SW003 and 09SW004. All other DRO results were not believed to be impacted by the DRO contamination/artifact and their results are believed to be from POL in the samples.

The following is a list of method blanks and sample results with chromatographic observations and interpretations.

DRO MB 199008 (prep) –Associated with samples GW01 thru GW05 (upgradient wells). Non-detect

DRO MB 199084 (prep)-Associated with samples GW06 thru GW17 (mid and lower gradient wells) DRO at 0.0334-J mg/L. DRO chromatographic pattern shows 4 modest peaks before the surrogate peak and 2 rounded peaks after the surrogate.

DRO MB 199927 (prep). Associated with samples 09SW001 thru -004 (Site 9 surface waters). Non-detect

GW01-26MW1, upgradient well (DRO 0.078 J B mg/L) Chromatogram has 4 peaks before the surrogate peak and 3 peaks after the surrogate. The elution times and patterns for the peaks are similar to the chromatogram for MB 199084.

GW02-22MW2 upgradient well (0.054 J B mg/L) Chromatogram has 4 peaks before the surrogate peak and 2 peaks after the surrogate. The elution times and patterns for the peaks are near identical to DRO MB 199084.

GW03-20MW1 upgradient well (0.055 J B mg/L) Chromatogram has 4 peaks before the surrogate peak and 2 low humps after the surrogate. The elution times and patterns for the peaks are very similar to DRO MB 199084.

GW04-17MW1-lower side gradient well (0.051 J B mg/L) Chromatogram has 4 peaks before the surrogate peak and 2 low humps after the surrogate. The elution times and patterns for the peaks are very similar to DRO MB 199084.

GW05-14MW01-lower unexcavated area well (MW corner of MOC just outside perimeter road (0.51 mg/L) Chromatogram shows a low boiling fuel pattern before the surrogate peak and 2 peaks after the surrogate. The elution times of the early peaks match up to LCS 199008 with some biodegradation/weathering of the straight alkanes. The analytical result is believed to be reflective of actual POL and not laboratory artifact with the exception of the 2 peaks after the surrogate. It is not believed those 2 peaks contribute significantly to the DRO result.

GW06-14MW07 upgradient well (0.056 J mg/L) Chromatogram has 4 peaks before the surrogate peak and 2 very low humps after the surrogate. The elution times and patterns for the peaks are very similar to DRO MB 199084

GW07-MW88-10 mid-gradient, upland of all excavations (0.43 mg/L). Chromatograms appears to show very weathered fuel with few discernable peaks. The analytical result is believed reflective of POL with some possible contribution from peaks with elution times seen in MB 199084.

GW08-14MW03 lower MOC in excavated areas of B Plume and Site 13 (1.3 mg/L). Chromatogram shows a low boiling fuel pattern before the surrogate peak and 2 peaks after the surrogate. The elution times of the early peaks match up to LCS 199008 with some biodegradation/weathering of the straight alkanes. The analytical result is believed to be reflective of actual POL and not laboratory artifact with the exception of the 2 peaks after the surrogate. It is not believed those 2 peaks contribute significantly to the DRO result.

GW09-14MW02 lower MOC outside of perimeter road in excavated area A2. (**1.6 mg/L**)). Chromatogram shows a low-medium boiling fuel pattern before the surrogate peak and 2 peaks after the surrogate. The elution times of the early peaks match up to LCS 199008 with some biodegradation/weathering of the straight alkanes along with the typical POL “hump”. The analytical result is believed to be reflective of actual POL and not laboratory artifact with the exception of the 2 peaks after the surrogate. It is not believed those 2 peaks contribute significantly to the DRO result.

GW10-MW88-1. mid-gradient in MOC, upland of all excavations (0.1 mg/L). Chromatogram has 4 peaks before the surrogate peak along with a rising baseline. The elution times and patterns for the 4 peaks are very similar to DRO MB 199084. The MB had a flatter baseline. The analytical result is greater than the LOQ.

GW11-MW88-3. Mid-lower gradient in the MOC upland of all excavations (0.38 mg/L.) Chromatogram appears to show very weathered fuel with few discernable peaks. The analytical result is believed reflective of POL with very minor contribution from peaks with elution times seen in MB 199084.

GW12-MW10-1 Downgradient of Site 10, outside of any excavations. (0.39 mg/L). Heavily weathered POL eluting in the late diesel early RRO range with 4 minor peaks before the surrogate and 2 large peaks after the surrogate. The PAH results were non-detect so the source of the 2 large peaks after the surrogate are unknown. The result is believed to be reflective of POL with some contribution from the unknown peaks.

GW13-14MW04 Lower MOC north of perimeter road. (**1.6 mg/**L QL, QN) Low surrogate recovery-38% (QL) and failed duplicate RPD (QN). Chromatogram shows a medium boiling fuel pattern before the surrogate peak and 4 peaks after the surrogate. The elution times of the early peaks match up to LCS

199008 with some biodegradation/weathering of the straight alkanes along with the typical POL "hump". The analytical result is believed to be reflective of actual POL and not laboratory artifact with the exception of possibly the 2 peaks after the surrogate. It is not believed those 2 peaks contribute significantly to the DRO result, which exceeds groundwater cleanup levels

GW16-14MW04 field duplicate (**2.8 mg/L QN**). Flagged QN for failing duplicate RPD. Similar pattern to GW13, only the concentration is higher. It is likely the extraction process affected the GW13 result based on low surrogate recovery in GW13 for both DRO and RRO surrogates.

GW14-14MW05. Lower MOC north of perimeter road. (**12 mg/**L). Chromatogram shows a medium boiling fuel pattern before the surrogate peak and 4 peaks after the surrogate. The elution times of the early peaks match up to LCS 199008 with modest biodegradation/weathering of the straight alkanes along with the typical POL "hump".

GW17-14MW05 field duplicate.(**11 mg/L**.) Near identical to GW14-field duplicate.

GW15-14MW06 center of J1A excavation northeast and downgradient of Site 11 (bulk fuel storage tanks). (**2.3 mg/L**). Chromatogram shows medium boiling fuel pattern with heavy weathering of alkanes and most peaks along with the typical POL "hump". The result is believed to be reflective of weathered POL.

09SW001-Site 9 surface water (0.15 mg/L) Chromatogram has 5 peaks before the surrogate peak and 4 peaks after the surrogate. The elution times and patterns for some of the peaks are similar to the chromatogram for MB 199084.

09SW002-Site 9 surface water (0.1 mg/L). Chromatogram has 3 peaks before the surrogate peak and no peaks after the surrogate. The elution times and patterns for the peaks are similar to the chromatogram for MB 199084.

09SW004-Site 9 surface water. Field duplicate of 09SW002.(0.1 mg/L). Chromatogram has 3 peaks before the surrogate peak and no peaks after the surrogate. The elution times and patterns for the peaks are similar to the chromatogram for MB 199084.

09SW003-Site 9 surface water (0.13 mg/L). Chromatogram has 3 peaks before the surrogate peak and no peaks after the surrogate. The elution times and patterns for the peaks are similar to the chromatogram for MB 199084.

Report Date: 26-Aug-2015 10:04:56 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

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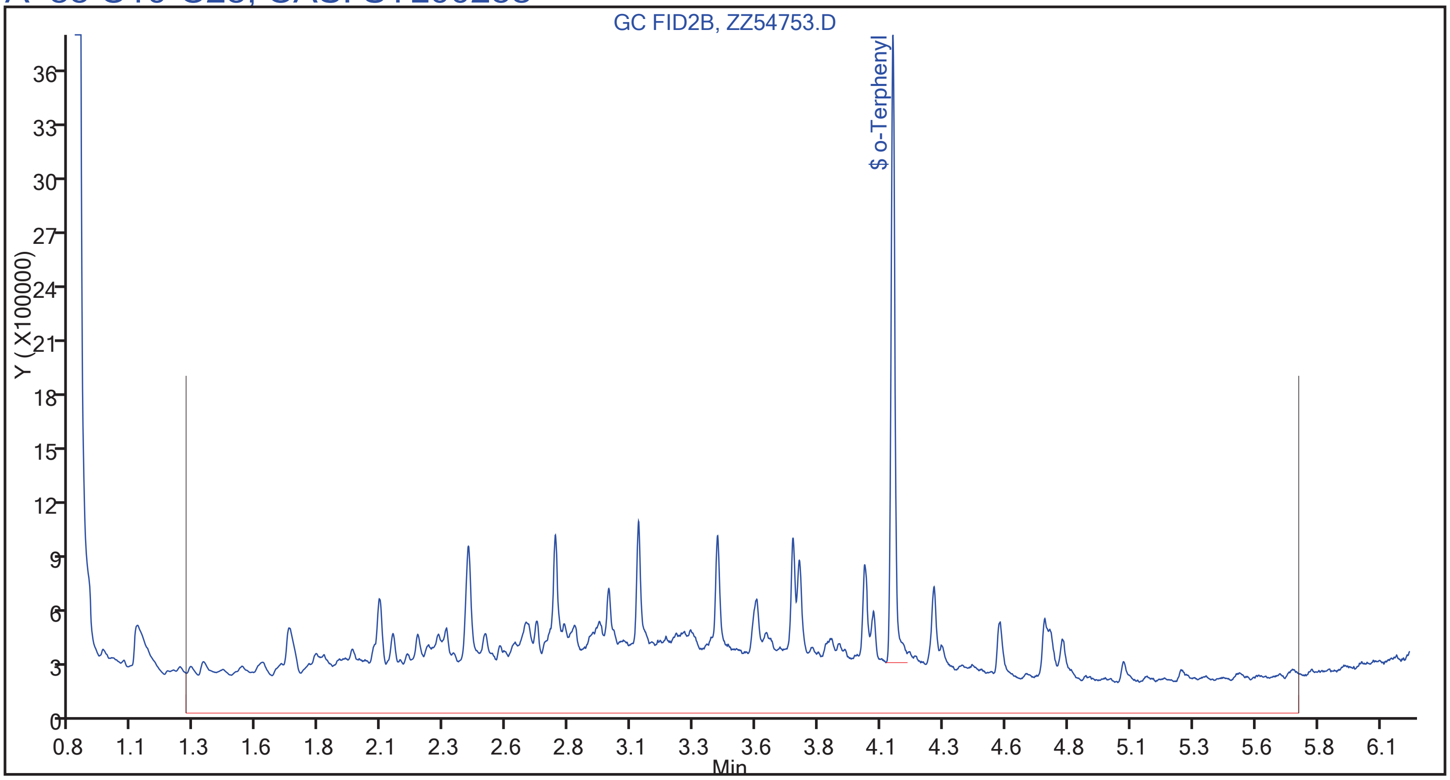

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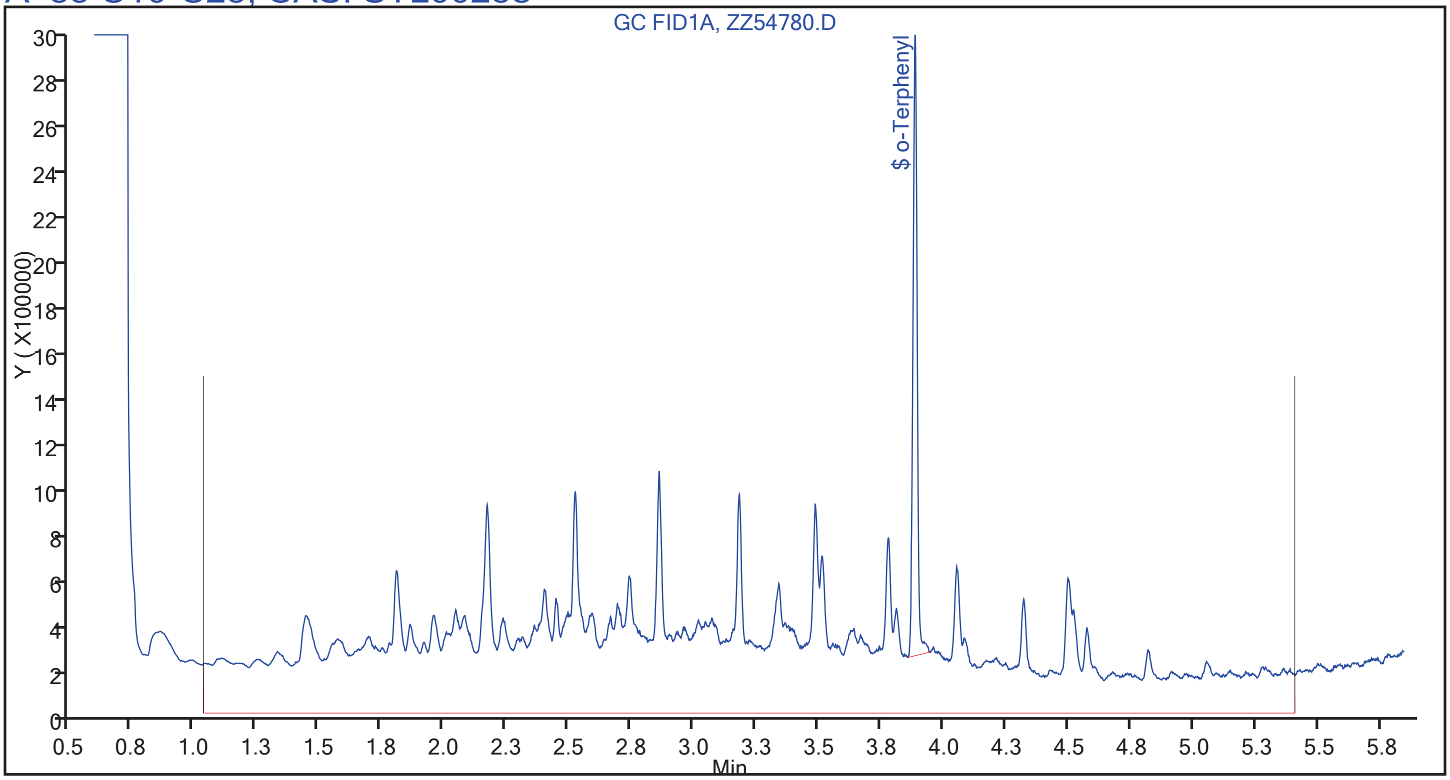
A 35 C10-C25, CAS: STL00258



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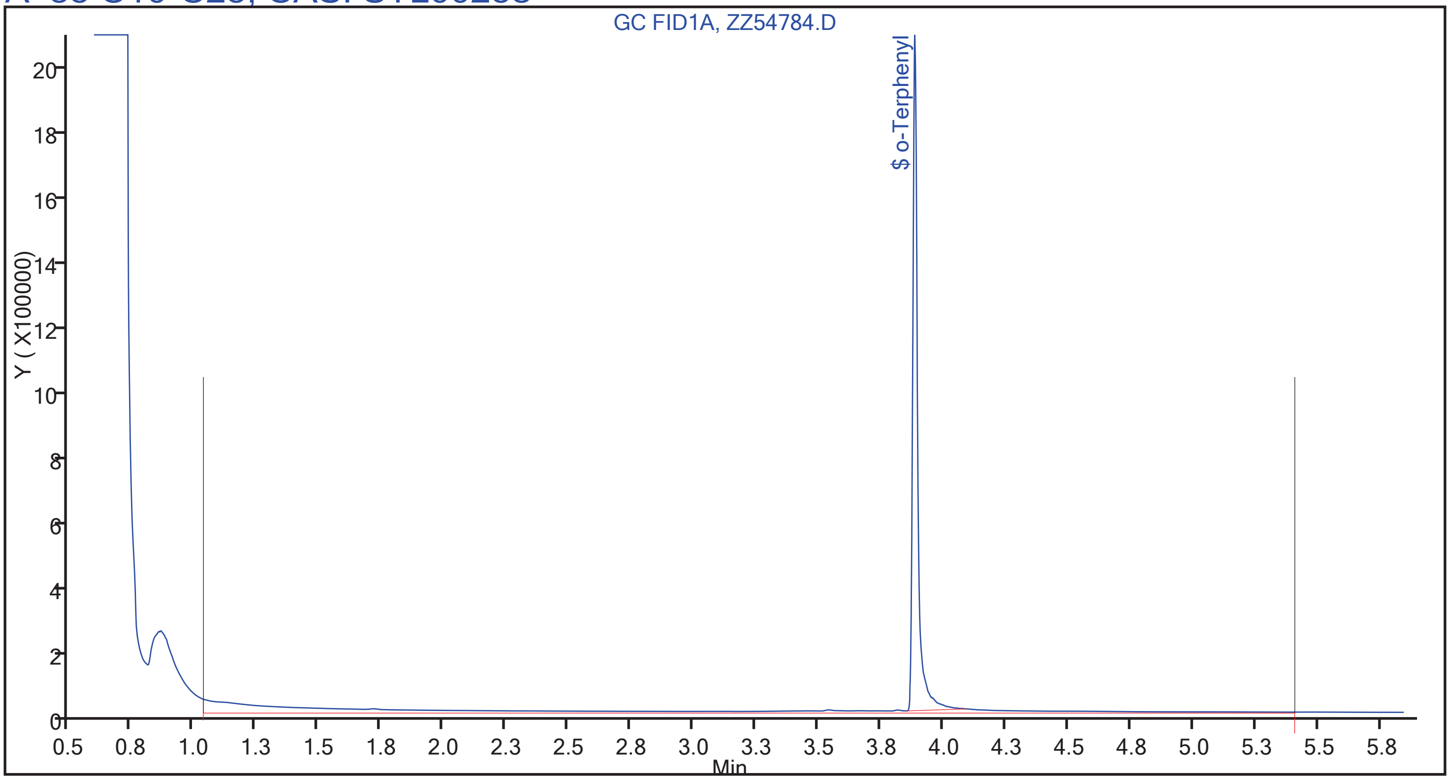
A 35 C10-C25, CAS: STL00258



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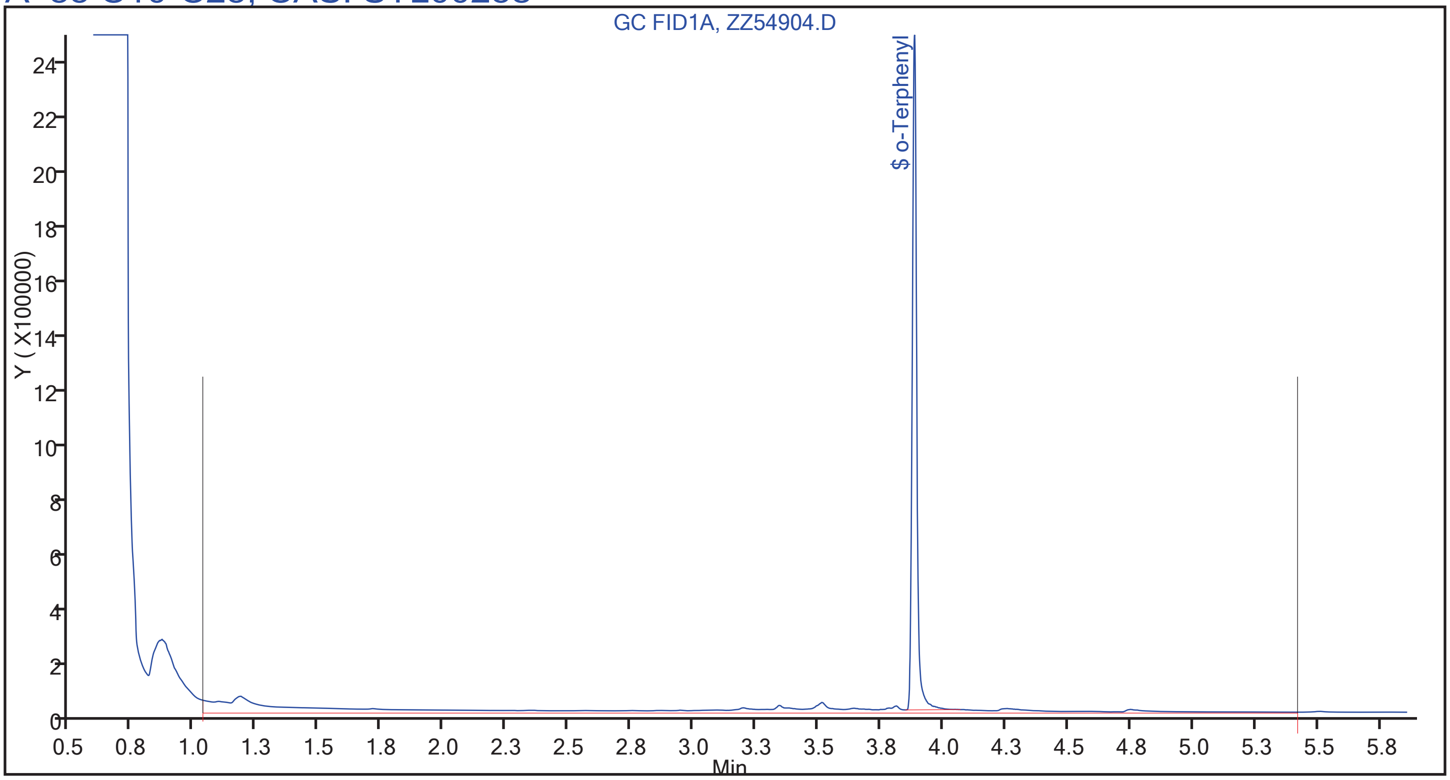
A 35 C10-C25, CAS: STL00258



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TestAmerica Seattle

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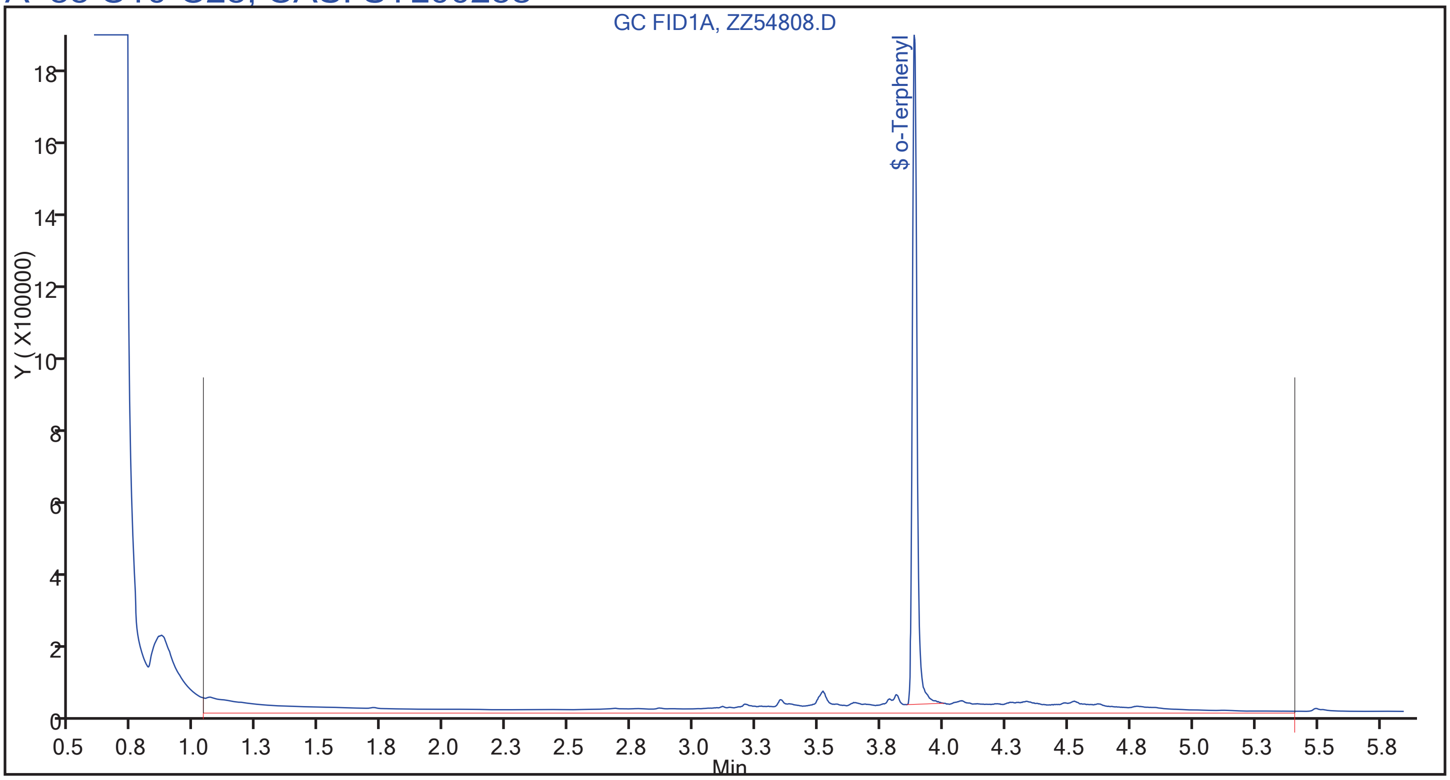
A 35 C10-C25, CAS: STL00258



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TestAmerica Seattle

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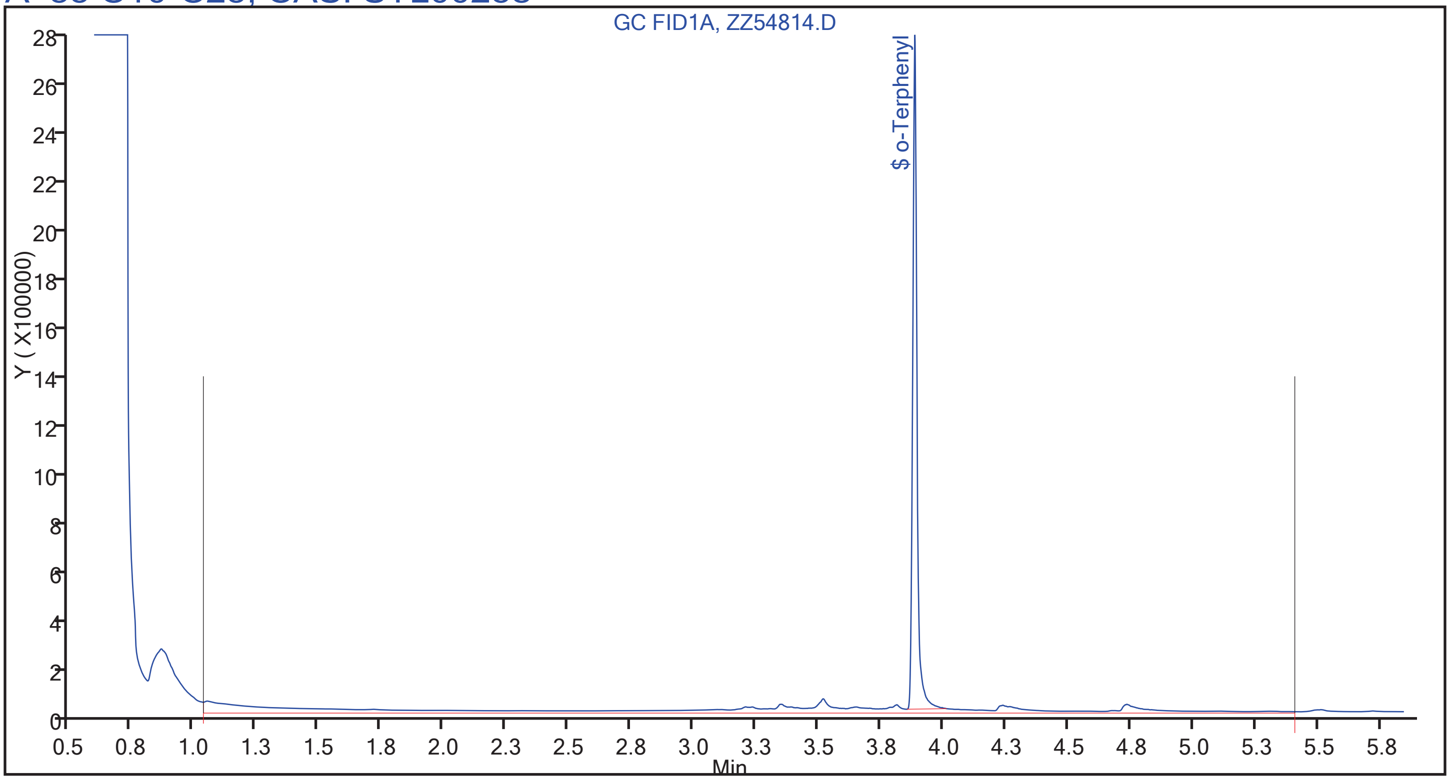
A 35 C10-C25, CAS: STL00258



TestAmerica Seattle

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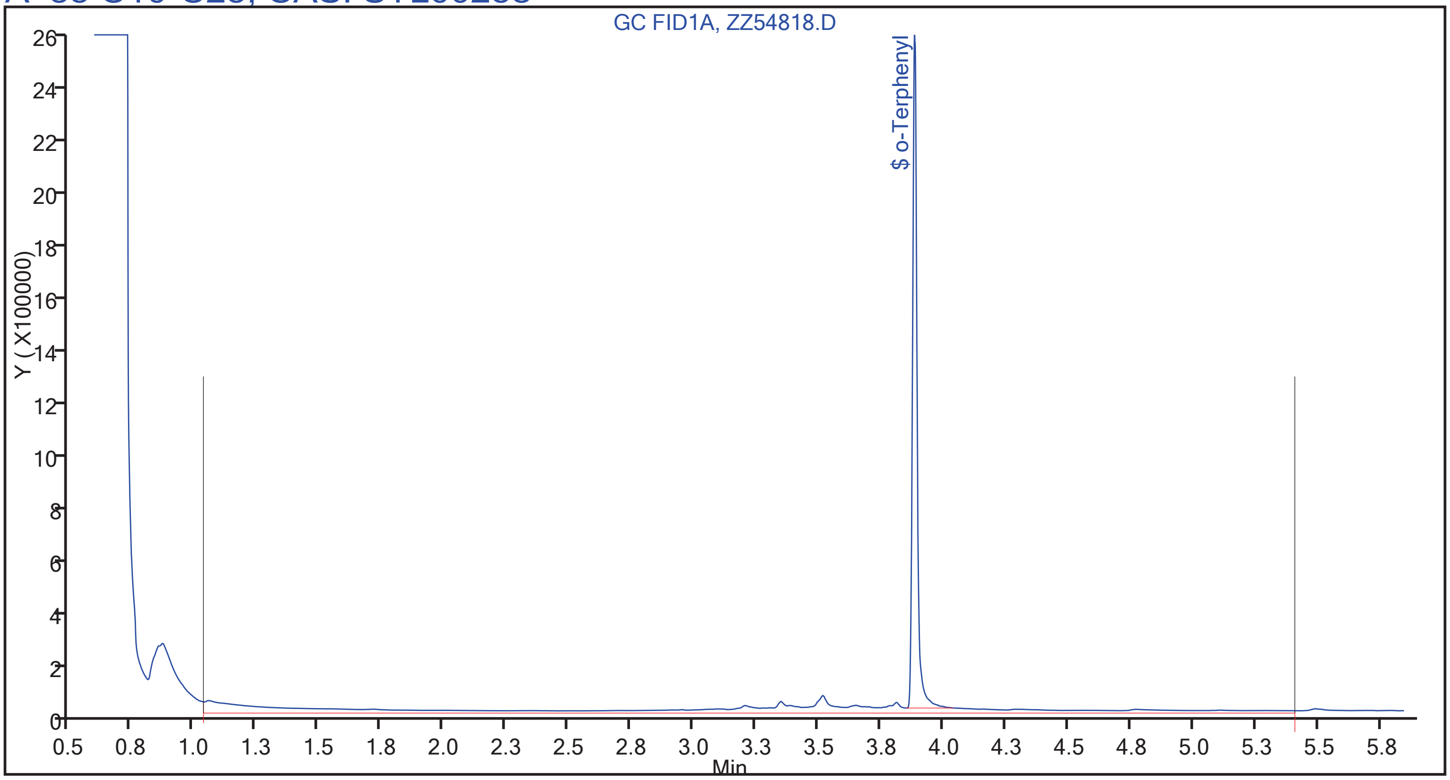
A 35 C10-C25, CAS: STL00258



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TestAmerica Seattle

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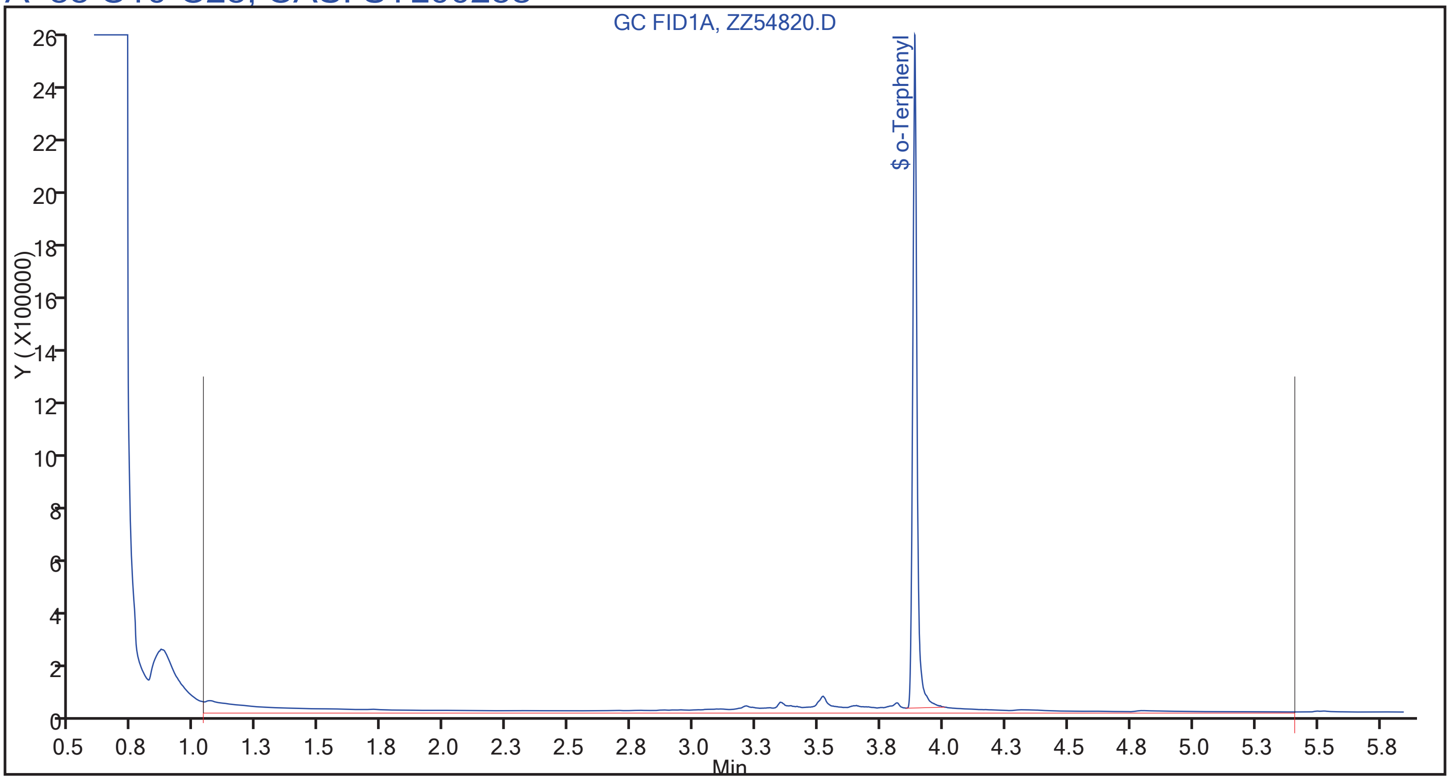
A 35 C10-C25, CAS: STL00258



TestAmerica Seattle

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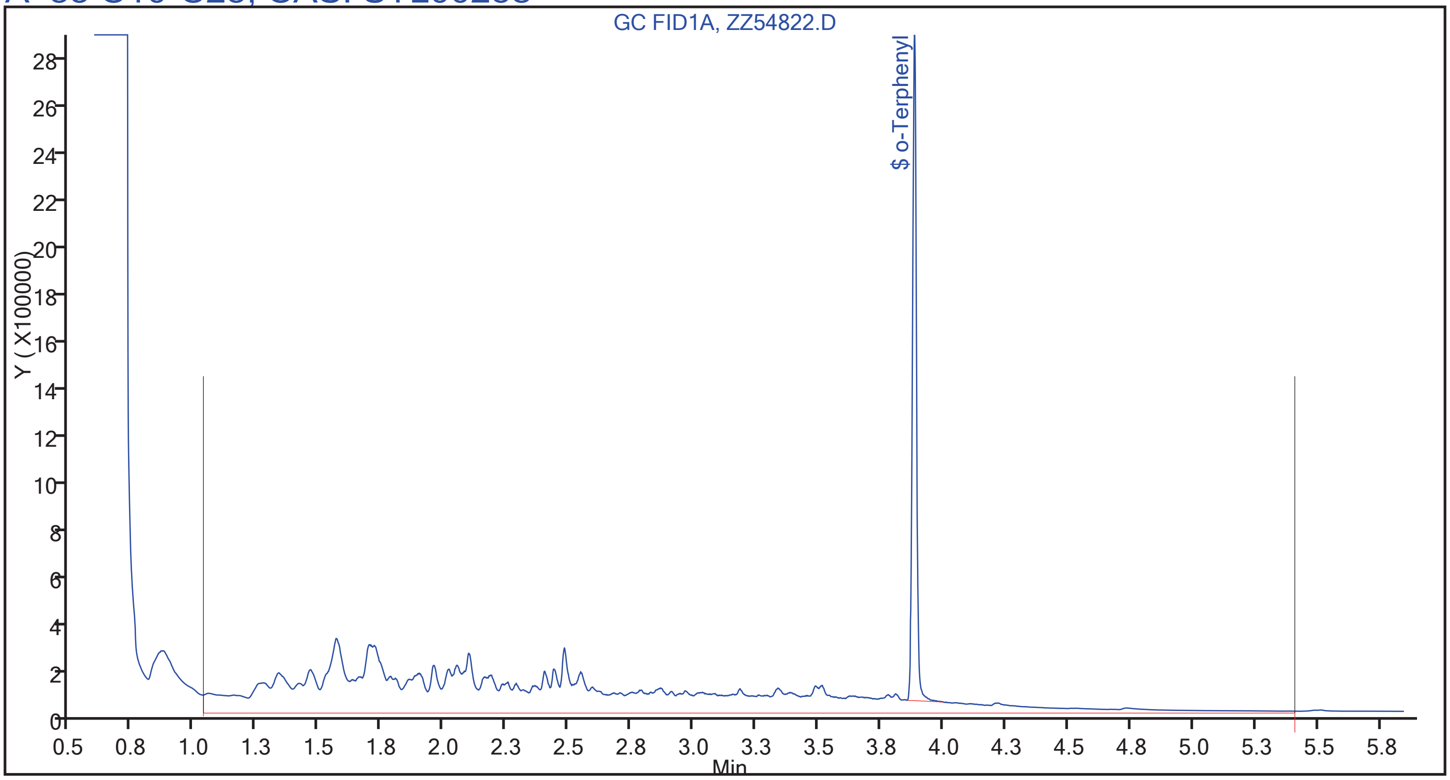
A 35 C10-C25, CAS: STL00258



TestAmerica Seattle

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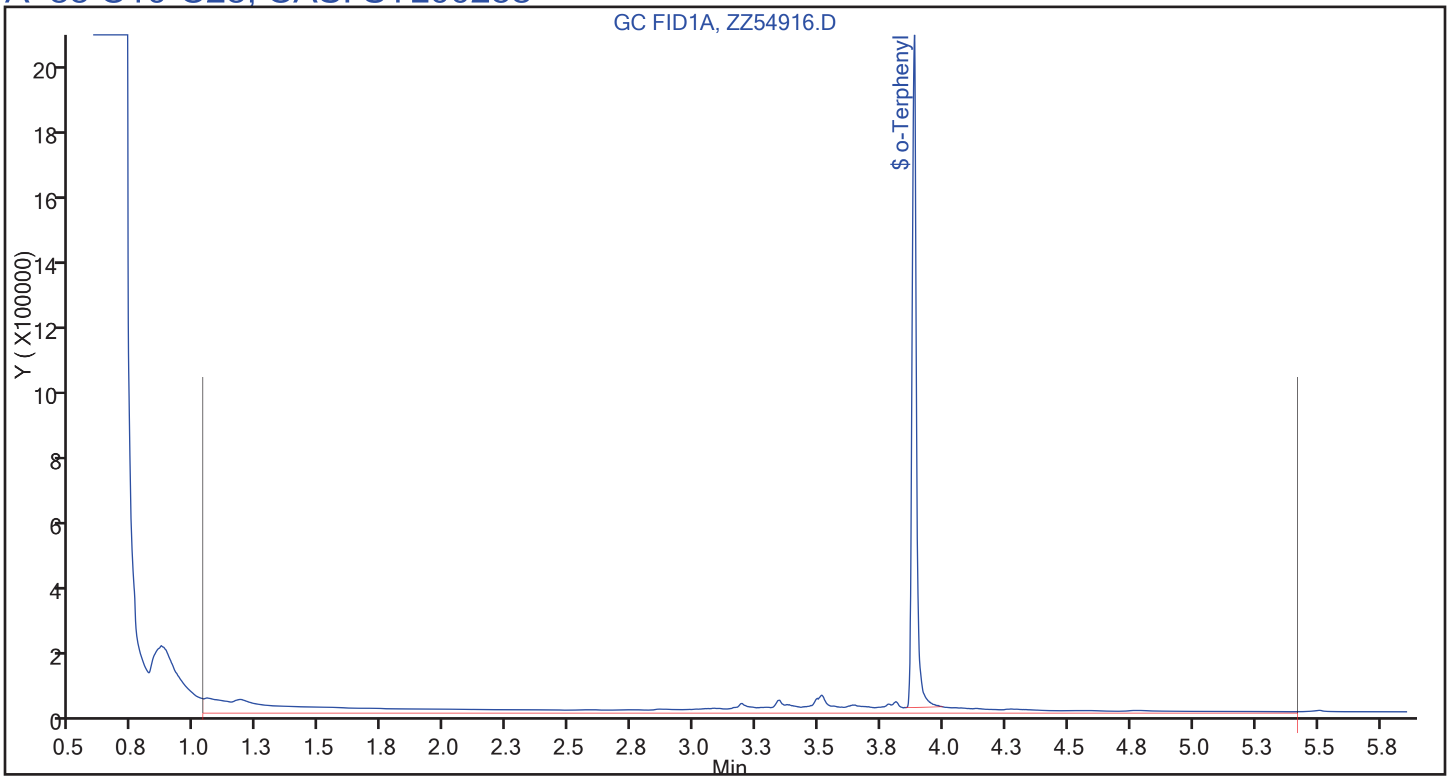
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

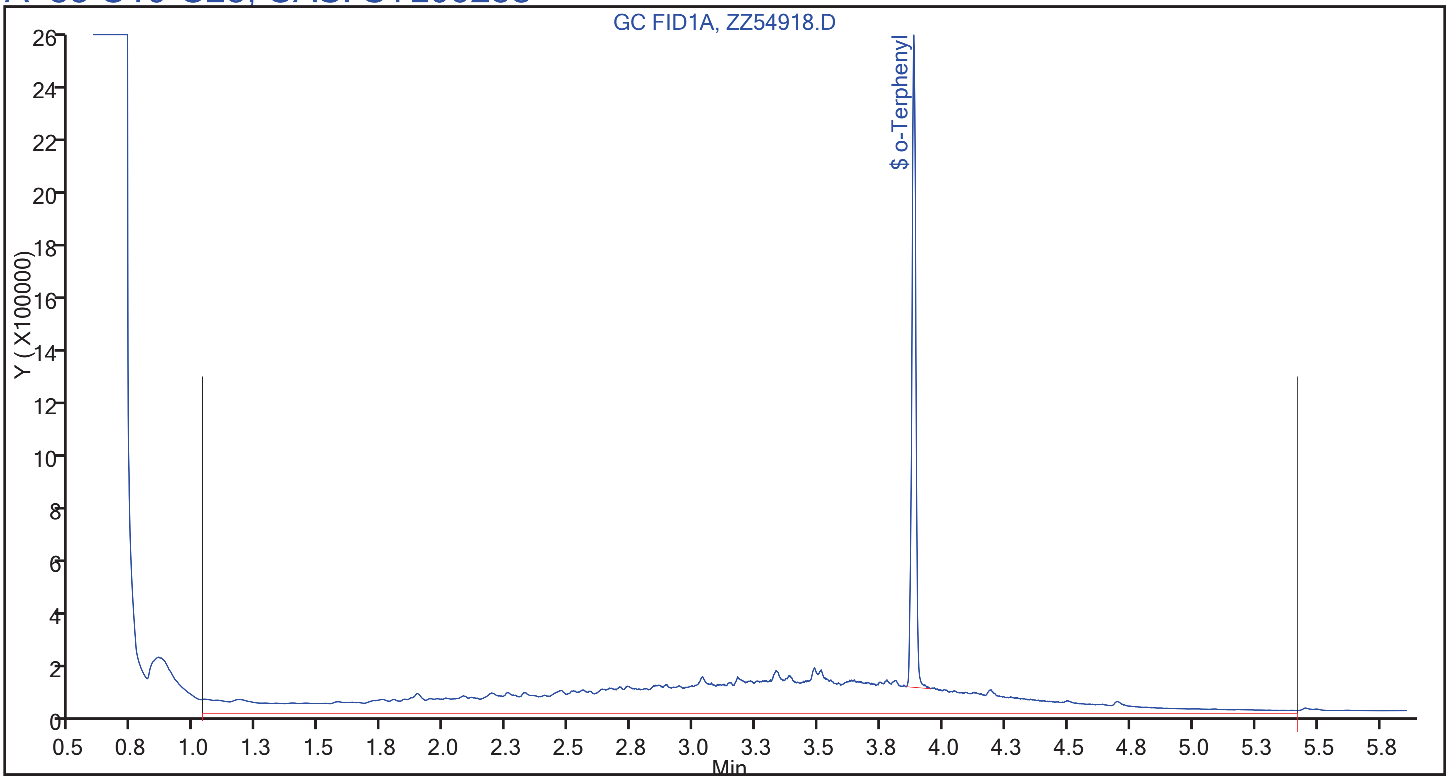


Report Date: 28-Aug-2015 10:41:04 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54918.D				
Injection Date:	27-Aug-2015 18:53:47	Instrument ID:	TAC017		
Lims ID:	580-52566-B-7-A	Lab Sample ID:	580-52566-7		
Client ID:	15NCMOCGW07				
Operator ID:	EKK	ALS Bottle#:	35	Worklist Smp#:	34
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

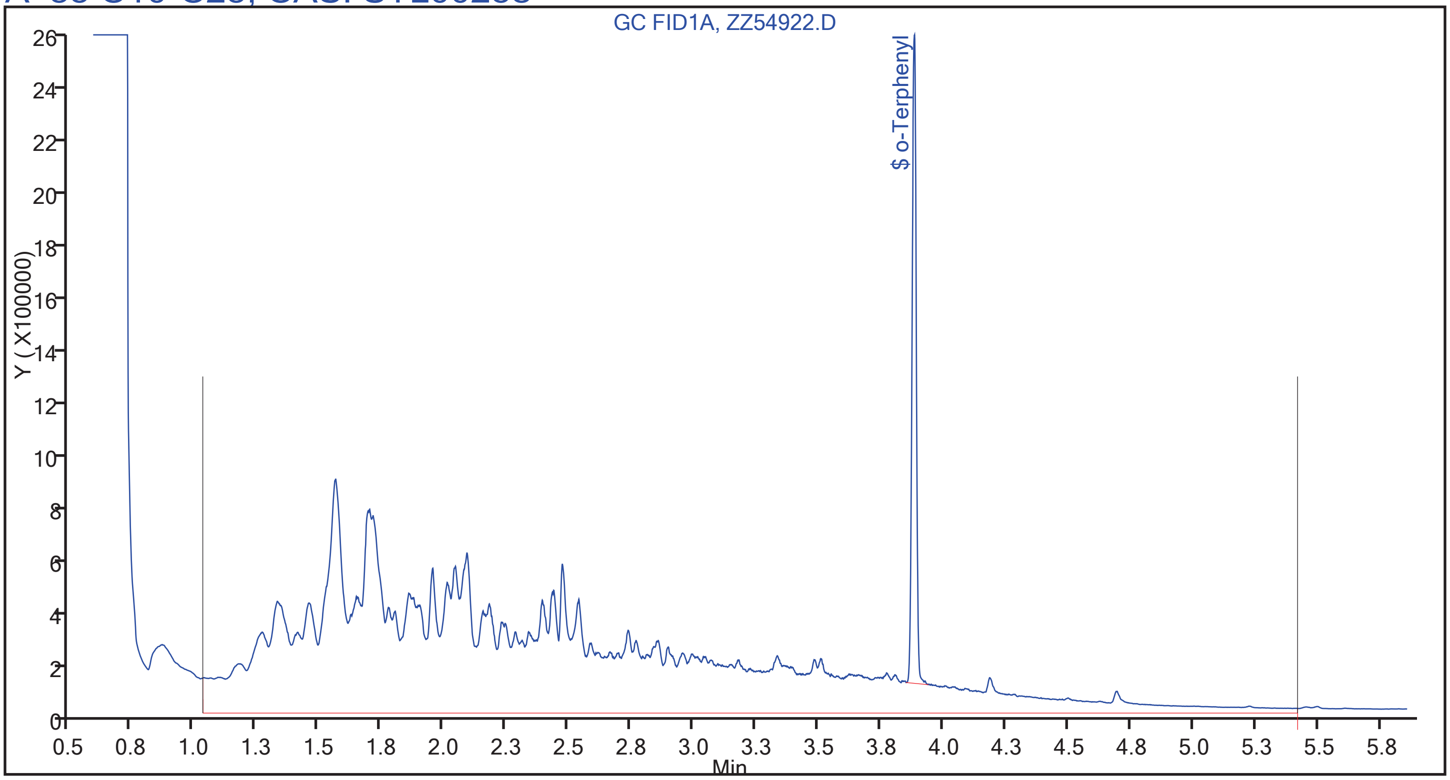


Report Date: 28-Aug-2015 10:11:15 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54922.D				
Injection Date:	27-Aug-2015 19:29:52	Instrument ID:	TAC017		
Lims ID:	580-52566-A-8-A	Lab Sample ID:	580-52566-8		
Client ID:	15NCMOCGW08				
Operator ID:	EKK	ALS Bottle#:	36	Worklist Smp#:	36
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

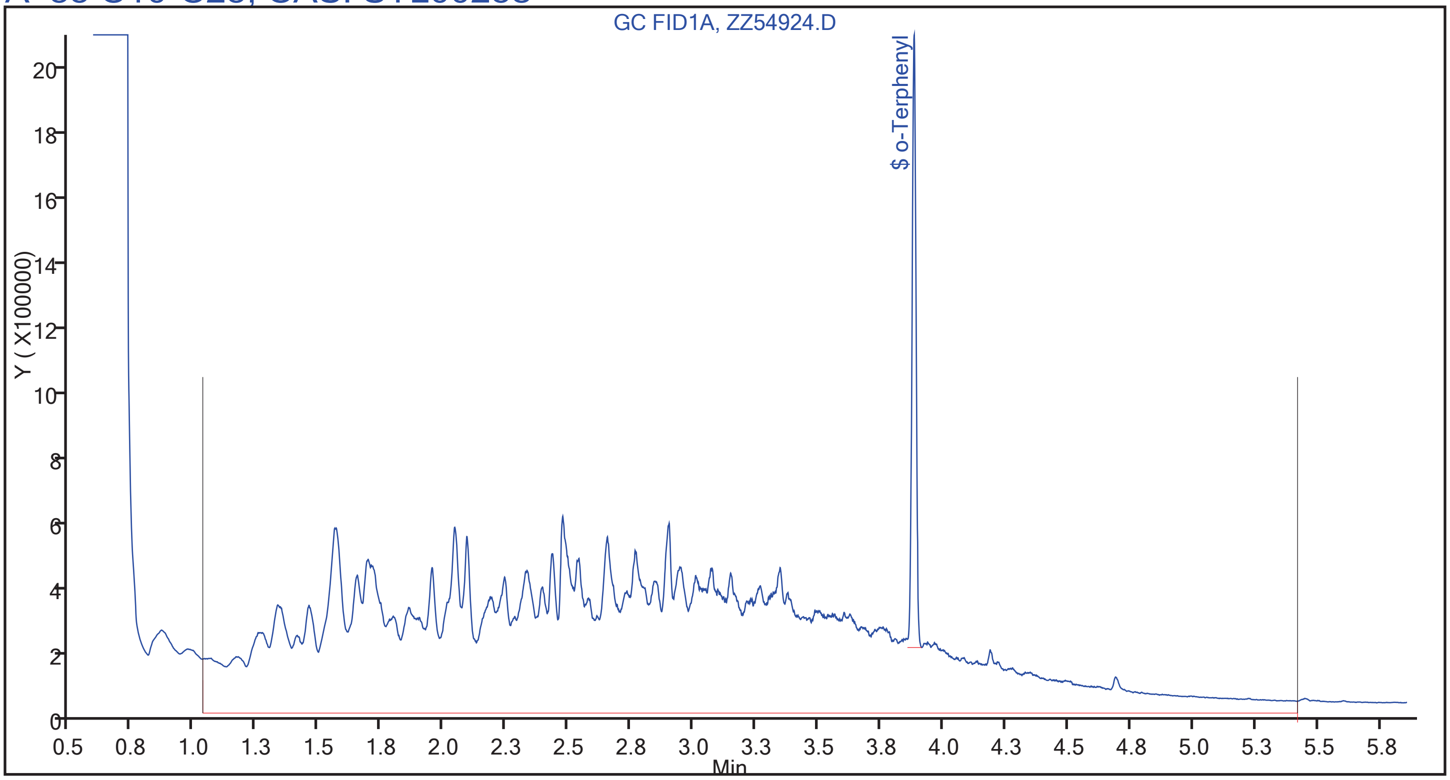


Report Date: 28-Aug-2015 10:11:18 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54924.D				
Injection Date:	27-Aug-2015 19:47:53	Instrument ID:	TAC017		
Lims ID:	580-52566-B-9-A	Lab Sample ID:	580-52566-9		
Client ID:	15NCMOCGW09				
Operator ID:	EKK	ALS Bottle#:	37	Worklist Smp#:	37
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

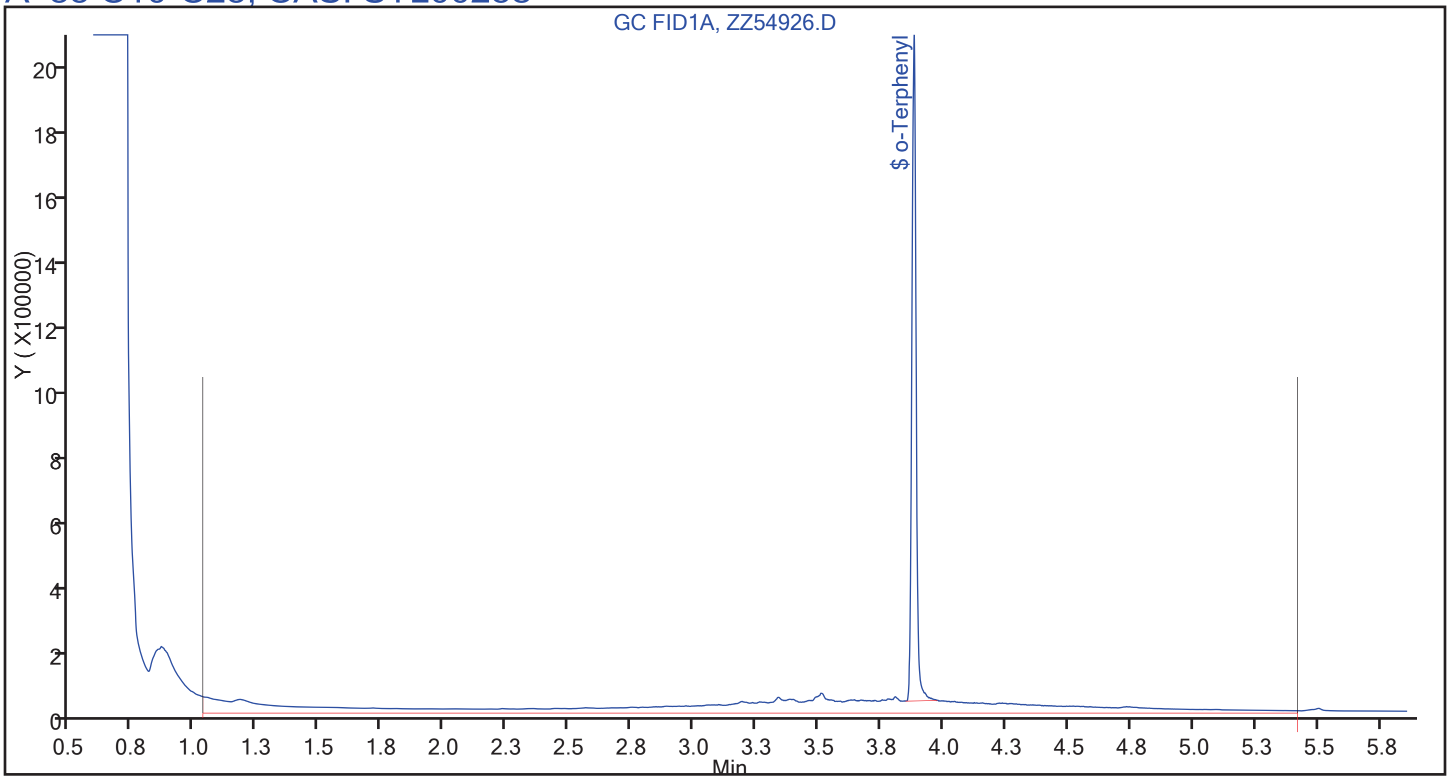


Report Date: 28-Aug-2015 10:11:21 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54926.D				
Injection Date:	27-Aug-2015 20:05:51	Instrument ID:	TAC017		
Lims ID:	580-52566-B-10-A	Lab Sample ID:	580-52566-10		
Client ID:	15NCMOCGW10				
Operator ID:	EKK	ALS Bottle#:	38	Worklist Smp#:	38
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

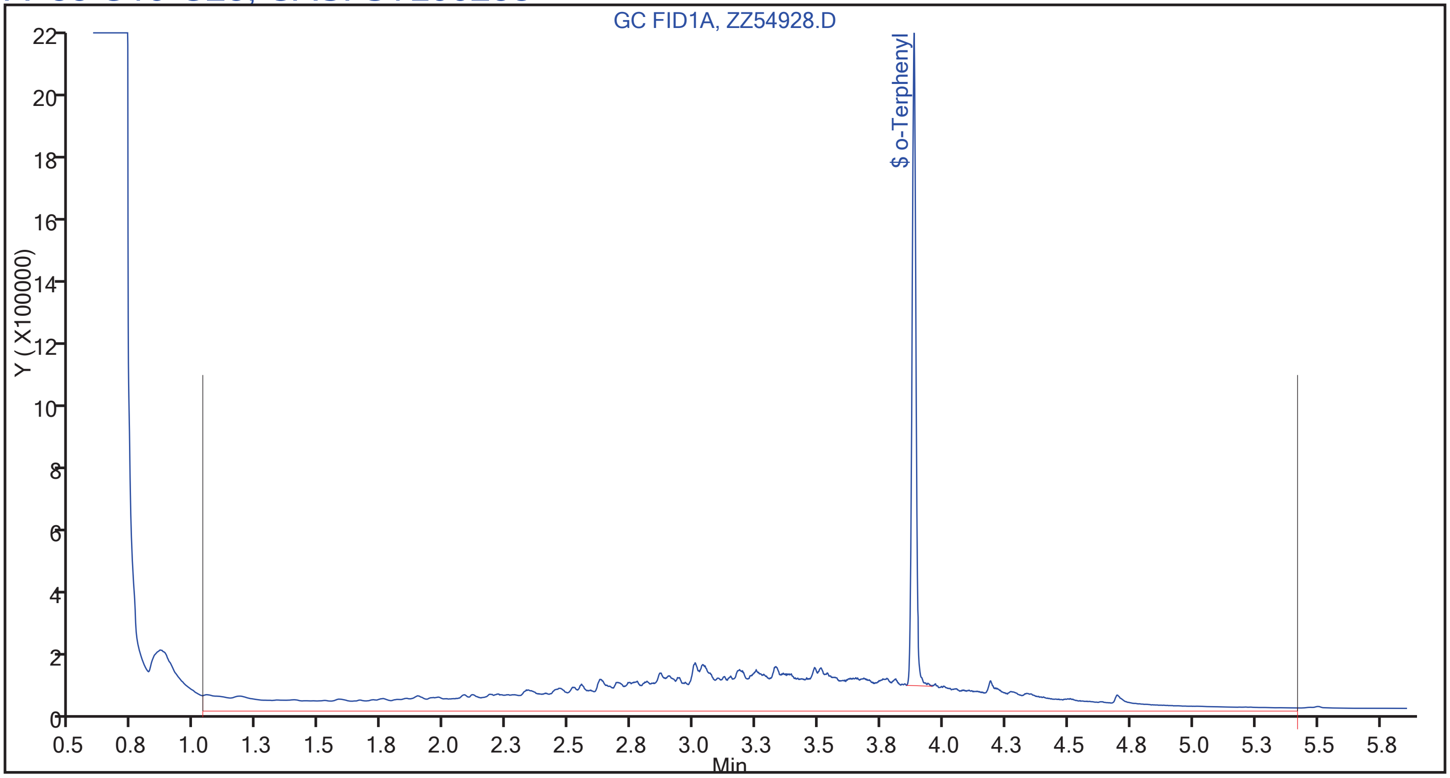


Report Date: 28-Aug-2015 10:11:24 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54928.D				
Injection Date:	27-Aug-2015 20:23:48	Instrument ID:	TAC017		
Lims ID:	580-52566-B-11-A	Lab Sample ID:	580-52566-11		
Client ID:	15NCMOCGW11				
Operator ID:	EKK	ALS Bottle#:	39	Worklist Smp#:	39
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

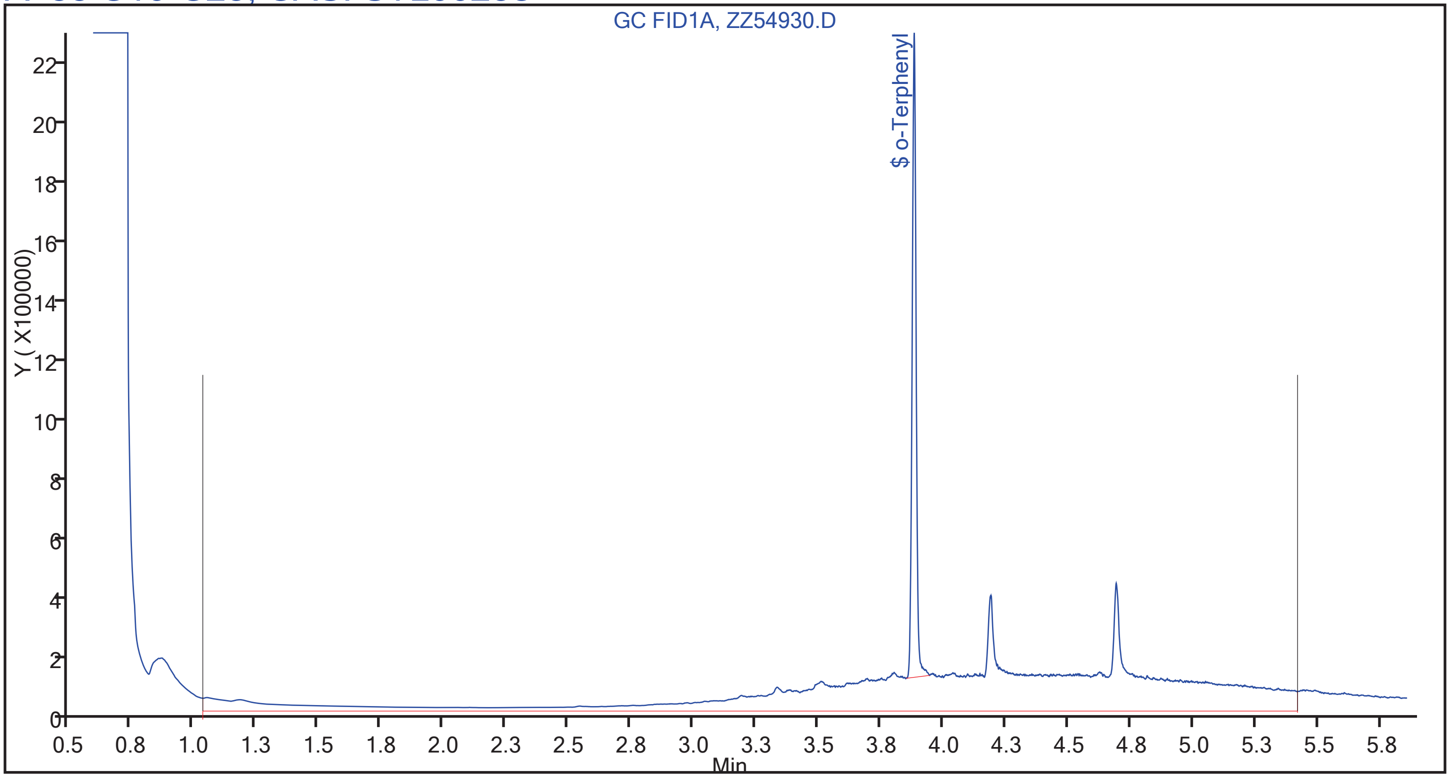


Report Date: 28-Aug-2015 10:11:27 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54930.D				
Injection Date:	27-Aug-2015 20:41:59	Instrument ID:	TAC017		
Lims ID:	580-52566-A-12-A	Lab Sample ID:	580-52566-12		
Client ID:	15NCMOCGW12				
Operator ID:	EKK	ALS Bottle#:	40	Worklist Smp#:	40
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

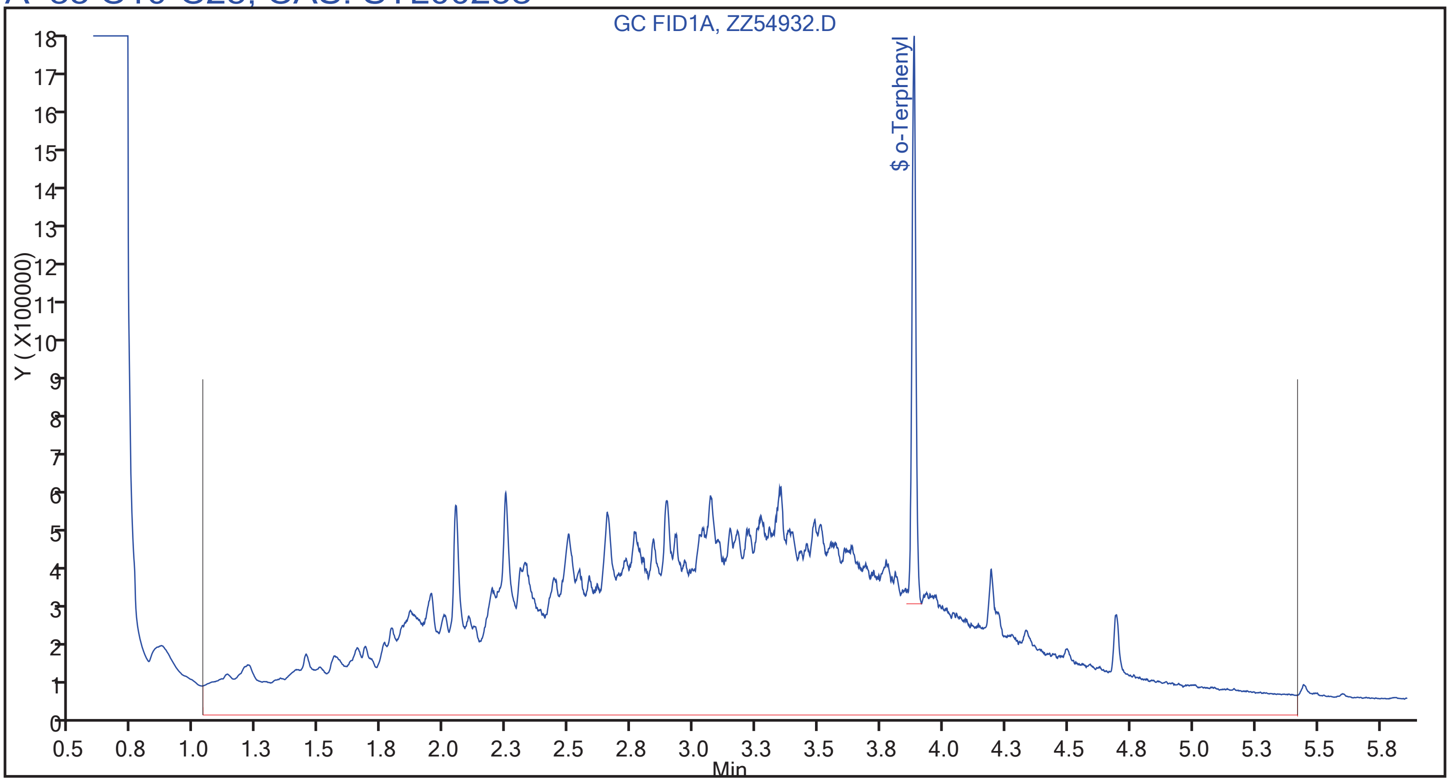


Report Date: 28-Aug-2015 10:11:31 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54932.D				
Injection Date:	27-Aug-2015 21:00:11	Instrument ID:	TAC017		
Lims ID:	580-52566-B-13-A	Lab Sample ID:	580-52566-13		
Client ID:	15NCMOCGW13				
Operator ID:	EKK	ALS Bottle#:	41	Worklist Smp#:	41
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

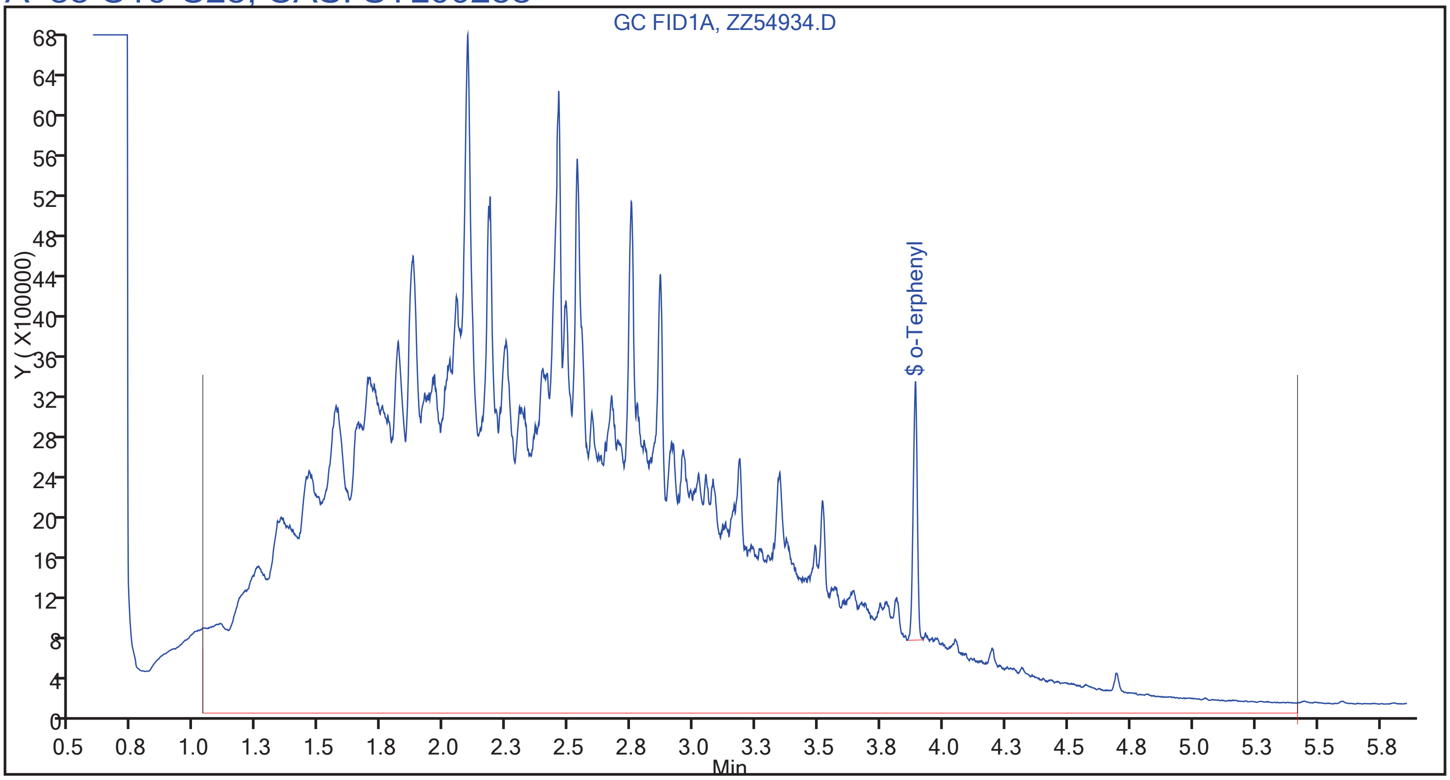


Report Date: 28-Aug-2015 10:12:04 | Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54934.D				
Injection Date:	27-Aug-2015 21:18:18	Instrument ID:	TAC017		
Lims ID:	580-52566-B-14-A	Lab Sample ID:	580-52566-14		
Client ID:	15NCMOCGW14				
Operator ID:	EKK	ALS Bottle#:	42	Worklist Smp#:	42
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

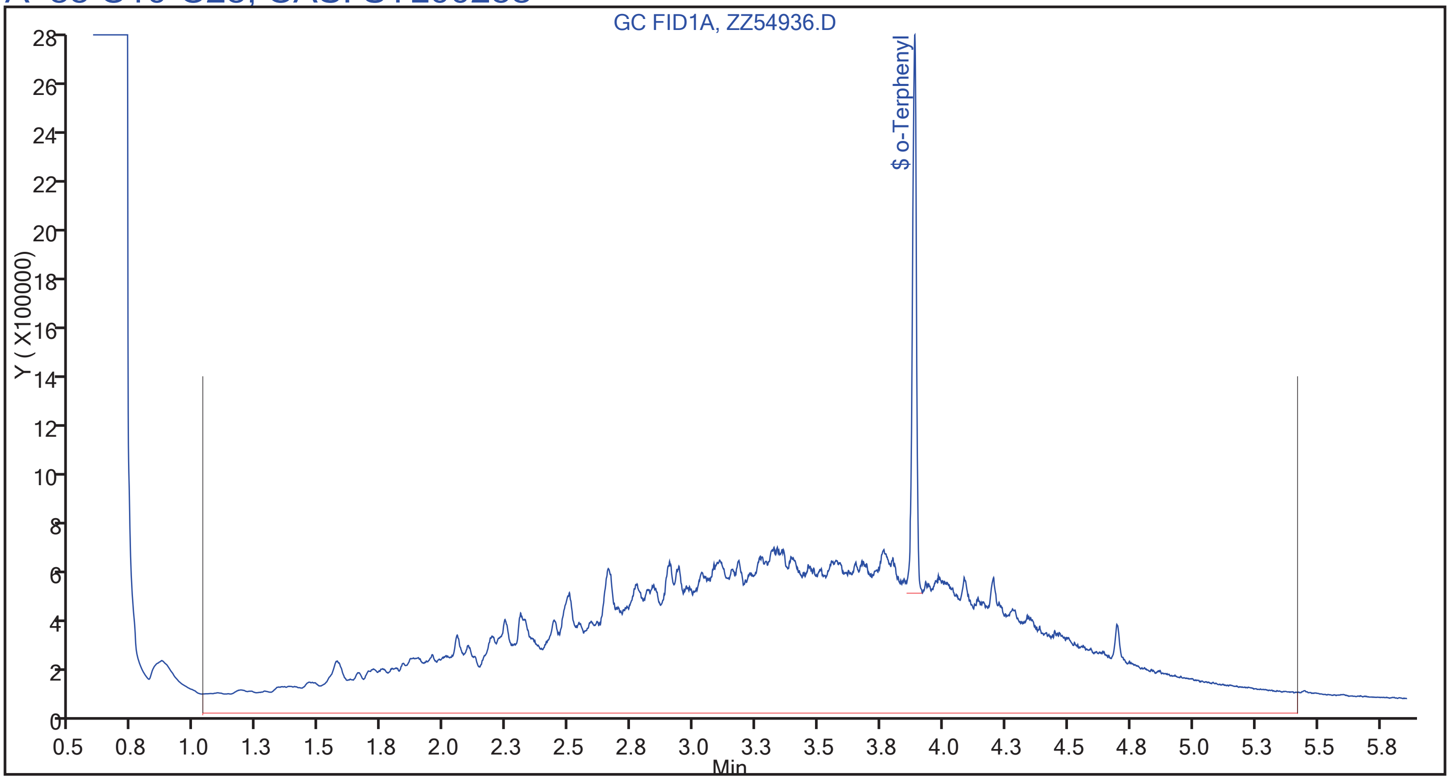


Report Date: 28-Aug-2015 10:12:08 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54936.D				
Injection Date:	27-Aug-2015 21:36:28	Instrument ID:	TAC017		
Lims ID:	580-52566-A-15-A	Lab Sample ID:	580-52566-15		
Client ID:	15NCMOCGW15				
Operator ID:	EKK	ALS Bottle#:	43	Worklist Smp#:	43
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

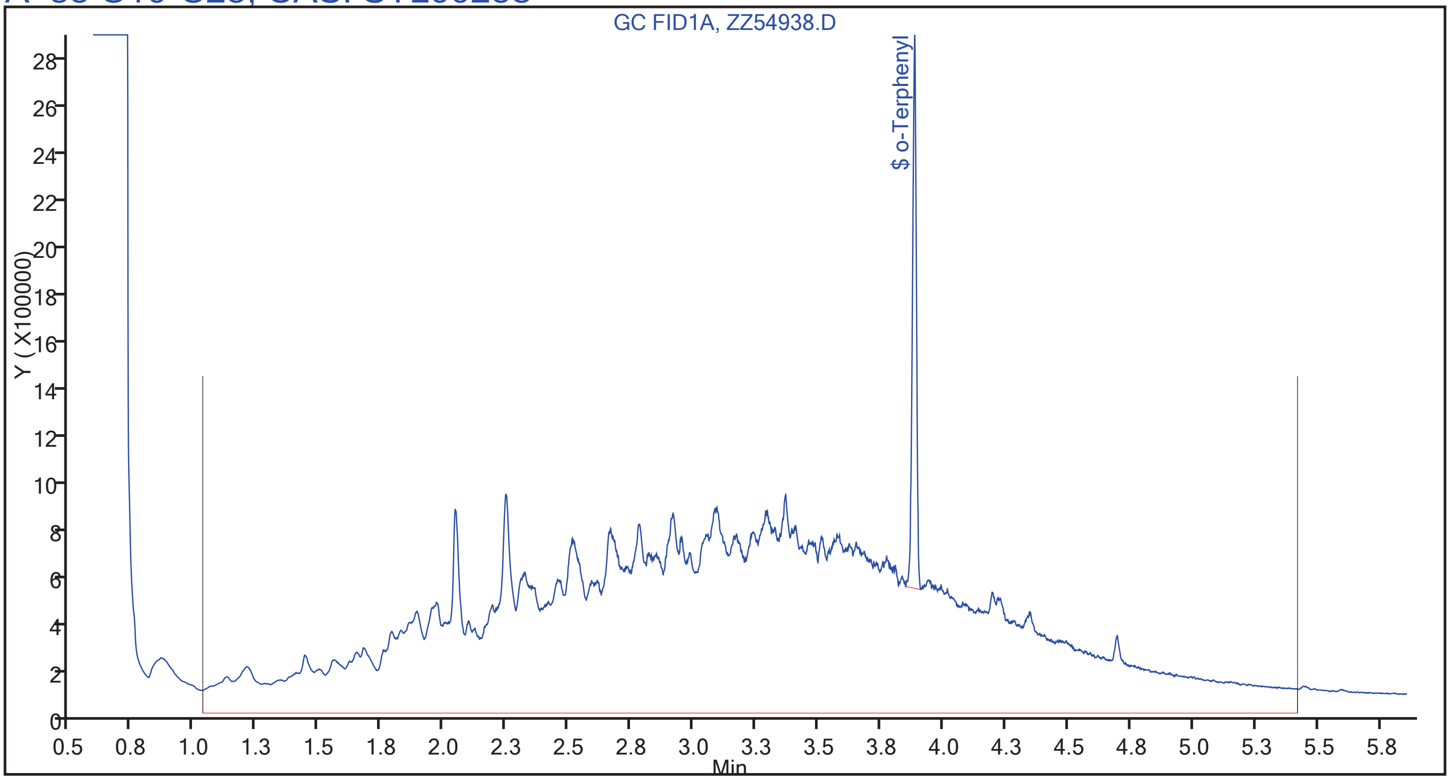
A 35 C10-C25, CAS: STL00258



TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54938.D				
Injection Date:	27-Aug-2015 21:54:38	Instrument ID:	TAC017		
Lims ID:	580-52566-B-16-A	Lab Sample ID:	580-52566-16		
Client ID:	15NCMOCGW16				
Operator ID:	EKK	ALS Bottle#:	44	Worklist Smp#:	44
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

A 35 C10-C25, CAS: STL00258

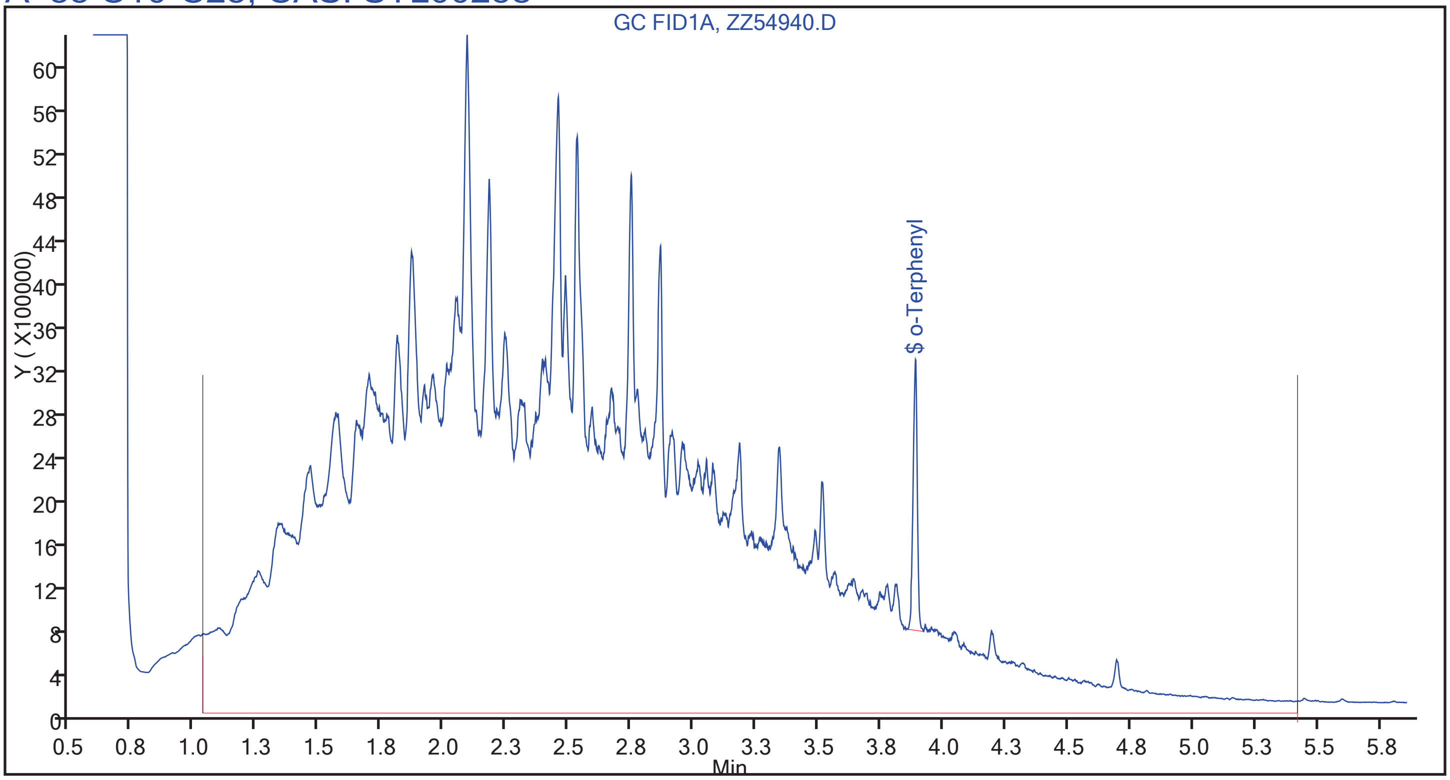


Report Date: 28-Aug-2015 10:12:15 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150827-43784.b\ZZ54940.D				
Injection Date:	27-Aug-2015 22:12:44	Instrument ID:	TAC017		
Lims ID:	580-52566-A-17-A	Lab Sample ID:	580-52566-17		
Client ID:	15NCMOCGW17				
Operator ID:	EKK	ALS Bottle#:	45	Worklist Smp#:	45
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Front_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID1A		

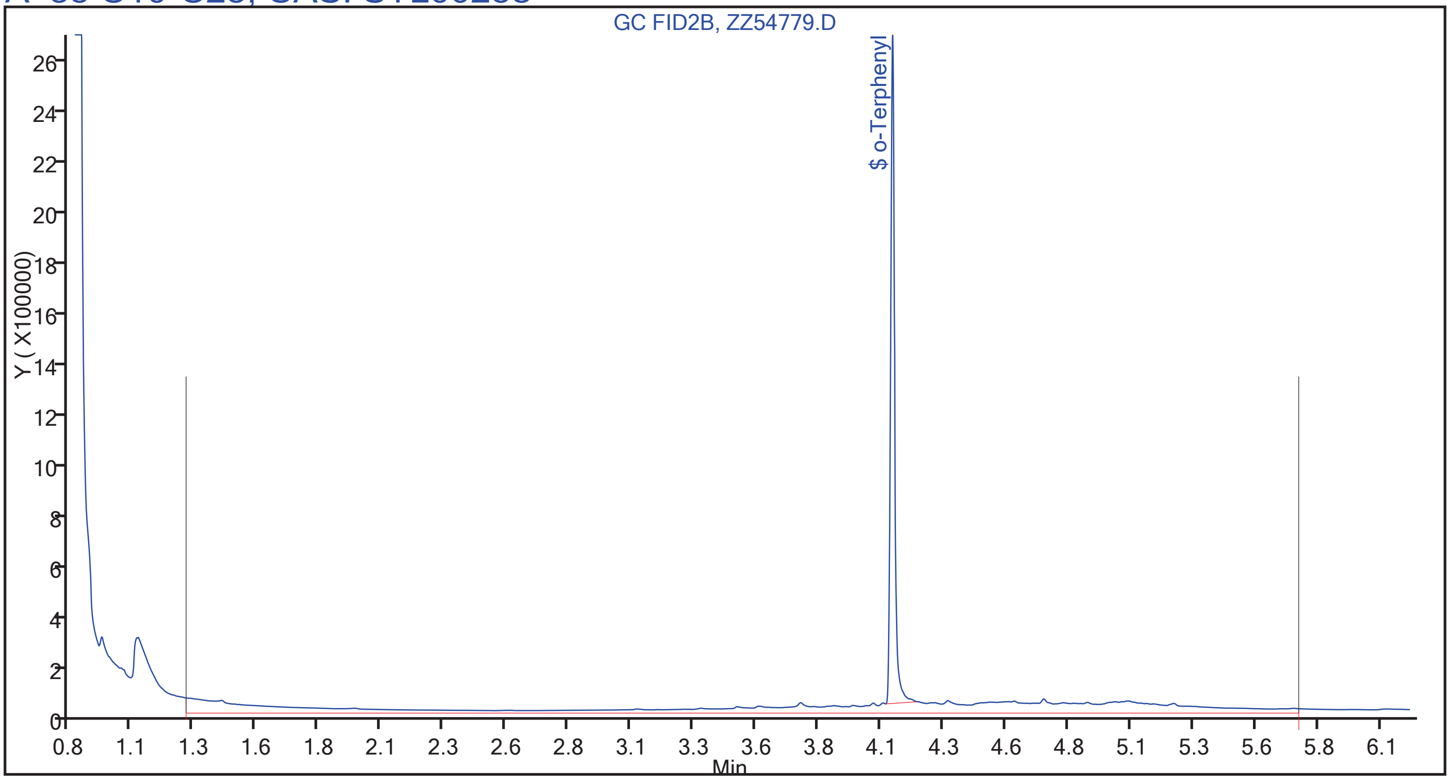
A 35 C10-C25, CAS: STL00258



TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150826-43753.b\ZZ54779.D				
Injection Date:	26-Aug-2015 13:39:49	Instrument ID:	TAC017		
Lims ID:	580-52566-A-18-A	Lab Sample ID:	580-52566-18		
Client ID:	15NC09SW001				
Operator ID:	EKK	ALS Bottle#:	68	Worklist Smp#:	16
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Rear_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID2B		

A 35 C10-C25, CAS: STL00258

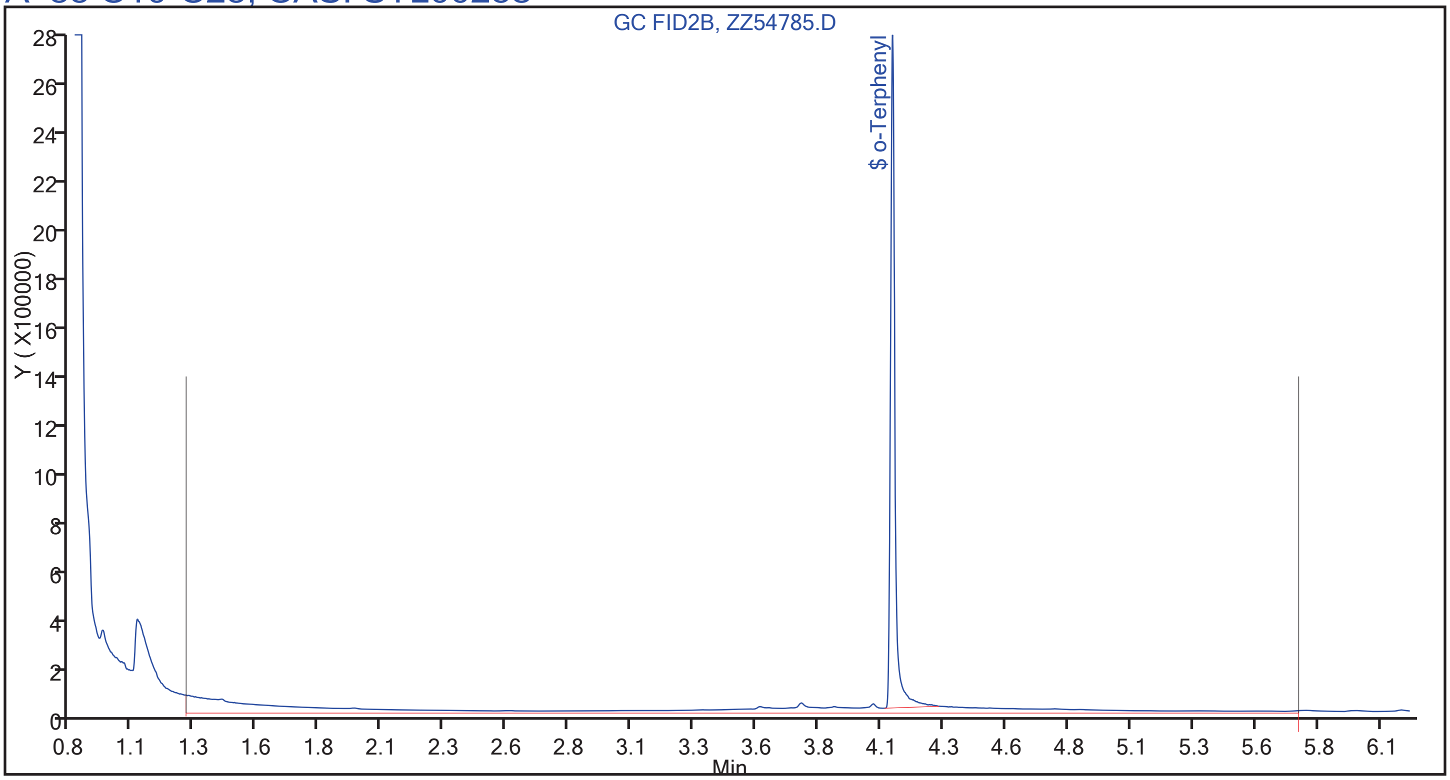


Report Date: 26-Aug-2015 15:14:46 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150826-43753.b\ZZ54785.D				
Injection Date:	26-Aug-2015 14:34:32	Instrument ID:	TAC017		
Lims ID:	580-52566-B-19-A	Lab Sample ID:	580-52566-19		
Client ID:	15NC09SW002				
Operator ID:	EKK	ALS Bottle#:	71	Worklist Smp#:	19
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Rear_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID2B		

A 35 C10-C25, CAS: STL00258

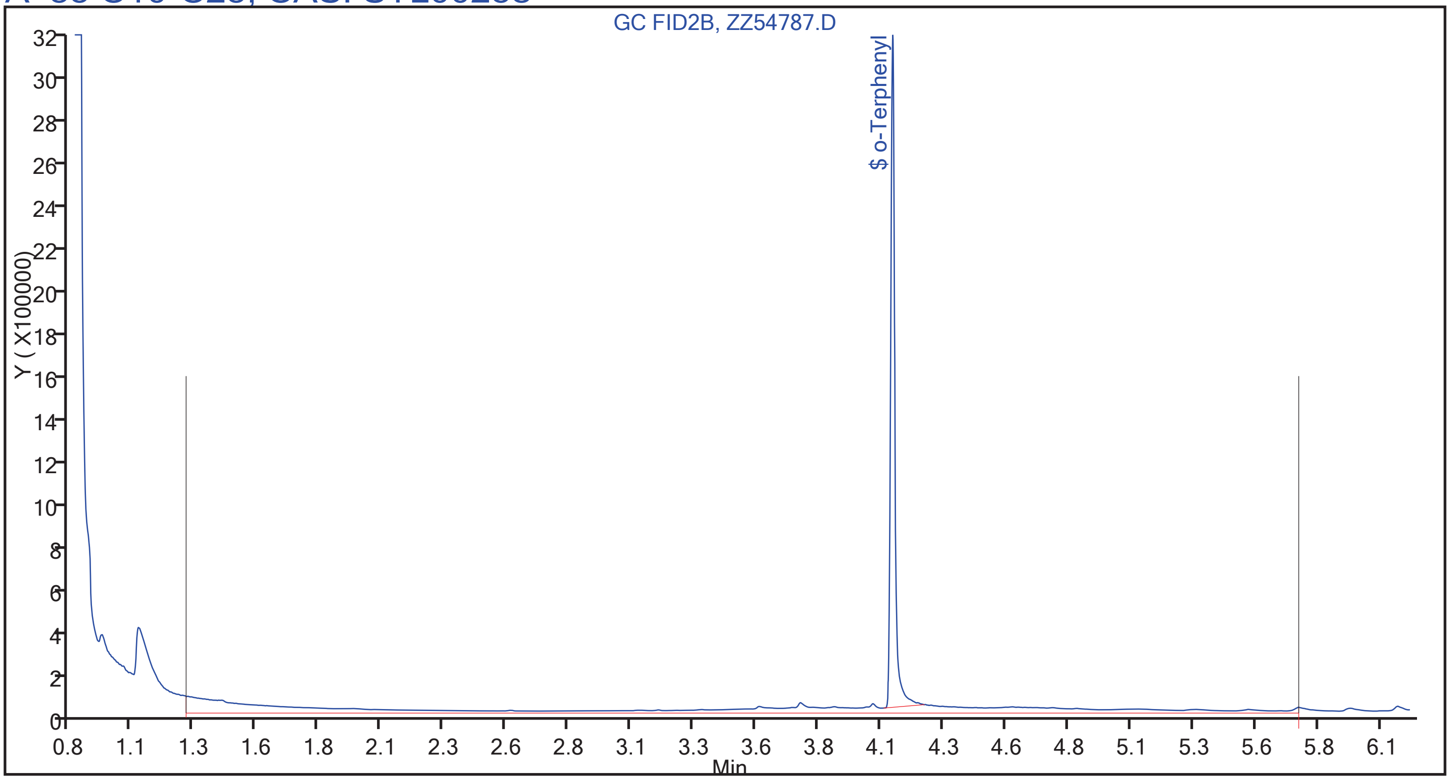


Report Date: 26-Aug-2015 15:15:00 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150826-43753.b\ZZ54787.D				
Injection Date:	26-Aug-2015 14:52:39	Instrument ID:	TAC017		
Lims ID:	580-52566-A-20-A	Lab Sample ID:	580-52566-20		
Client ID:	15NC09SW003				
Operator ID:	EKK	ALS Bottle#:	72	Worklist Smp#:	20
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Rear_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID2B		

A 35 C10-C25, CAS: STL00258

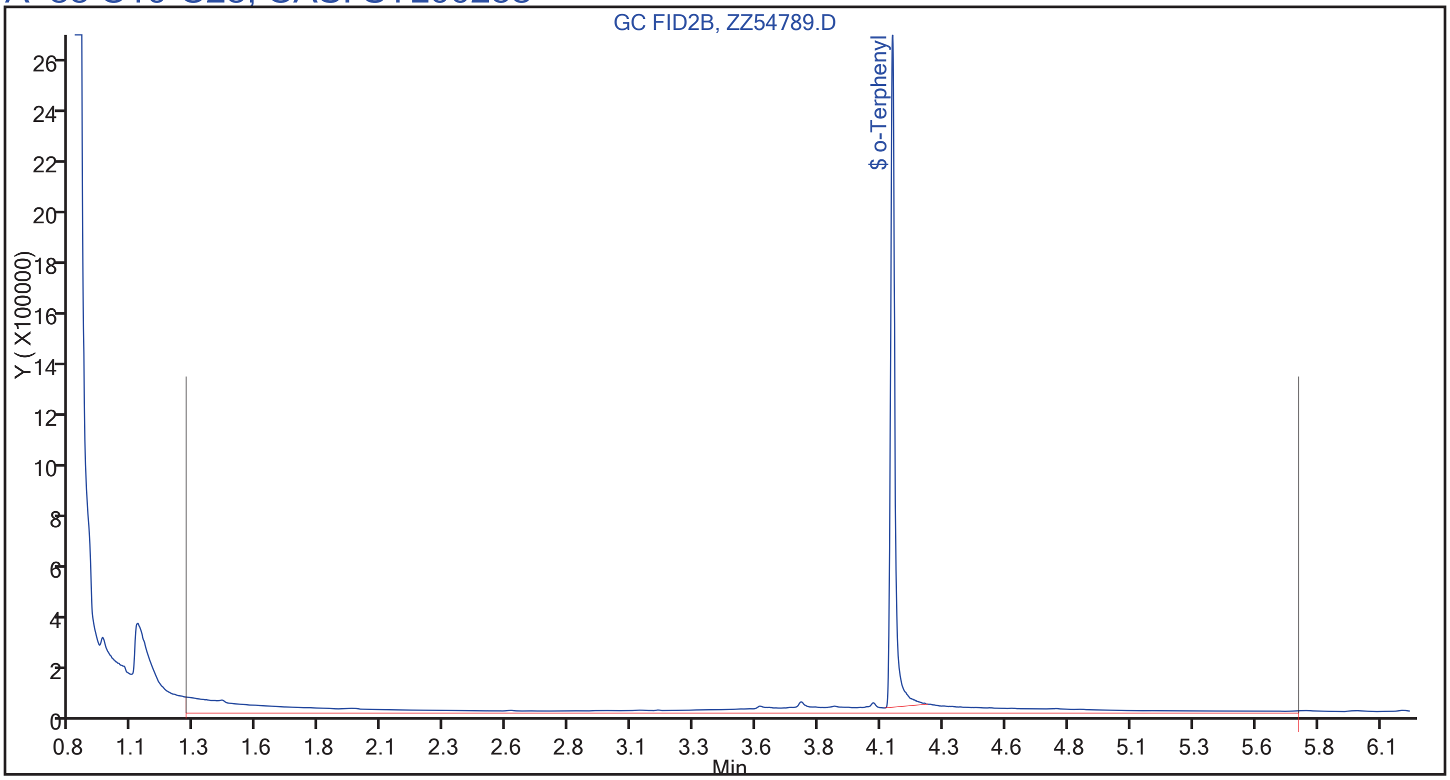


Report Date: 26-Aug-2015 15:40:51 Chrom Revision: 2.2 23-Jul-2015 08:26:08

TestAmerica Seattle

Data File:	\\ChromNA\Seattle\ChromData\TAC017\20150826-43753.b\ZZ54789.D				
Injection Date:	26-Aug-2015 15:10:45	Instrument ID:	TAC017		
Lims ID:	580-52566-B-21-A	Lab Sample ID:	580-52566-21		
Client ID:	15NC09SW004				
Operator ID:	EKK	ALS Bottle#:	73	Worklist Smp#:	21
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	TPH-Rear_TAC017	Limit Group:	Ak 102 DRO AK103 RRO		
Column:		Detector	GC FID2B		

A 35 C10-C25, CAS: STL00258



ATTACHMENT 4

Laboratory Certifications

LABORATORY ACCREDITATION BUREAU

Certificate of Accreditation

ISO/IEC 17025:2005 Certificate Number L2236

TestAmerica Laboratories, Inc.

5755 8th Street East
Tacoma WA 98424

has met the requirements set forth in L-A-B's policies and procedures, all requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the U.S. Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP).*

The accredited lab has demonstrated technical competence to a defined "Scope of Accreditation" and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Accreditation valid through: January 19, 2016

R. Douglas Leonard, Jr., President, COO
Laboratory Accreditation Bureau
Presented the 23rd of May 2013

*See the laboratory's Scope of Accreditation for details of accredited parameters
**Laboratory Accreditation Bureau is found to be in compliance with ISO/IEC 17011:2004 and recognized by ILAC (International Laboratory Accreditation Cooperation) and NACLA (National Cooperation for Laboratory Accreditation).

LABORATORY ACCREDITATION BUREAU

Certificate # L2236

Scope of Accreditation
For
TestAmerica Laboratories, Inc.

5755 8th Street East
Tacoma, WA 98424
Terri Torres
253-922-2310

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM v4.2) based on the National Environmental Laboratory Accreditation Conference Chapter 5 Quality Systems Standard (NELAC Voted Revision June 5, 2003), accreditation is granted to TestAmerica Laboratories, Inc. to perform the following tests:

Accreditation granted through: **January 19, 2016**

Testing - Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/200.7	Silver
ICP-AES	EPA 6010B/6010C/200.7	Aluminum
ICP-AES	EPA 6010B/6010C/200.7	Arsenic
ICP-AES	EPA 6010B/6010C/200.7	Boron
ICP-AES	EPA 6010B/6010C/200.7	Barium
ICP-AES	EPA 6010B/6010C/200.7	Beryllium
ICP-AES	EPA 6010B/6010C/200.7	Calcium
ICP-AES	EPA 6010B/6010C/200.7	Cadmium
ICP-AES	EPA 6010B/6010C/200.7	Cobalt
ICP-AES	EPA 6010B/6010C/200.7	Chromium
ICP-AES	EPA 6010B/6010C/200.7	Copper
ICP-AES	EPA 6010B/6010C/200.7	Iron
ICP-AES	EPA 6010B/6010C/200.7	Potassium
ICP-AES	EPA 6010B/6010C/200.7	Magnesium
ICP-AES	EPA 6010B/6010C/200.7	Manganese
ICP-AES	EPA 6010B/6010C/200.7	Molybdenum
ICP-AES	EPA 6010B/6010C/200.7	Sodium
ICP-AES	EPA 6010B/6010C/200.7	Nickel
ICP-AES	EPA 6010B/6010C/200.7	Lead
ICP-AES	EPA 6010B/6010C/200.7	Antimony
ICP-AES	EPA 6010B/6010C/200.7	Selenium
ICP-AES	EPA 6010B/6010C/200.7	Silicon
ICP-AES	EPA 6010B/6010C/200.7	Tin

LABORATORY ACCREDITATION BUREAU

Certificate # L2236

Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C/200.7	Titanium
ICP-AES	EPA 6010B/6010C/200.7	Strontium
ICP-AES	EPA 6010B/6010C/200.7	Thallium
ICP-AES	EPA 6010B/6010C/200.7	Vanadium
ICP-AES	EPA 6010B/6010C/200.7	Zinc
ICP-MS	EPA 6020/6020A/200.8	Silver
ICP-MS	EPA 6020/6020A/200.8	Arsenic
ICP-MS	EPA 6020/6020A/200.8	Barium
ICP-MS	EPA 6020/6020A/200.8	Beryllium
ICP-MS	EPA 6020/6020A/200.8	Cadmium
ICP-MS	EPA 6020/6020A/200.8	Cobalt
ICP-MS	EPA 6020/6020A/200.8	Chromium
ICP-MS	EPA 6020/6020A/200.8	Copper
ICP-MS	EPA 6020/6020A/200.8	Manganese
ICP-MS	EPA 6020/6020A/200.8	Molybdenum
ICP-MS	EPA 6020/6020A/200.8	Nickel
ICP-MS	EPA 6020/6020A/200.8	Lead
ICP-MS	EPA 6020/6020A/200.8	Antimony
ICP-MS	EPA 6020/6020A/200.8	Selenium
ICP-MS	EPA 6020/6020A/200.8	Thallium
ICP-MS	EPA 6020/6020A/200.8	Uranium
ICP-MS	EPA 6020/6020A/200.8	Vanadium
ICP-MS	EPA 6020/6020A/200.8	Zinc
CVAAS	EPA 7470A/245.1	Mercury
ICP-AES	EPA 7195/6010B	Hexavalent Chromium
GC/MS	EPA 8260B/8260C/624	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C/624	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C/624	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C/624	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C/624	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C/624	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C/624	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C/624	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C/624	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C/624	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/8260C/624	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C/624	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C/624	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C/624	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C/624	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C/624	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C/624	1,3-Dichloropropane

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8260B/8260C/624	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C/624	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C/624	2-Chloroethylvinylether
GC/MS	EPA 8260B/8260C/624	2-Chlorotoluene
GC/MS	EPA 8260B/8260C/624	2-Hexanone
GC/MS	EPA 8260B/8260C/624	4-Chlorotoluene
GC/MS	EPA 8260B/8260C/624	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C/624	Acetone
GC/MS	EPA 8260B/8260C/624	Acetonitrile
GC/MS	EPA 8260B/8260C/624	Acrolein
GC/MS	EPA 8260B/8260C/624	Acrylonitrile
GC/MS	EPA 8260B/8260C/624	Benzene
GC/MS	EPA 8260B/8260C/624	Bromobenzene
GC/MS	EPA 8260B/8260C/624	Bromodichloromethane
GC/MS	EPA 8260B/8260C/624	Bromoform
GC/MS	EPA 8260B/8260C/624	Bromomethane
GC/MS	EPA 8260B/8260C/624	Carbon disulfide
GC/MS	EPA 8260B/8260C/624	Carbon tetrachloride
GC/MS	EPA 8260B/8260C/624	Chlorobenzene
GC/MS	EPA 8260B/8260C/624	Chlorobromomethane
GC/MS	EPA 8260B/8260C/624	Chlorodibromomethane
GC/MS	EPA 8260B/8260C/624	Chloroethane
GC/MS	EPA 8260B/8260C/624	Chloroform
GC/MS	EPA 8260B/8260C/624	Chloromethane
GC/MS	EPA 8260B/8260C/624	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C/624	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C/624	Dibromomethane
GC/MS	EPA 8260B/8260C/624	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C/624	Ethylbenzene
GC/MS	EPA 8260B/8260C/624	Ethylene Dibromide
GC/MS	EPA 8260B/8260C/624	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C/624	Isopropylbenzene
GC/MS	EPA 8260B/8260C/624	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C/624	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C/624	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C/624	Methylene Chloride
GC/MS	EPA 8260B/8260C/624	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C/624	Naphthalene
GC/MS	EPA 8260B/8260C/624	n-Butylbenzene
GC/MS	EPA 8260B/8260C/624	N-Propylbenzene
GC/MS	EPA 8260B/8260C/624	o-Xylene
GC/MS	EPA 8260B/8260C/624	sec-Butylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C/624	Styrene
GC/MS	EPA 8260B/8260C/624	tert-Butylbenzene
GC/MS	EPA 8260B/8260C/624	Tetrachloroethene
GC/MS	EPA 8260B/8260C/624	Toluene
GC/MS	EPA 8260B/8260C/624	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C/624	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C/624	Trichloroethene
GC/MS	EPA 8260B/8260C/624	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C/624	Vinyl Acetate
GC/MS	EPA 8260B/8260C/624	Vinyl chloride
GC/MS	EPA 8270C/8270D/625	1-Methylnaphthalene
GC/MS	EPA 8270C/8270D/625	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/8270D/625	1,2-Dichlorobenzene
GC/MS	EPA 8270C/8270D/625	1,3-Dichlorobenzene
GC/MS	EPA 8270C/8270D/625	1,4-Dichlorobenzene
GC/MS	EPA 8270C/8270D/625	bis(2-chloroisopropyl)ether
GC/MS	EPA 8270C/8270D/625	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C/8270D/625	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/8270D/625	2,4,6-Trichlorophenol
GC/MS	EPA 8270C/8270D/625	2,4-Dichlorophenol
GC/MS	EPA 8270C/8270D/625	2,4-Dimethylphenol
GC/MS	EPA 8270C/8270D/625	2,4-Dinitrophenol
GC/MS	EPA 8270C/8270D/625	2,4-Dinitrotoluene
GC/MS	EPA 8270C/8270D/625	2,6-Dinitrotoluene
GC/MS	EPA 8270C/8270D/625	2-Chloronaphthalene
GC/MS	EPA 8270C/8270D/625	2-Chlorophenol
GC/MS	EPA 8270C/8270D/625	2-Methylnaphthalene
GC/MS	EPA 8270C/8270D/625	2-Methylphenol
GC/MS	EPA 8270C/8270D/625	2-Nitroaniline
GC/MS	EPA 8270C/8270D/625	2-Nitrophenol
GC/MS	EPA 8270C/8270D/625	3 & 4 Methylphenol
GC/MS	EPA 8270C/8270D/625	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/8270D/625	3-Nitroaniline
GC/MS	EPA 8270C/8270D/625	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C/8270D/625	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C/8270D/625	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/8270D/625	4-Chloroaniline
GC/MS	EPA 8270C/8270D/625	4-Chlorophenyl phenyl ether
GC/MS	EPA 8270C/8270D/625	4-Nitroaniline
GC/MS	EPA 8270C/8270D/625	4-Nitrophenol
GC/MS	EPA 8270C/8270D/625	Acenaphthene
GC/MS	EPA 8270C/8270D/625	Acenaphthylene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D/625	Aniline
GC/MS	EPA 8270C/8270D/625	Anthracene
GC/MS	EPA 8270C/8270D/625	1,2-Diphenylhydrazine as Azobenzene
GC/MS	EPA 8270C/8270D/625	Benzo[a]anthracene
GC/MS	EPA 8270C/8270D/625	Benzo[a]pyrene
GC/MS	EPA 8270C/8270D/625	Benzo[b]fluoranthene
GC/MS	EPA 8270C/8270D/625	Benzo[g,h,i]perylene
GC/MS	EPA 8270C/8270D/625	Benzo[k]fluoranthene
GC/MS	EPA 8270C/8270D/625	Benzoic acid
GC/MS	EPA 8270C/8270D/625	Benzyl alcohol
GC/MS	EPA 8270C/8270D/625	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C/8270D/625	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C/8270D/625	Bis(2-ethylhexyl) phthalate
GC/MS	EPA 8270C/8270D/625	Butyl benzyl phthalate
GC/MS	EPA 8270C/8270D/625	Carbazole
GC/MS	EPA 8270C/8270D/625	Chrysene
GC/MS	EPA 8270C/8270D/625	Dibenz(a,h)anthracene
GC/MS	EPA 8270C/8270D/625	Dibenzofuran
GC/MS	EPA 8270C/8270D/625	Diethyl phthalate
GC/MS	EPA 8270C/8270D/625	Dimethyl phthalate
GC/MS	EPA 8270C/8270D/625	Di-n-butyl phthalate
GC/MS	EPA 8270C/8270D/625	Di-n-octyl phthalate
GC/MS	EPA 8270C/8270D/625	Fluoranthene
GC/MS	EPA 8270C/8270D/625	Fluorene
GC/MS	EPA 8270C/8270D/625	Hexachlorobenzene
GC/MS	EPA 8270C/8270D/625	Hexachlorobutadiene
GC/MS	EPA 8270C/8270D/625	Hexachlorocyclopentadiene
GC/MS	EPA 8270C/8270D/625	Hexachloroethane
GC/MS	EPA 8270C/8270D/625	Indeno[1,2,3-cd]pyrene
GC/MS	EPA 8270C/8270D/625	Isophorone
GC/MS	EPA 8270C/8270D/625	Naphthalene
GC/MS	EPA 8270C/8270D/625	Nitrobenzene
GC/MS	EPA 8270C/8270D/625	N-Nitrosodimethylamine
GC/MS	EPA 8270C/8270D/625	N-Nitrosodi-n-propylamine
GC/MS	EPA 8270C/8270D/625	N-Nitrosodiphenylamine
GC/MS	EPA 8270C/8270D/625	Pentachlorophenol
GC/MS	EPA 8270C/8270D/625	Phenanthrene
GC/MS	EPA 8270C/8270D/625	Phenol
GC/MS	EPA 8270C/8270D/625	Pyrene
GC/MS	EPA 8270C/8270D/625	Pyridine

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	1-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
GC-ECD	EPA 8011/504.1	1,2-Dibromoethane
GC-ECD	EPA 8011/504.1	1,2-Dibromo-3-Chloropropane
GC-ECD	EPA 8081A/8081B/608	4,4'-DDD
GC-ECD	EPA 8081A/8081B/608	4,4'-DDE
GC-ECD	EPA 8081A/8081B/608	4,4'-DDT
GC-ECD	EPA 8081A/8081B/608	Aldrin
GC-ECD	EPA 8081A/8081B/608	alpha-BHC
GC-ECD	EPA 8081A/8081B/608	alpha-Chlordane
GC-ECD	EPA 8081A/8081B/608	beta-BHC

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Non-Potable Water

Technology	Method	Analyte
GC-ECD	EPA 8081A/8081B/608	delta-BHC
GC-ECD	EPA 8081A/8081B/608	Dieldrin
GC-ECD	EPA 8081A/8081B/608	Endosulfan I
GC-ECD	EPA 8081A/8081B/608	Endosulfan II
GC-ECD	EPA 8081A/8081B/608	Endosulfan sulfate
GC-ECD	EPA 8081A/8081B/608	Endrin
GC-ECD	EPA 8081A/8081B/608	Endrin aldehyde
GC-ECD	EPA 8081A/8081B/608	Endrin ketone
GC-ECD	EPA 8081A/8081B/608	gamma-BHC (Lindane)
GC-ECD	EPA 8081A/8081B/608	gamma-Chlordane
GC-ECD	EPA 8081A/8081B/608	Heptachlor
GC-ECD	EPA 8081A/8081B/608	Heptachlor epoxide
GC-ECD	EPA 8081A/8081B/608	Methoxychlor
GC-ECD	EPA 8081A/8081B/608	Technical Chlordane
GC-ECD	EPA 8081A/8081B/608	Toxaphene
GC-ECD	EPA 8082/8082A/608	PCB-1016
GC-ECD	EPA 8082/8082A/608	PCB-1221
GC-ECD	EPA 8082/8082A/608	PCB-1232
GC-ECD	EPA 8082/8082A/608	PCB-1242
GC-ECD	EPA 8082/8082A/608	PCB-1248
GC-ECD	EPA 8082/8082A/608	PCB-1254
GC-ECD	EPA 8082/8082A/608	PCB-1260
GC-ECD	EPA 8082/8082A/608	PCB-1262
GC-ECD	EPA 8082/8082A/608	PCB-1268
GC-IT/MS	EPA 8151A MOD	2,4,5-T
GC-IT/MS	EPA 8151A MOD	2,4-D
GC-IT/MS	EPA 8151A MOD	2,4-DB
GC-IT/MS	EPA 8151A MOD	4-Nitrophenol
GC-IT/MS	EPA 8151A MOD	Dalapon
GC-IT/MS	EPA 8151A MOD	Dicamba
GC-IT/MS	EPA 8151A MOD	Dichlorprop
GC-IT/MS	EPA 8151A MOD	Dinoseb
GC-IT/MS	EPA 8151A MOD	MCPA
GC-IT/MS	EPA 8151A MOD	Mecoprop
GC-IT/MS	EPA 8151A MOD	Pentachlorophenol
GC-IT/MS	EPA 8151A MOD	Silvex (2,4,5-TP)
GC-FID	EPA 8015B/AK101/ NWTPH-Gx/NWVPH	Gasoline and Volatile Petroleum Hydrocarbons
GC-FID	EPA 8015B/AK102/ NWTPH-Dx/NWEPH	Diesel and Extractable Petroleum Hydrocarbons
GC-FID	EPA 8015B/AK103/ NWTPH-Dx/NWEPH	Motor Oil and Extractable Petroleum Hydrocarbons

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Non-Potable Water		
Technology	**Method**	**Analyte**
Titration	EPA 310.1 / SM 2320B	Alkalinity
Colorimetric / RFA	EPA 353.2	Nitrate
Colorimetric / RFA	EPA 353.2	Nitrite
Colorimetric / RFA	EPA 353.2	Nitrate + Nitrite
Probe	EPA 405.1 / SM 5210B	BOD
Titration	EPA 410.1 / 410.2 / SM 5220C	COD
Colorimetric / RFA	SM 5220D 21st Ed	COD
Gravimetric	EPA 1664A	Oil & Grease
Colorimetric/RFA	9012A	Total Cyanides
Colorimetric	7196A	Hexavalent Chromium
Ion Chromatography	EPA 300.0/9056A	Bromide
Ion Chromatography	EPA 300.0/9056A	Chloride
Ion Chromatography	EPA 300.0/9056A	Fluoride
Ion Chromatography	EPA 300.0/9056A	Sulfate
Ion Chromatography	EPA 300.0/9056A	Nitrate
Ion Chromatography	EPA 300.0/9056A	Nitrite
TOC Analyzer (IR)	EPA 415.1/9060	TOC
Probe	EPA 9040/9045/150.1	pH
Conductivity meter	EPA 9050A/120.1 SM 2510B	Specific Conductance
Setaflash	EPA 1020	Flashpoint
Preparation	**Method**	**Type**
Separatory Funnel Liquid-Liquid Extraction	EPA 3510C	Semivolatile and Nonvolatile Organics
Continuous Liquid-Liquid Extraction	EPA 3520C	Semivolatile and Nonvolatile Organics
Purge and Trap	EPA 5030B	Volatile Organic Compounds
Acid Digestion (Aqueous)	EPA 3005A/3010A	Inorganics
TCLP Extraction	EPA 1311	Toxicity Characteristic Leaching Procedure
Florisil Cleanup	EPA 3620B	Cleanup of pesticide residues and other chlorinated hydrocarbons
Silica Gel Cleanup	EPA 3630C	Column Cleanup
Sulfur Cleanup	EPA 3660B	Sulfur Cleanup Reagent
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantization of PCBs

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-AES	EPA 6010B/6010C	Silver
ICP-AES	EPA 6010B/6010C	Aluminum
ICP-AES	EPA 6010B/6010C	Arsenic
ICP-AES	EPA 6010B/6010C	Boron
ICP-AES	EPA 6010B/6010C	Barium
ICP-AES	EPA 6010B/6010C	Beryllium
ICP-AES	EPA 6010B/6010C	Calcium
ICP-AES	EPA 6010B/6010C	Cadmium
ICP-AES	EPA 6010B/6010C	Cobalt
ICP-AES	EPA 6010B/6010C	Chromium
ICP-AES	EPA 6010B/6010C	Copper
ICP-AES	EPA 6010B/6010C	Iron
ICP-AES	EPA 6010B/6010C	Potassium
ICP-AES	EPA 6010B/6010C	Magnesium
ICP-AES	EPA 6010B/6010C	Manganese
ICP-AES	EPA 6010B/6010C	Molybdenum
ICP-AES	EPA 6010B/6010C	Sodium
ICP-AES	EPA 6010B/6010C	Nickel
ICP-AES	EPA 6010B/6010C	Lead
ICP-AES	EPA 6010B/6010C	Antimony
ICP-AES	EPA 6010B/6010C	Selenium
ICP-AES	EPA 6010B/6010C	Silicon
ICP-AES	EPA 6010B/6010C	Tin
ICP-AES	EPA 6010B/6010C	Titanium
ICP-AES	EPA 6010B/6010C	Strontium
ICP-AES	EPA 6010B/6010C	Thallium
ICP-AES	EPA 6010B/6010C	Vanadium
ICP-AES	EPA 6010B/6010C	Zinc
ICP-MS	EPA 6020/6020A	Silver
ICP-MS	EPA 6020/6020A	Arsenic
ICP-MS	EPA 6020/6020A	Barium
ICP-MS	EPA 6020/6020A	Beryllium
ICP-MS	EPA 6020/6020A	Cadmium
ICP-MS	EPA 6020/6020A	Cobalt
ICP-MS	EPA 6020/6020A	Chromium
ICP-MS	EPA 6020/6020A	Copper
ICP-MS	EPA 6020/6020A	Manganese
ICP-MS	EPA 6020/6020A	Molybdenum
ICP-MS	EPA 6020/6020A	Nickel
ICP-MS	EPA 6020/6020A	Lead

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
ICP-MS	EPA 6020/6020A	Antimony
ICP-MS	EPA 6020/6020A	Selenium
ICP-MS	EPA 6020/6020A	Thallium
ICP-MS	EPA 6020/6020A	Uranium
ICP-MS	EPA 6020/6020A	Vanadium
ICP-MS	EPA 6020/6020A	Zinc
CVAAS	EPA 7471A	Mercury
GC/MS	EPA 8260B/8260C	1,1,1,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,1-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1,2,2-Tetrachloroethane
GC/MS	EPA 8260B/8260C	1,1,2-Trichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethane
GC/MS	EPA 8260B/8260C	1,1-Dichloroethene
GC/MS	EPA 8260B/8260C	1,1-Dichloropropene
GC/MS	EPA 8260B/8260C	1,2,3-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,3-Trichloropropane
GC/MS	EPA 8260B/8260C	1,2,4-Trichlorobenzene
GC/MS	EPA 8260B/8260C	1,2,4-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,2-Dibromo-3-Chloropropane
GC/MS	EPA 8260B/8260C	1,2-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,2-Dichloroethane
GC/MS	EPA 8260B/8260C	1,2-Dichloropropane
GC/MS	EPA 8260B/8260C	1,3,5-Trimethylbenzene
GC/MS	EPA 8260B/8260C	1,3-Dichlorobenzene
GC/MS	EPA 8260B/8260C	1,3-Dichloropropane
GC/MS	EPA 8260B/8260C	1,4-Dichlorobenzene
GC/MS	EPA 8260B/8260C	2,2-Dichloropropane
GC/MS	EPA 8260B/8260C	2-Chlorotoluene
GC/MS	EPA 8260B/8260C	2-Hexanone
GC/MS	EPA 8260B/8260C	4-Chlorotoluene
GC/MS	EPA 8260B/8260C	4-Isopropyltoluene
GC/MS	EPA 8260B/8260C	Acetone
GC/MS	EPA 8260B/8260C	Acetonitrile
GC/MS	EPA 8260B/8260C	Acrolein
GC/MS	EPA 8260B/8260C	Acrylonitrile
GC/MS	EPA 8260B/8260C	Benzene
GC/MS	EPA 8260B/8260C	Bromobenzene
GC/MS	EPA 8260B/8260C	Bromodichloromethane
GC/MS	EPA 8260B/8260C	Bromoform
GC/MS	EPA 8260B/8260C	Bromomethane
GC/MS	EPA 8260B/8260C	Carbon disulfide

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B/8260C	Carbon tetrachloride
GC/MS	EPA 8260B/8260C	Chlorobenzene
GC/MS	EPA 8260B/8260C	Chlorobromomethane
GC/MS	EPA 8260B/8260C	Chlorodibromomethane
GC/MS	EPA 8260B/8260C	Chloroethane
GC/MS	EPA 8260B/8260C	Chloroform
GC/MS	EPA 8260B/8260C	Chloromethane
GC/MS	EPA 8260B/8260C	cis-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	cis-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Dibromomethane
GC/MS	EPA 8260B/8260C	Dichlorodifluoromethane
GC/MS	EPA 8260B/8260C	Ethylbenzene
GC/MS	EPA 8260B/8260C	Ethylene Dibromide
GC/MS	EPA 8260B/8260C	Hexachlorobutadiene
GC/MS	EPA 8260B/8260C	Isopropylbenzene
GC/MS	EPA 8260B/8260C	Methyl Ethyl Ketone
GC/MS	EPA 8260B/8260C	Methyl Isobutyl Ketone
GC/MS	EPA 8260B/8260C	Methyl tert-butyl ether
GC/MS	EPA 8260B/8260C	Methylene Chloride
GC/MS	EPA 8260B/8260C	m-Xylene & p-Xylene
GC/MS	EPA 8260B/8260C	Naphthalene
GC/MS	EPA 8260B/8260C	n-Butylbenzene
GC/MS	EPA 8260B/8260C	N-Propylbenzene
GC/MS	EPA 8260B/8260C	o-Xylene
GC/MS	EPA 8260B/8260C	sec-Butylbenzene
GC/MS	EPA 8260B/8260C	Styrene
GC/MS	EPA 8260B/8260C	tert-Butylbenzene
GC/MS	EPA 8260B/8260C	Tetrachloroethene
GC/MS	EPA 8260B/8260C	Toluene
GC/MS	EPA 8260B/8260C	trans-1,2-Dichloroethene
GC/MS	EPA 8260B/8260C	trans-1,3-Dichloropropene
GC/MS	EPA 8260B/8260C	Trichloroethene
GC/MS	EPA 8260B/8260C	Trichlorofluoromethane
GC/MS	EPA 8260B/8260C	Vinyl Acetate
GC/MS	EPA 8260B/8260C	Vinyl chloride
GC/MS	EPA 8270C/8270D	1-Methylnaphthalene
GC/MS	EPA 8270C/8270D	1,2,4-Trichlorobenzene
GC/MS	EPA 8270C/8270D	1,2-Dichlorobenzene
GC/MS	EPA 8270C/8270D	1,3-Dichlorobenzene
GC/MS	EPA 8270C/8270D	1,4-Dichlorobenzene
GC/MS	EPA 8270C/8270D	bis(2-chloroisopropyl)ether
GC/MS	EPA 8270C/8270D	2,3,4,6-Tetrachlorophenol

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D	2,4,5-Trichlorophenol
GC/MS	EPA 8270C/8270D	2,4,6-Trichlorophenol
GC/MS	EPA 8270C/8270D	2,4-Dichlorophenol
GC/MS	EPA 8270C/8270D	2,4-Dimethylphenol
GC/MS	EPA 8270C/8270D	2,4-Dinitrophenol
GC/MS	EPA 8270C/8270D	2,4-Dinitrotoluene
GC/MS	EPA 8270C/8270D	2,6-Dinitrotoluene
GC/MS	EPA 8270C/8270D	2-Chloronaphthalene
GC/MS	EPA 8270C/8270D	2-Chlorophenol
GC/MS	EPA 8270C/8270D	2-Methylnaphthalene
GC/MS	EPA 8270C/8270D	2-Methylphenol
GC/MS	EPA 8270C/8270D	2-Nitroaniline
GC/MS	EPA 8270C/8270D	2-Nitrophenol
GC/MS	EPA 8270C/8270D	3 & 4 Methylphenol
GC/MS	EPA 8270C/8270D	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C/8270D	3-Nitroaniline
GC/MS	EPA 8270C/8270D	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C/8270D	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C/8270D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C/8270D	4-Chloroaniline
GC/MS	EPA 8270C/8270D	4-Chlorophenyl phenyl ether
GC/MS	EPA 8270C/8270D	4-Nitroaniline
GC/MS	EPA 8270C/8270D	4-Nitrophenol
GC/MS	EPA 8270C/8270D	Acenaphthene
GC/MS	EPA 8270C/8270D	Acenaphthylene
GC/MS	EPA 8270C/8270D	Aniline
GC/MS	EPA 8270C/8270D	Anthracene
GC/MS	EPA 8270C/8270D	1,2-Diphenylhydrazine as Azobenzene
GC/MS	EPA 8270C/8270D	Benzo[a]anthracene
GC/MS	EPA 8270C/8270D	Benzo[a]pyrene
GC/MS	EPA 8270C/8270D	Benzo[b]fluoranthene
GC/MS	EPA 8270C/8270D	Benzo[g,h,i]perylene
GC/MS	EPA 8270C/8270D	Benzo[k]fluoranthene
GC/MS	EPA 8270C/8270D	Benzoic acid
GC/MS	EPA 8270C/8270D	Benzyl alcohol
GC/MS	EPA 8270C/8270D	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C/8270D	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C/8270D	Bis(2-ethylhexyl) phthalate
GC/MS	EPA 8270C/8270D	Butyl benzyl phthalate
GC/MS	EPA 8270C/8270D	Carbazole
GC/MS	EPA 8270C/8270D	Chrysene

LABORATORY ACCREDITATION BUREAU

Certificate # L2236

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C/8270D	Dibenz(a,h)anthracene
GC/MS	EPA 8270C/8270D	Dibenzofuran
GC/MS	EPA 8270C/8270D	Diethyl phthalate
GC/MS	EPA 8270C/8270D	Dimethyl phthalate
GC/MS	EPA 8270C/8270D	Di-n-butyl phthalate
GC/MS	EPA 8270C/8270D	Di-n-octyl phthalate
GC/MS	EPA 8270C/8270D	Fluoranthene
GC/MS	EPA 8270C/8270D	Fluorene
GC/MS	EPA 8270C/8270D	Hexachlorobenzene
GC/MS	EPA 8270C/8270D	Hexachlorobutadiene
GC/MS	EPA 8270C/8270D	Hexachlorocyclopentadiene
GC/MS	EPA 8270C/8270D	Hexachloroethane
GC/MS	EPA 8270C/8270D	Indeno[1,2,3-cd]pyrene
GC/MS	EPA 8270C/8270D	Isophorone
GC/MS	EPA 8270C/8270D	Naphthalene
GC/MS	EPA 8270C/8270D	Nitrobenzene
GC/MS	EPA 8270C/8270D	N-Nitrosodimethylamine
GC/MS	EPA 8270C/8270D	N-Nitrosodi-n-propylamine
GC/MS	EPA 8270C/8270D	N-Nitrosodiphenylamine
GC/MS	EPA 8270C/8270D	Pentachlorophenol
GC/MS	EPA 8270C/8270D	Phenanthrene
GC/MS	EPA 8270C/8270D	Phenol
GC/MS	EPA 8270C/8270D	Pyrene
GC/MS	EPA 8270C/8270D	Pyridine
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	2-Methylnaphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Acenaphthylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[a]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[b]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[g,h,i]perylene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Benzo[k]fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Chrysene

LABORATORY ACCREDITATION BUREAU

Certificate # L2236

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Dibenz(a,h)anthracene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluoranthene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Fluorene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Indeno[1,2,3-cd]pyrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Naphthalene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Phenanthrene
GC/MS SIM	EPA 8270C SIM EPA 8270D SIM	Pyrene
GC-ECD	EPA 8081A/8081B	4,4'-DDD
GC-ECD	EPA 8081A/8081B	4,4'-DDE
GC-ECD	EPA 8081A/8081B	4,4'-DDT
GC-ECD	EPA 8081A/8081B	Aldrin
GC-ECD	EPA 8081A/8081B	alpha-BHC
GC-ECD	EPA 8081A/8081B	alpha-Chlordane
GC-ECD	EPA 8081A/8081B	beta-BHC
GC-ECD	EPA 8081A/8081B	delta-BHC
GC-ECD	EPA 8081A/8081B	Dieldrin
GC-ECD	EPA 8081A/8081B	Endosulfan I
GC-ECD	EPA 8081A/8081B	Endosulfan II
GC-ECD	EPA 8081A/8081B	Endosulfan sulfate
GC-ECD	EPA 8081A/8081B	Endrin
GC-ECD	EPA 8081A/8081B	Endrin aldehyde
GC-ECD	EPA 8081A/8081B	Endrin ketone
GC-ECD	EPA 8081A/8081B	gamma-BHC (Lindane)
GC-ECD	EPA 8081A/8081B	gamma-Chlordane
GC-ECD	EPA 8081A/8081B	Heptachlor
GC-ECD	EPA 8081A/8081B	Heptachlor epoxide
GC-ECD	EPA 8081A/8081B	Methoxychlor
GC-ECD	EPA 8081A/8081B	Technical Chlordane
GC-ECD	EPA 8081A/8081B	Toxaphene
GC-ECD	EPA 8082/8082A	PCB-1016
GC-ECD	EPA 8082/8082A	PCB-1221
GC-ECD	EPA 8082/8082A	PCB-1232
GC-ECD	EPA 8082/8082A	PCB-1242
GC-ECD	EPA 8082/8082A	PCB-1248
GC-ECD	EPA 8082/8082A	PCB-1254

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC-ECD	EPA 8082/8082A	PCB-1260
GC-ECD	EPA 8082/8082A	PCB-1262
GC-ECD	EPA 8082/8082A	PCB-1268
GC-IT/MS	EPA 8151A MOD	2,4,5-T
GC-IT/MS	EPA 8151A MOD	2,4-D
GC-IT/MS	EPA 8151A MOD	2,4-DB
GC-IT/MS	EPA 8151A MOD	4-Nitrophenol
GC-IT/MS	EPA 8151A MOD	Dalapon
GC-IT/MS	EPA 8151A MOD	Dicamba
GC-IT/MS	EPA 8151A MOD	Dichlorprop
GC-IT/MS	EPA 8151A MOD	Dinoseb
GC-IT/MS	EPA 8151A MOD	MCPA
GC-IT/MS	EPA 8151A MOD	Mecoprop MCPP
GC-IT/MS	EPA 8151A MOD	Pentachlorophenol
GC-IT/MS	EPA 8151A MOD	Silvex (2,4,5-TP)
GC-FID	EPA 8015B/AK101/ NWTPH-Gx/NWVPH	Gasoline and Volatile Petroleum Hydrocarbons
GC-FID	EPA 8015B/AK102/ NWTPH-Dx/NWEPH	Diesel and Extractable Petroleum Hydrocarbons
GC-FID	EPA 8015B/AK103/ NWTPH-Dx/NWEPH	Motor Oil and Extractable Petroleum Hydrocarbons
Colorimetric/RFA	EPA 9012A	Total Cyanides
Ion Chromatography	EPA 300.0/9056A	Bromide
Ion Chromatography	EPA 300.0/9056A	Chloride
Ion Chromatography	EPA 300.0/9056A	Fluoride
Ion Chromatography	EPA 300.0/9056A	Sulfate
Ion Chromatography	EPA 300.0/9056A	Nitrate
Ion Chromatography	EPA 300.0/9056A	Nitrite
TOC Analyzer (IR)	EPA 9060	TOC
Probe	EPA 9040/9045	pH/Corrosivity
Conductivity meter	EPA 9050A	Specific Conductance
Setaflash	EPA 1020	Flashpoint
Preparation	**Method**	**Type**
Separatory Funnel Liquid-Liquid Extraction	EPA 3510C	Semivolatile and Nonvolatile Organics
Continuous Liquid-Liquid Extraction	EPA 3520C	Semivolatile and Nonvolatile Organics

LABORATORY ACCREDITATION BUREAU

Certificate # L2236

Solid and Chemical Materials		
Microwave Extraction	EPA 3546	Semivolatile and Nonvolatile Organics
Ultrasonic Extraction	EPA 3550B	Semivolatile and Nonvolatile Organics
Solvent Dilution	EPA 3580A	Semivolatile and Nonvolatile Organics
Waste Dilution	EPA 3585	Volatile Organic Compounds
Purge and Trap	EPA 5030B	Volatile Organic Compounds
Purge and Trap	EPA 5035	Volatile Organic Compounds
Acid Digestion (Aqueous)	EPA 3005A/3010A	Inorganics
Acid Digestion (Sediments, Sludges, Soils)	EPA 3050B	Inorganics
TCLP Extraction	EPA 1311	Toxicity Characteristic Leaching Procedure
Florisil Cleanup	EPA 3620B	Cleanup of pesticide residues and other chlorinated hydrocarbons
Silica Gel Cleanup	EPA 3630C	Column Cleanup
Sulfur Cleanup	EPA 3660B	Sulfur Cleanup Reagent
Sulfuric Acid Cleanup	EPA 3665A	Cleanup for Quantitation of PCBs

This accreditation covers testing performed at the main laboratory listed above, and a mobile laboratory (VIN# 1GDJP32K0L3500707, License # GLF522) for the tests indicated below.

Solid and Chemical Materials		
Technology	**Method**	**Type**
GC-FID	AK102	Diesel and Extractable Petroleum Hydrocarbons
GC-FID	AK103	Motor Oil and Extractable Petroleum Hydrocarbons
Preparation	**Method**	**Type**
Ultrasonic Extraction	EPA 3550B	Semivolatile and Nonvolatile Organics
Silica Gel Cleanup	EPA 3630C	Column Cleanup

Notes:

1) This laboratory offers commercial testing service.

Approved by: ______________________
R. Douglas Leonard
Chief Technical Officer

Date: May 21, 2014

Re-Issued: 5/23/13 Revised: 5/21/14

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation

DIVISION OF ENVIRONMENTAL HEALTH
Environmental Health Laboratory

5251 Dr. Martin Luther King Jr. Ave.
Anchorage, Alaska 99507-1293
Main: 907.375.8200
Fax: 907.929.7335
www.dec.alaska.gov

March 2, 2015

Terri Torres
TestAmerica-Seattle, WA
5755 8th Street East
Tacoma, WA 98424

Reference: FY2015 Contaminated Sites Approval, #UST-022

Terri Torres:

Thank you for submitting an application on January 23, 2015 to the Alaska Department of Environmental Conservation's (DEC) Laboratory Certification Program (LCP), for renewal of your Alaska Contaminated Sites (CS) Laboratory Approval.

Based on the materials reviewed to date, TestAmerica-Seattle, WA, located at 5755 8th Street East, Tacoma, WA, is granted ***Full approval*** to perform the analyses listed in the attached *State of Alaska Scope of Accreditation*, for Alaska CS projects, including UST/LUST, under the January 30, 2003 revision of 18 AAC 78. Approval Status may be upgraded or downgraded upon full review of the renewal application, supporting materials, and any additionally requested documentation.

Be aware that method detection limit (MDL) data must be retained on file for each method and instrument for which you are maintaining or seeking approval under the AK CS Program. The data may be subject to inspection at any time.

Please remember your expiration date is 3/2/2016. The required documentation must be submitted for renewal no earlier than 90 days and no later than 30 days before your date of expiration. The application, fees, and the latest revision of the quality assurance manual must be received during this window. Proficiency test (PT) results must be performed less than 90 days before expiration, and must be submitted from the vendor to the LCP before the expiration date. Please remember to include the laboratory's ID number, listed above, on ALL correspondence concerning the laboratory, and on all data transmittals.

A copy of the application may be downloaded from the following site:
http://www.state.ak.us/dec/eh/lab/cs/csapproval.htm

If you have any questions, please contact the LCP at (907)375-8200, or at the following email address: declabcert@alaska.gov.

Respectfully,

Shera Hickman
Alaska CS Lab Approval Officer

Attachments: Certificate, Scope of Approval

THE STATE OF ALASKA
Department of Environmental Conservation
Laboratory Approval Program

Scope of Approval

Expiration: 03/02/2016

TestAmerica-Seattle, WA **UST-022**
5755 8th Street East
Tacoma, WA 98424

is approved by the State of Alaska Department of Environmental Conservation, pursuant to 18 AAC 78, to perform analysis for the parameters listed below using the analytical methods indicated. Approval for all parameters is final. Approval is for the latest version of a method unless specified otherwise in a note. EPA refers to the U.S. Environmental Protection Agency. AK refers to Alaska Methods 101, 102 and 103 for the determination of gasoline, diesel and residual range organics in soil and water. ASTM refers to the American Society for Testing and Materials.

Contaminated Sites

Method/Test Name	Reference	Analyte	Matrix	Status
6010C	EPA	Total Arsenic	Soil	Approved
6010C	EPA	Total Barium	Soil	Approved
6010C	EPA	Total Cadmium	Soil	Approved
6010C	EPA	Total Chromium	Soil	Approved
6010C	EPA	Total Lead	Soil	Approved
6010C	EPA	Total Nickel	Soil	Approved
6010C	EPA	Total Vanadium	Soil	Approved
6010C	EPA	Total Arsenic	Water	Approved
6010C	EPA	Total Barium	Water	Approved
6010C	EPA	Total Cadmium	Water	Approved
6010C	EPA	Total Chromium	Water	Approved
6010C	EPA	Total Lead	Water	Approved
6010C	EPA	Total Nickel	Water	Approved
6010C	EPA	Total Vanadium	Water	Approved
6020A	EPA	Total Arsenic	Soil	Approved
6020A	EPA	Total Barium	Soil	Approved
6020A	EPA	Total Cadmium	Soil	Approved
6020A	EPA	Total Chromium	Soil	Approved
6020A	EPA	Total Lead	Soil	Approved

Contaminated Sites

Method/Test Name	Reference	Analyte	Matrix	Status
6020A	EPA	Total Nickel	Soil	Approved
6020A	EPA	Total Vanadium	Soil	Approved
6020A	EPA	Total Arsenic	Water	Approved
6020A	EPA	Total Barium	Water	Approved
6020A	EPA	Total Cadmium	Water	Approved
6020A	EPA	Total Chromium	Water	Approved
6020A	EPA	Total Lead	Water	Approved
6020A	EPA	Total Nickel	Water	Approved
6020A	EPA	Total Vanadium	Water	Approved
8082A	EPA	Polychlorinated Biphenyls-PCB	Soil	Approved
8082A	EPA	Polychlorinated Biphenyls-PCB	Water	Approved
8082A-SV	EPA	Polychlorinated Biphenyls-PCB	Water	Approved
8260B	EPA	BTEX	Soil	Approved
8260B	EPA	Total Volatile Chlorinated Solvents	Soil	Approved
8260B	EPA	BTEX	Water	Approved
8260B	EPA	Total Volatile Chlorinated Solvents	Water	Approved
8260C	EPA	BTEX	Soil	Approved
8260C	EPA	Total Volatile Chlorinated Solvents	Soil	Approved
8260C	EPA	BTEX	Water	Approved
8260C	EPA	Total Volatile Chlorinated Solvents	Water	Approved
8270D	EPA	PAH	Soil	Approved
8270D	EPA	PAH	Water	Approved
8270D-SV	EPA	PAH-small volume by 3510C	Water	Approved
AK101	AK	Gasoline Range Organics	Soil	Approved
AK101	AK	Gasoline Range Organics	Water	Approved
AK101-MS	AK	Gasoline Range Organics	Soil	Approved
AK101-MS	AK	Gasoline Range Organics	Water	Approved
AK102	AK	Diesel Range Organics	Soil	Approved
AK102	AK	Diesel Range Organics	Water	Approved
AK102-SV	AK	Diesel Range Organics-small volume	Water	Approved
AK103	AK	Residual Range Organics	Soil	Approved

THE STATE OF ALASKA

Department of Environmental Conservation
Laboratory Certification Program

Certificate of Approval for Contaminated Sites Analysis

TestAmerica-Seattle, WA

5755 8th Street East
Tacoma, WA 98424

UST-022

has complied with the provisions set forth in 18 AAC 78 and is hereby recognized by The Department of Environmental Conservation as **Fully Approved** for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective **3/2/2015**, and expires **3/2/2016**.

Patryce D. McKinney
State of Alaska Certification Authority

Shera Hickman
Laboratory Approval Officer

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TESTAMERICA DENVER
4955 Yarrow Street
Arvada, CO 80002
Margaret S. Sleevi   Phone: 303-736-0100
www.testamericainc.com

ENVIRONMENTAL

Valid To: October 31, 2015   Certificate Number: 2907.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality Systems Manual for Environmental Laboratories), and for the test methods applicable to the Wyoming Storage Tank Remediation Laboratory Accreditation Program, accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

Atomic Absorption/ICP-AES Spectrometry, ICP/MS, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Misc.- Electronic Probes (pH, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, Total Organic Carbon, Total Organic Halide

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Metals				
Aluminum	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Antimony	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Arsenic	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Barium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Beryllium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Boron	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Cadmium	EPA 6010C	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Calcium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Chromium	EPA 6010C	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Cobalt	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Copper	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Iron	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Lead	EPA 6010C	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Lithium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Magnesium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Manganese	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Mercury	----------------------	----------------------	EPA 7470A	EPA 7471A / 7471B
Molybdenum	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Nickel	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Potassium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Selenium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Silica	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Silicon	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Silver	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Sodium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Strontium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Thallium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Tin	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Titanium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Vanadium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Zinc	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Nutrients				
Nitrate (as N)	----------------------	By calculation	By calculation / EPA 9056 / 9056A	By calculation / EPA 9056 / 9056A
Nitrate-nitrite (as N)	----------------------	EPA 353.2	EPA 353.2 / 9056 / 9056A	EPA 9056 / 9056A
Nitrite (as N)	----------------------	SM 4500-NO2 B	SM 4500-NO2 B; EPA 9056 / 9056A	EPA 9056 / 9056A
Orthophosphate (as P)	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Total phosphorus	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Demands				
Total Organic Carbon	----------------------	----------------------	EPA 9060 / 9060A	EPA 9060 / 9060A
Total Organic Halides	----------------------	----------------------	EPA 9020B	----------------------
Wet Chemistry				----------------------
Alkalinity (Total Bicarbonate, Carbonate, and Hydroxide Alkalinty)	----------------------	SM 2320 B_1997	SM 2320 B	SM 2320 B
Ammonia	----------------------	EPA 350.1	EPA 350.1	----------------------
Biological Oxygen Demand	----------------------	SM 5210B	SM 5210B	----------------------
Bromide	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Chloride	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Chemical Oxygen Demand	----------------------	EPA 410.4	EPA 410.4	
Conductivity	----------------------	----------------------	EPA 9050 / 9050A	EPA 9050 / 9050A
Cyanide	----------------------	----------------------	9012A / 9012B	9012A / 9012B
Ferrous Iron	----------------------	SM 3500 Fe B, D	SM 3500 Fe B, D	----------------------
Fluoride	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Hexavalent Chromium	EPA 7196A	----------------------	EPA 7196A	----------------------
pH	----------------------	----------------------	EPA 9040B / 9045C	EPA 9040B / 9045C
Oil and Grease (HEM and SGT-HEM)	----------------------	----------------------	EPA 1664A/ 1664B	9071B
Percent Moisture	----------------------	----------------------	----------------------	ASTM D2216
Perchlorate	----------------------	----------------------	EPA 6860	EPA 6860
Phenols	----------------------	----------------------	EPA 9066	EPA 9066
Solids, Total	----------------------	SM 2540 B	SM 2540 B	SM 2540 B
Solids, Total Suspended	----------------------	SM 2540 D	SM 2540 D	SM 2540 D
Solids, Total Dissolved	----------------------	SM 2540 C	SM 2540 C	SM 2540 C
Sulfate	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Sulfide, Total	----------------------	----------------------	EPA 9034	EPA 9034
Sulfide	----------------------	----------------------	EPA 9030B	EPA 9030B
Total Kjeldahl Nitrogen	----------------------	----------------------	EPA 351.2	----------------------

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Purgeable Organics (volatiles)				----------------------
Acetone	----------------------	----------------------	EPA 8260B	EPA 8260B
Acetonitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
Acrolein	----------------------	----------------------	EPA 8260B	EPA 8260B
Acrylonitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
Allyl Chloride	----------------------	----------------------	EPA 8260B	EPA 8260B
tert-Amyl Methyl Ether	EPA 8260B			
Benzene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101/ OK DEQ GRO	EPA 8260B / 8021B / AK101/ OK DEQ GRO
Bromobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromochloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromodichloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromoform	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromomethane	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Butanone	----------------------	----------------------	EPA 8260B	EPA 8260B
n-Butyl alcohol	----------------------	----------------------	EPA 8260B / 8015B / 8015C	EPA 8260B / 8015B / 8015C
tert-Butyl alcohol	EPA 8260B			
n-Butylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
sec-Butylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
tert-Butylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Carbon disulfide	----------------------	----------------------	EPA 8260B	EPA 8260B
Carbon tetrachloride	----------------------	----------------------	EPA 8260B	EPA 8260B
Chlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B
2-Chloro-1,3-butadiene	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Chloroethyl vinyl ether	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloroform	----------------------	----------------------	EPA 8260B	EPA 8260B
1-Chlorohexane	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloroprene	----------------------	----------------------	EPA 8260B	EPA 8260B
4-Chlorotoluene	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Chlorotoluene	----------------------	----------------------	EPA 8260B	EPA 8260B
Cyclohexane	----------------------	----------------------	EPA 8260B	EPA 8260B
Cyclohexanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Dibromochloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dibromo-3-chloropropane (DBCP)	----------------------	EPA 504	EPA 504 / 8260B / 8011	EPA 8260B / 8011
Dibromochloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Dichlorodifluoromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Dibromomethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2 Dibromoethane (EDB)	EPA 8011	EPA 504	EPA 504 / 8260B / 8011	EPA 8260B / 8011
1,2-Dichlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B
1,3-Dichlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
1,4-Dichlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B
cis-1,4-Dichloro-2-butene	----------------------	----------------------	EPA 8260B	EPA 8260B
trans-1,4-Dichloro-2-butene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1-Dichloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dichloroethane	EPA 8260B	----------------------	EPA 8260B	EPA 8260B
1,1-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
cis-1,2-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
trans-1,2-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
Dichlorofluoromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dichloropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,3-Dichloropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
2,2-Dichloropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,3-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
cis-1,3-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
trans-1,3-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
Diethyl ether	----------------------	----------------------	EPA 8260B	EPA 8260B
Di-isopropylether	EPA 8260B	----------------------	EPA 8260B	EPA 8260B
1,4-Dioxane	----------------------	----------------------	EPA 8260B / 8260B SIM	EPA 8260B / 8260B SIM
Ethanol	----------------------	----------------------	EPA 8260B / 8015B / 8015C	EPA 8260B / 8015B / 8015C
Ethyl Acetate	----------------------	----------------------	EPA 8260B	EPA 8260B
Ethyl Benzene	EPA 8260B/8021B	----------------------	EPA 8260B / 8021B / AK101/ OK DEQ GRO	EPA 8260B / 8021B/ AK101/ OK DEQ GRO
Ethyl Methacrylate	----------------------	----------------------	EPA 8260B	EPA 8260B
Ethyl tert-Butyl Ether	EPA 8260B			
Ethylene Glycol	----------------------	----------------------	EPA 8015C	EPA 8015C
Gas Range Organics (GRO)	EPA 8015C	----------------------	EPA 8015B / 8015C / AK101 / 8015D	EPA 8015B / 8015C / AK101 / 8015D
Hexane	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Hexanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Hexachlorobutadiene	----------------------	----------------------	EPA 8260B	EPA 8260B
Isobutyl Alcohol (2-Methyl-1-propanol)	----------------------	----------------------	EPA 8260B / 8015B / 8015C	EPA 8260B / 8015B / 8015C
Isopropyl Alcohol	----------------------	----------------------	EPA 8260B	EPA 8260B
Isopropylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,4-Isopropyltoluene	----------------------	----------------------	EPA 8260B	EPA 8260B
Iodomethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Methacrylonitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
Methanol	----------------------	----------------------	EPA 8015B / 8015C	EPA 8015B / 8015C
Methyl Acetate	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Cyclohexane	----------------------	----------------------	EPA 8260B	EPA 8260B
Methylene Chloride	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Ethyl Ketone (MEK)	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Isobutyl Ketone	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Methacrylate	----------------------	----------------------	EPA 8260B	EPA 8260B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Methyl tert-Butyl Ether (MtBE)	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / OK DEQ GRO	EPA 8260B / 8021B/ OK DEQ GRO
4-Methyl-2-Pentanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Naphthalene	EPA 8260B / 8021B	----------------------	EPA 8260B/ OK DEQ GRO	EPA 8260B / OK DEQ GRO
2-Nitropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
2,2' Oxybisethanol	----------------------	----------------------	EPA 8015C	EPA 8015C
2-Pentanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Propionitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
n-Propylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Propylene Glycol	----------------------	----------------------	EPA 8015C	EPA 8015C
Styrene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,1,2-Tetrachloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,2,2-Tetrachloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Tetrachloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
Tetrahydrofuran	----------------------	----------------------	EPA 8260B	EPA 8260B
Toluene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
Total Petroleum Hydrocarbons (TPH)	----------------------	EPA 1664A EPA 1664B	EPA 1664A EPA 1664B	----------------------
1,2,3-Trichlorobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,1-Trichloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,2-Trichloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Trichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
Trichlorofluoromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,3-Trichlorobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,4-Trichlorobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,3-Trichloropropane	----------------------	EPA 504.1	EPA 504.1 / 8260B / 8011	EPA 8260B / 8011
1,1,2-Trichloro-1,2,2-trifluoroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Triethylene Glycol	----------------------	----------------------	EPA 8015C	EPA 8015C
1,2,3-Trimethylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,4-Trimethylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,3,5-Trimethylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Vinyl Acetate	----------------------	----------------------	EPA 8260B	EPA 8260B
Vinyl Chloride	----------------------	----------------------	EPA 8260B	EPA 8260B
Xylenes, total	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
1,2-Xylene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
M+P-Xylene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
Methane	----------------------	----------------------	RSK-175	----------------------
Ethane	----------------------	----------------------	RSK-175	----------------------
Ethylene (Ethene)	----------------------	----------------------	RSK-175	----------------------
Acetylene	----------------------	----------------------	RSK-175	----------------------

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Acetylene Ethane	----------------------	----------------------	RSK-175	----------------------
Extractable Organics (semivolatiles)				
Acenaphthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Acenaphthylene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Acetophenone	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Acetylaminofluorene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Alachlor	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Aminobiphenyl	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Aniline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Anthracene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Aramite	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Atrazine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Azobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzaldehyde	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzoic acid	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo (a) Anthracene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (b) Fluoranthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (k) Fluoranthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (ghi) Perylene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (a) Pyrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzyl Alcohol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis (2-chloroethoxy) methane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis (2-chloroethyl) Ether	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis (2-chloroisopropyl) Ether (2,2'Oxybis(1-chloropropane)	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Bis (2-ethylhexyl) Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Bromophenyl Phenyl Ether	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Butyl Benzyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-sec-Butyl-4,6-Dinitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Carbazole	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chloroanilene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Chlorobenzilate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chloro-3-Methylphenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1-Chloronaphthalene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Chloronaphthalene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Chlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chlorophenyl Phenyl Ether	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Chrysene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Cresols	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diallate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dibenzo (a,h) Anthracene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Dibenzofuran	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2-Dichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3-Dichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3,3’-Dichlorobenzidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,6-Dichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diethyl phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dimethoate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3,3-Dimethylbenzidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
p-Dimethylaminoazobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
7,12-Dimethylbenz(a)anthracene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Alpha-,alpha-Dimethylphenethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dimethylphenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dimethyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Di-n-Butyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Di-n-Octyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3-Dinitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dinitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dinitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dinitrotoluene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,6-Dinitrotoluene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dioxane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diphenylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2-Diphenylhydrazine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Disulfoton	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diesel Range Organics (DRO)	EPA 8015C	----------------------	EPA 8015B / 8015C, AK102, TX 1005 / 8015D / OK DEQ DRO	EPA 8015B / 8015C, AK102, TX 1005 / 8015D / OK DEQ DRO
Ethyl Methanesulfonate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Famphur	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Fluoroanthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Fluorene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Gasoline Range Organics	----------------------	----------------------	TX 1005 / OK DEQ GRO	TX 1005 / OK DEQ GRO
Hexachlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorobutadiene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorocyclopentadiene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Hexachloroethane	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachloropropene	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Indeno (1,2,3-cd) Pyrene	---------------------	---------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Isodrin	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Isophorone	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Isosafrole	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Methapyrilene	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3-Methylcholanthrene	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Methyl-4,6-Dinitrophenol	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Methyl Methane Sulfonate	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Methylcholanthrene	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1-Methylnaphthalene	---------------------	---------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
2-Methylnaphthalene	---------------------	---------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
2-Methylphenol	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3+4-Methylphenol	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Naphthalene	---------------------	---------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
1,4-Naphthoquinone	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1-Naphthylamine	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Naphthylamine	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Nitroaniline	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3-Nitroaniline	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Nitroaniline	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Nitrobenzene	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Nitrophenol	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Nitrophenol	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Nitroquinoline-1-Oxide	---------------------	---------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
N-Nitrosodiethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodimethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodi-n-Butylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodi-n-Propylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodiphenylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosomethylethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosomorpholine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosopiperidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosopyrrolidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
5-Nitro-o-Toluidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,2-oxybis(1-chloropropane)	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Parathion, Methyl	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Parathion, Ethyl	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachloroethane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachloronitobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachlorophenol	----------------------	----------------------	EPA 8270C / 8270D / 8321A / 8321B	EPA 8270C / 8270D / 8321A / 8321B
Phenacetin	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Phenanthrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Phenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Phorate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Picoline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pronamide	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pyrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Pyridine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Safrole	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Sulfotepp	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2,4,5-Tetrachlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,3,4,6-Tetrachlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Thionazin	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
o-Toluidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2,4-Trichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4,5-Trichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4,6-Trichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
o,o,o-Triethyl Phosphorothioate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3,5-Trinitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Motor Oil (Residual Range Organics)	----------------------	----------------------	EPA 8015B / 8015C, AK103 / OK DEQ RRO	EPA 8015B / 8015C, AK103 / OK DEQ RRO
Pesticides/Herbicides/PCBs				
Aldrin	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Atrazine	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Azinophos ethyl	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Azinophos methyl	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
alpha-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
beta-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
delta-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
gamma-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Bolstar	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
alpha-Chlordane	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
gamma-Chlordane	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Chlordane (technical)	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Chloropyrifos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Coumaphos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
2,4-D	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A /8321A
Dalapon	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
2,4-DB	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
4,4'-DDD	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
4,4'-DDE	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
4,4'-DDT	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Demeton-O	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Demeton-S	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Demeton, total	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Diazinon	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Dicamba	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Dichlorovos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Dichloroprop	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Dieldrin	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Dimethoate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Dinoseb	----------------------	----------------------	EPA 8151A / 8321A	EPA 8321A
Disulfoton	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Endosulfan I	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endosulfan II	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endonsulfan sulfate	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endrin	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endrin aldehyde	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endrin ketone	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
EPN	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Ethoprop	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Ethyl Parathion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Famphur	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Fensulfothion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Fenthion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Heptachlor	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Heptachlor Epoxide	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Hexachlorobenzene	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Malathion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
MCPA	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
MCPP	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Merphos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Methoxychlor	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Methyl parathion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Mevinphos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Naled	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
PCB-1016 (Arochlor)	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1221	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1232	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1242	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1248	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1254	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1260	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1262	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1268	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
Phorate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Phosmet	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Propazine	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Ronnel	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Simazine	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Stirophos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Sulfotepp	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
2,4,5-T	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Thionazin	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Tokuthion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
2,4,5-TP	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Toxaphene	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Trichloronate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
o,o,o-Triethylphos Phorothioate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Explosives				
1,3,5-Trinitrobenzene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
1,3-Dinitrobenzene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2,4,6-Trinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
3,5-Dinitroaniline	----------------------	----------------------	EPA 8330B	EPA 8330B
2,4-Dinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2,6-Dinitroltoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2-Amino-4,6-Dinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2-Nitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
3-Nitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
4-Amino-2,6-Dinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
4-Nitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Nitrobenzene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Nitroglycerin	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Octahydro-1,3,5,7-Tetrabitro-1,3,5,7-Tetrazocine (HMX)	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Pentaerythritoltetranitrate (PETN)	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Picric acid	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
RDX (Hexahydro-1,3,5-Trinitro-1,3,5-Triazine)	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Tetryl (Methyl 2,4,6-Trinitrophenylnitramine	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Perfluorinated Hydrocarbons (PFCs) and Perfluorinated Sulfonates (PFSs)				
Perfluorobutanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluoropentanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorohexanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluoroheptanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorooctanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorononanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorodecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluoroundecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorododecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorotridecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorotetradecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorobutane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorohexane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorooctane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorodecane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorooctane Sulfonamide	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Hazardous Waste Characteristics				
Conductivity	----------------------	----------------------	EPA 9050A	EPA 9050A
Corrosivity	----------------------	----------------------	EPA 9040B	9045C
Ignitibility	----------------------	EPA 1010/EPA 1010A	EPA 1010 / 1010A	EPA 1010 / 1010A
Paint Filter Liquids Test	----------------------	----------------------	EPA 9095A	EPA 9095A
Synthetic Precipitation Leaching Procedure (SPLP)	----------------------	----------------------	EPA 1312	EPA 1312

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Toxicity Characteristic Leaching Procedure	----------------------	----------------------	EPA 1311	EPA 1311
Organic Prep Methods				
Separatory Funnel Liquid-Liquid Extraction	----------------------	----------------------	EPA 3510C	-----------------------
Continuous Liquid-Liquid Extraction	----------------------	----------------------	EPA 3520C	-----------------------
Soxhlet Extraction	----------------------	----------------------	-----------------------	EPA 3540C
Microwave Extraction	----------------------	----------------------	-----------------------	EPA 3546
Ultrasonic Extraction	----------------------	----------------------	-----------------------	EPA 3550B
Ultrasonic Extraction	----------------------	----------------------	-----------------------	EPA 3550C
Waste Dilution	----------------------	----------------------	EPA 3580A	EPA 3580A
Solid Phase Extraction Volatiles Purge and trap Volatiles Purge and Trap for Soils	----------------------	----------------------	EPA 3535A EPA 5030B	EPA 5030B EPA 5035
Organic Cleanup Procedures				
Florisil Cleanup	----------------------	----------------------	EPA 3620B	EPA 3620B
Florisil Cleanup	----------------------	----------------------	EPA 3620C	EPA 3620C
Sulfur Cleanup	----------------------	----------------------	EPA 3660B	EPA 3660B
Sulfuric Acid/Permanganate Cleanup	----------------------	----------------------	EPA 3665A	EPA 3665A
Metals Digestion				
Acid Digestion Total Recoverable or Dissolved Metals	----------------------	----------------------	EPA 3005A	----------------------
Acid Digestion for Total Metals	----------------------	----------------------	EPA 3010A	----------------------
Acid Digestion for Total Metals	----------------------	----------------------	EPA 3020A	----------------------
Acid Digestion of Sediments, Sludges and Soils	----------------------	----------------------	----------------------	EPA 3050B

American Association for Laboratory Accreditation

Accredited DoD ELAP Laboratory

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for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality System Manual for Environmental Laboratories (QSM); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 5th day of November 2013.

President & CEO
For the Accreditation Council
Certificate Number 2907.01
Valid to October 31, 2015

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.