U.S. Army Corps of Engineers
Alaska District

2016 MONITORED NATURAL ATTENUATION GROUNDWATER ANNUAL SAMPLING REPORT AT THE MAIN OPERATIONS COMPLEX AT NORTHEAST CAPE

NORTHEAST CAPE
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03
FINAL
AUGUST 2017

F10AK096903_07.11_0509_a
1200C-PERM

U.S. Army Corps of Engineers
Alaska District

2016 MONITORED NATURAL ATTENUATION GROUNDWATER ANNUAL SAMPLING REPORT AT THE MAIN OPERATIONS COMPLEX AT NORTHEAST CAPE

NORTHEAST CAPE
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03
FINAL
AUGUST 2017

F10AK096903_07.11_0509_a
1200C-PERM

TABLE OF CONTENTS

SECTION **PAGE**

TABLE OF CONTENTS (Continued)

TABLES

PHOTOGRAPHS (IN-TEXT)

TABLE OF CONTENTS (Continued)

SECTION **PAGE**

APPENDICES

(intentionally blank)

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µS/cm	micro Siemens per centimeter
AAC	Alaska Administrative Code
AC&WS	Aircraft Control and Warning Station
ADEC	Alaska Department of Environmental Conservation
ALS	ALS Environmental
AMSL	above mean sea level
ATV	all-terrain vehicle
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
cm	centimeter
COC	contaminant of concern
DD	decision document
DO	dissolved oxygen
DoD	U.S. Department of Defense
DQA	data quality assessment
DRO	diesel-range organics
DTW	depth to water
ECC	Environmental Compliance Consultants
EM	Engineering Manual
EPA	U.S. Environmental Protection Agency
ft	feet
FUDS	Formerly Used Defense Site
GAC	granulated activated carbon
GRO	gasoline-range organics
GWE	groundwater elevation
HTRW	hazardous, toxic, and radiological waste
IDW	investigation-derived waste
ISCO	in situ chemical oxidation
Jacobs	Jacobs Engineering Group Inc.
kg	kilogram
L	liter
mg/L	milligrams per liter
MNA	monitored natural attenuation

ACRONYMS AND ABBREVIATIONS (Continued)

MOC	main operations complex
mV	millivolt
ND	not detected
NEC	Northeast Cape
NTU	nephelometric turbidity units
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
PM	project manager
QA	quality assurance
QC	quality control
RAO	remedial action operation
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RPM	remedial program manager
RRO	residual-range organics
SOP	standard operating procedure
SOW	scope of work
SSCL	site-specific cleanup level
SSHO	Site Safety and Health Officer
Suqi River	Suqitughneq River
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
UVOST	Ultraviolet Optical Screening Tool
VOC	volatile organic compound
WACS	White Alice Communications System
WP	work plan

EXECUTIVE SUMMARY

This report summarizes the continuing remedial action operations (RAO) at the main operations complex (MOC) at Northeast Cape on St. Lawrence Island, Alaska conducted during August 2016. Environmental Compliance Consultants (ECC) and Jacobs Engineering Group (Jacobs) performed the fieldwork and prepared this report for the U.S. Army Corps of Engineers (USACE) under Hazardous, Toxic, and Radiological Wastes, Contract No. W911KB-16-D-0002. This work was performed under the authority of the Defense Environmental Restoration Program and the Comprehensive Environmental Response, Compensation, and Liability Act. Activities completed during 2016 fieldwork included monitored natural attenuation sampling of groundwater at the MOC. The 2016 activities were completed according to the *2016 Groundwater Monitoring at the Main Operations Complex and Other Field Activities Work Plan* (2016 work plan [WP]) (USACE 2016b). Following an initial site visit to locate monitoring wells, groundwater depth measurements and low-flow groundwater samples were collected from 15 monitoring wells.

All analytical results were compared to site-specific cleanup levels (SSCLs) established by the 2009 decision document (DD) (USACE 2009) and evaluation criteria established by Alaska Department of Environmental Conservation (ADEC) Alaska Administrative Code Title 18, Chapter 75, Table C (ADEC 2016b).

The findings of the 2016 RAOs include:

- The elevation of the water table at the MOC varies across the site and seasonally. In 2016, the groundwater flow direction at the MOC was predominantly northwest.
- Current groundwater conditions in wells 14MW04 and 14MW05 indicate natural attenuation is occurring at the MOC.
- Diesel-range organics (DRO) and lead exceeded groundwater SSCLs and DRO, naphthalene, arsenic, and lead exceeded 2016 ADEC evaluation criteria.
- Attenuation of DRO is predicted to be complete in 2047.

(intentionally blank)

1.0 INTRODUCTION

This report presents the August 2016 sample results and interpretations for main operations complex (MOC) groundwater at Northeast Cape (NEC) Formerly Used Defense Site (FUDS) on St. Lawrence Island, Alaska. Environmental Compliance Consultants (ECC) and Jacobs Engineering Group Inc. (Jacobs) performed the fieldwork and Jacobs prepared this report for the U.S. Army Corps of Engineers (USACE) under Hazardous, Toxic, and Radiological Waste (HTRW) Contract No. W911KB-16-D-0002, Task Order No. 0002. This work was performed under the authority of the Defense Environmental Restoration Program and the Comprehensive Environmental Response, Compensation, and Liability Act.

Field activities were performed in accordance with the *2016 Groundwater Monitoring at the Main Operations Complex and Other Field Activities Work Plan* (2016 work plan [WP]) (USACE 2016b), with the exception of deviations noted in Section 4.0.

1.1 PROJECT GOALS AND OBJECTIVES

The project goal defined in the WP for the MOC is to perform monitored natural attenuation (MNA) sampling of groundwater and to assess trends, if any, for contaminants of concern defined in the decision document (DD). Following an initial site visit to locate monitoring wells, groundwater depth measurements and low-flow samples were collected from 15 currently installed and serviceable monitoring wells.

1.2 REPORT ORGANIZATION

This report is organized as follows:

- Section 1.0 introduces the project, describes the project goals, and outlines the report organization.
- Section 2.0 describes the site and its history.
- Section 3.0 presents field personnel key to successful project completion.
- Section 4.0 details deviations from the 2016 WP (USACE 2016b).

- Section 5.0 describes project mobilization, sampling activities, waste management, and demobilization.
- Section 6.0 discusses investigation results.
- Section 7.0 presents conclusions derived from the field investigation and analytical data review.
- Section 8.0 lists the references cited in this document.

In addition to the main report, the following appendices provide further information:

- Appendix A contains figures of the site and sampling locations.
- Appendix B contains the data quality assessment (DQA), including the sample summary, analytical results, qualified data tables, and the laboratory deliverables (provided as electronic files on the accompanying CD).
- Appendix C contains summarized historical analytical results tables and plots displaying trends over time.
- Appendix D contains field documentation, including field logbooks and groundwater sampling data sheets.
- Appendix E contains the photograph log for 2016 field activities described here.
- Appendix F presents comments on the draft version of the document and responses to the comments.

2.0 SITE DESCRIPTION AND HISTORY

The following sections present the NEC location, information about the physical and ecological setting, site history, and previous investigations at the MOC.

2.1 SITE DESCRIPTION

The NEC FUDS is located on St. Lawrence Island, Alaska, in the western portion of the Bering Sea, approximately 135 air miles southwest of Nome. It is 9 miles west of the northeastern cape of St. Lawrence Island at 63°19’N, 168°58’W. The NEC FUDS property originally encompassed approximately 4,800 acres (7.5 square miles) and is bordered by Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south (USACE 2015a).

NEC consists mainly of rolling tundra, which rises from the Bering Sea toward the base of the Kinipaghulghat Mountains. The Kinipaghulghat Mountains rise abruptly to an elevation of approximately 1,800 feet above sea level roughly 3 miles from the coastline. The NEC FUDS is not connected to other permanent communities on the island by road and is only accessible by air, water, or all-terrain vehicle (ATV) trails. The Native Village of Savoonga, the closest community, is located approximately 60 miles to the northwest (Figure A-1). Savoonga has a subarctic maritime climate with some continental influences during the winter.

2.1.1 Climate

St. Lawrence Island has a cool, moist, subarctic maritime climate, with some continental influences during winter when much of the Bering Sea is capped with pack ice. 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.

Freeze-up on the island normally occurs in October or November, and breakup normally occurs in June (USACE 2015b).

2.1.2 Geology

As specified in the DD (USACE 2009), St. 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. The MOC is located at approximately 100 feet above sea level. In the area of the MOC, shallow unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton (Patton and Csejtey 1980). The pluton forms the mountainous area south of the NEC sites, which includes Kangukhsam Mountain. The Suqitughneq River (Suqi River) drainage has created an erosional valley in the Kinipaghulghat Pluton and deposited an alluvial fan of unconsolidated sediments. NEC is located on this alluvial fan, which protrudes north from the mountain front toward the Bering Sea. Granitic bedrock is exposed at the coast, north of the site at Kitnagak Bay, which suggests that the quartz monzonitic bedrock underlies the unconsolidated materials at a relatively shallow depth on a wave-cut erosional platform.

In general, the native soil stratigraphy at NEC is characterized by silt near the surface, overlying more sand-dominated soils at depth. The dark brown (in outcrops) to dark green (aqua-green or blue in some areas) and sometimes molted silt contains varying quantities of clay/sand/gravel, and varies from 0 to 10 feet in thickness. The sand at depth contains varying degrees of silt/gravel/cobbles and ranges from 2 feet to greater than 20 feet in thickness. These deeper, coarse-grained materials are generally unsorted and likely to be of glaciofluvial origin. The depth to bedrock at the NEC FUDS is unknown (USACE 2009).

2.1.3 Hydrogeology

The aquifer at the NEC FUDS is associated with the unconsolidated alluvial material that underlies the area. Select regions, consisting of those areas where blocks of bedrock are breaking off to form talus fields flanking the Kinipaghulghat Mountains, are likely capable of transmitting large volumes of groundwater. 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 flow north from the mountainous recharge area south of the site toward the Bering Sea (USACE 2015b).

Groundwater elevations recorded in 2016 at the MOC sampling area wells range from approximately 60 to 74 feet above mean sea level (amsl) and exhibited depths from approximately 2 to 35 feet below ground surface (bgs). Groundwater flow appears to travel north-northwest. Water depths bgs at the MOC are greatest to the south and become shallower progressing north to the drainage basin that runs through Site 28 (USACE 2015b).

Key factors influencing the flow of groundwater at the site are permafrost and frozen soils, which render the unconsolidated materials effectively impermeable in some areas. The U.S. Geological Survey has classified St. Lawrence Island as an area of moderately thick to thin permafrost. Although the depth of permafrost at St. Lawrence Island is unknown, the base of permafrost on the mainland at Nome (135 air miles to the northeast) is estimated to be 120 feet deep. The deeper, unconsolidated deposits at the site are likely permafrost, and the shallow soils represent the active layer where soils are frozen and thawed seasonally. Frozen soils have a profound effect in retarding groundwater flow during most of the year (USACE 2015b).

In addition to the Bering Sea that borders the NEC FUDS to the north, area surface water consists of small streams, small- to moderate-sized lakes, and marshy areas. Surface water generally flows northward from highland areas to the south. Small surface waterbodies are common throughout the area. The primary stream drainage in the area, the Suqi River, is fed by runoff from the prominent drainage of the Kinipaghulghat Mountain valley in the lower mountain area south of the former installation. Several smaller tributaries, originating from two small, unnamed lakes, feed the Suqi River as it flows north into Kitnagak Bay. Surface water flow in the area is highly dynamic, changing significantly over time. Contractors undertaking remedial and removal actions at the FUDS have 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 connects the MOC and Site 31 (USACE 2015b). 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 connects the MOC to the borrow source. This drainage originated in the Kinipaghulghat Mountains and exhibited variable flow in late spring/early summer. The drainage would flow for days at a time but would run dry later into the summer during drier periods. Water was encountered during excavations within the MOC ranging from 7 feet bgs in 2010 to approximately 12 feet bgs in 2012 (USACE 2015b). The variability of depth to groundwater at the MOC appears to be heavily influenced by proximity to wetlands near Site 28, the seasonal spring thaw, and high levels of precipitation during the summer field season. This drainage, originating in the Kinipaghulghat Mountain Valley, exhibited high water in late spring/early summer that lasted for days at a time but would exhibit little or no flow later into the summer during drier periods (USACE 2015b).

2.1.4 Vegetation

The NEC 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, roseroot, coltsfoot, 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 the nearby mountains. The NEC area has many low-lying areas with lakes, bogs, and poorly-drained soils (USACE 2015b).

2.1.5 Land and Resource Use

St. Lawrence Island residents from the villages of Gambell and Savoonga engage in year-round subsistence fishing, hunting, and gathering in the NEC area. Local subsistence hunting camp structures are located adjacent to Site 3 and are seasonally occupied (USACE 2009).

Currently, there are no permanent residents in the NEC area; however, representatives of the Native Village of Savoonga have indicated a desire to re-establish a permanent residential community at the site in the future (USACE 2015a).

St. Lawrence Island supports habitats for the following endangered or threatened species: bowhead whale (endangered), polar bear (threatened), spectacled eider (endangered), Steller's eider (threatened), and the western distinct population segment of Steller sea lion (endangered). Walrus are protected under the Marine Mammal Protection Act. The NEC vicinity is used for berry collection and reindeer subsistence hunting. The Suqi River, located within the NEC FUDS, is used for subsistence fishing. The ocean surrounding NEC is used extensively for subsistence activities including hunting of whales, walrus, seals, and sea birds; and fishing (USACE 2015a).

2.2 SITE HISTORY

NEC was constructed as an Aircraft Control and Warning Station (AC&WS) during 1950 and 1951 to provide radar coverage and surveillance for the Alaskan Air Command, and later for the North American Air Defense Command, as part of the Alaska Early Warning System. The site was activated in 1952 and a White Alice Communications System (WACS) station was added to the site in 1954. The AC&WS and WACS operations were supported by 212 personnel and were terminated in 1969 and 1972, respectively. The majority of military personnel were removed from the site by the end of 1969 (USACE 2015a).

NEC included areas for housing site personnel, power plant facilities, fuel storage tanks, distribution lines, maintenance shops, wastewater treatment facilities, and landfills. The buildings and majority of furnishings and equipment related to the AC&WS were initially abandoned in place due to the high cost of off-island transport (USACE 2015a).

In 1971, the villages of Gambell and Savoonga opted out of the Alaska Native Claims Settlement Act, which allowed for title to 1.136 million acres of land in the former St. Lawrence Island Reindeer Reserve, established in 1903. The Gambell Native Corporation and Savoonga Native Corporation (now known as Sivuqaq, Inc. and Kukulget, Inc., respectively) received titles to all of St. Lawrence Island (except U.S. Surveys 4235, 4237, 4340, 4369, and 3728) by Interim Conveyance No. 203 dated 21 June 1979 and finalized 2 December 1980. In 1982, the Navy obtained approximately 26 acres of land containing the former WACS. The land transfer was later deemed invalid and property ownership reverted to Sivuqaq, Inc. and Kukulget, Inc.

Demolition and removal of the buildings and the majority of other structures from 1990 through 2014 were completed under multiple USACE contracts (USACE 2016a). The runway, improved gravel roads, and concrete slabs of some of the former structures remain intact. Four remedial investigations (RI) were conducted at the NEC FUDS between 1994 and 2004, during which environmental concerns were grouped into 34 individual sites (USACE 2015a). Following the Feasibility Study in 2007 and completion of the DD in September of 2009 (USACE 2007, 2009), remedial actions occurred through 2014 (USACE 2015b).

2.2.1 Main Operations Complex

The MOC at the NEC installation (Figure A-2) historically included the majority of site infrastructure such as buildings, heat and power supply, fuel storage tanks, maintenance, and housing quarters. All of the standing MOC structures have been demolished. Inert concrete foundations, pads, and backfilled utilidors remain. Fuel tanks and fuel distribution piping have been removed.

The primary sources of contamination at NEC are spills and leaks of fuel products associated with aboveground storage tanks, underground storage tanks, and associated piping. Other sources include polychlorinated biphenyls (PCBs) from transformers and electrical equipment, and vehicle maintenance fluids, such as glycol and solvent. Individual sites within the MOC were grouped together to evaluate an overall response action for the known contamination (USACE 2015a). These sites are located on the northeast portion of the main complex gravel pad and include Sites 10, 11, 13, 15, 19, and 27 (Figure A-2).

The largest known spill at NEC occurred in March 1968 when a dozer operator struck a 400,000-gallon diesel storage tank at Site 11 while plowing snow, resulting in a release of an estimated 180,000 gallons of fuel. Another significant spill occurred in 1967 when a plow truck hit petroleum, oil, and lubricant Tank No. 2, resulting in the release of approximately 30,000 gallons of fuel. As noted in the *First Five-Year Review Report, Northeast Cape FUDS* (USACE 2015a), interviews with former installation personnel suggest there were several undocumented incidents of much larger spills from the large aboveground storage tanks (USACE 2015a). Based on the results of the excavation and removal activities, the northernmost edge of the areas excavated at the MOC contains petroleum in subsurface soils at concentrations that are below the risk-based site-specific cleanup levels (SSCLs) specified in the 2009 DD. Additional excavation further northward was not performed due to the likelihood that excavation would have resulted in greater damage to the downgradient wetland area known as the Site 28 Drainage Basin. Residual contamination exceeding the soil SSCLs remains within the Site 28 Drainage Basin downgradient of the MOC.

Shallow groundwater is contaminated throughout the northern portion of the MOC. The DD-specified contaminants of concern (COCs) in groundwater are gasoline-range organics (GRO), diesel-range organics (DRO), residual-range organics (RRO), benzene, ethylbenzene, lead, and arsenic (USACE 2009).

RIs were conducted in 1994, 1996, 1998, 2001, 2002, and 2004. The sampling results indicated soils and groundwater contained petroleum compounds at elevated levels. An in situ chemical oxidation (ISCO) pilot test was completed at the MOC in 2009. Results indicated that ISCO was not an effective means of remediating the petroleum-contaminated soil present at the MOC due to the peat and organic silts in the soil, the presence of permafrost and/or frozen zones, and the observation of preferential flow zones (USACE 2015a). As a result, the alternate remedy of excavation and removal was implemented. In 2010, data collected using Ultraviolet Optical Screening Tool (UVOST) technology combined with a Geoprobe direct-push drill rig were used to plan petroleum-contaminated soil excavation. These UVOST data were used from 2011 through 2014 to guide excavation of soil with DRO concentrations above the SSCL of 9,200 milligrams per kilogram. In 2014, field-screening soil samples were collected and analyzed by an Environmental Laboratory Accreditation Program-certified and Alaska Department of Environmental Conservation (ADEC)-approved onsite field laboratory to further guide excavation. Confirmation samples were collected upon completion of excavation activities and submitted to a fixed base laboratory for analysis. Excavation and removal activities conducted from 2011 through 2013 also addressed concrete and soils contaminated with polychlorinated biphenyls (USACE 2015a).

Several monitoring wells have been installed and removed over time at the MOC. Monitoring well installation at the MOC began during RIs and continued through 2014 (USACE 2015b). Previous groundwater sampling events from 2002 through 2015 collected groundwater from various combinations of monitoring wells (USACE 2016a). Currently installed and serviceable monitoring wells at the MOC (installed between 2002 and 2014), are 17MW-1, 20MW-1, 22MW2, 26MW1, MW10-1, MW88-1, MW88-3, MW88-10, 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, 14MW06, and 14MW07 (Figures A-5.2 and A-6.2).

The MOC groundwater monitoring well network that is currently installed and serviceable includes upgradient wells 26MW1, 22MW2, 20MW-1, and 14MW07, which are located upgradient of all known petroleum sources at the MOC. Monitoring wells 17MW1 and MW10-1 are crossgradient to known petroleum sources at the MOC. Monitoring wells MW88-1, MW88-3, MW88-10, 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06 are source area monitoring wells. Soil samples collected during the installation of currently installed and serviceable monitoring wells were analyzed for a variable analytical suite including GRO, DRO, RRO, BTEX, polycyclic aromatic hydrocarbons (PAH), PCBs, metals, and total organic carbon (TOC). None of the soil samples exceeded SSCLs (USACE 2002, 2003, 2005, 2015b).

Groundwater at the MOC exhibited evidence of contamination prior to the 2009 DD (USACE 2009) promulgation, COC identification, and SSCL listings. Groundwater samples collected in 2002 were analyzed for GRO, DRO, RRO, BTEX, alkalinity, sulfate, methane, ethane, and ethene (USACE 2003) while in 2004 groundwater samples were analyzed for GRO, DRO, RRO, BTEX, PAHs, TOC, and metals (USACE 2005). Groundwater samples collected in 2002 and 2004 exceeded what would be the future SSCL for GRO, DRO, RRO, benzene, and total lead in wells MW88-3, MW88-4, MW88-5, MW88-10, and 20MW-1 (Table 2-1). After implementation of the 2009 DD (USACE 2009), DRO, RRO, benzene, arsenic, and lead exceeded the SSCL. From 2010 through 2011, groundwater samples collected from monitoring wells at the MOC were analyzed for GRO, DRO, BTEX, PAHs, PCBs, methane, metals, and natural attenuation parameters including ferrous iron, manganese, sulfate, nitrate, alkalinity, conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) (USACE 2011, 2012). Beginning in 2012, the analyte list was expanded to include RRO (USACE 2013, 2014a). In 2014 and 2015, volatile organic compounds (VOCs) and glycols were added to the analytical suite for well 10MW-1 (USACE 2015b, 2016a). Monitoring wells MW88-4 and MW88-5 served as source area wells from 2002 through 2012, however these wells were removed due to soil excavation at the MOC. Prior to demolishing the wells during removal actions in 2013, the wells were sampled for the last time; the analytical results of which indicated no exceedance of SSCLs. Historical data from these wells provide valuable information regarding historical downgradient contamination.

Table 2-1
Historical Results Above Site-Specific Cleanup Levels

Well ID	Year	Contaminant Exceeding SSCL	SSCL (mg/L)	Result (mg/L)
14MW02	2015	DRO	1.5	1.6
14MW03	2014	DRO	1.5	2.4
		Total Lead	0.015	0.062
	2015	Total Lead	0.015	0.015
14MW04	2014	DRO	1.5	2.5
	2015	DRO	1.5	2.8 QN
14MW05	2014	DRO	1.5	4.9
	2015	DRO	1.5	12
14MW06	2014	DRO	1.5	5.2 QL
	2015	DRO	1.5	2.3
17MW1	2014	Total Lead	0.015	0.13
20MW1	2004	Total Lead	0.015	0.0517
MW88-1	2012	DRO	1.5	1.9
MW88-3	2002	DRO	1.5	34
MW88-4	2002	DRO	1.5	72
				56*
		RRO	1.1	1.9
				1.3*
		Benzene	0.005	0.03
				0.03*

Table 2-1 (Continued)
Historical Results Above Site-Specific Cleanup Levels

Well ID	Year	Contaminant Exceeding SSCL	SSCL (mg/L)	Result (mg/L)
	2004	DRO	1.5	3.89
				3.82 J*
				3.49*
		RRO	1.1	1.46 B
				1.11 B*
		Benzene	0.005	0.033
				0.0337*
				0.0276*
	2010	DRO	1.5	3.3
				3.2*
	2011	DRO	1.5	2.3
		Benzene	0.005	0.0094
		Dissolved Arsenic	0.01	0.011
	2012	DRO	1.5	2.0
				1.8*
		Total Arsenic	0.01	0.011
				0.011*
		Dissolved Arsenic	0.01	0.011
MW88-5	2002	DRO	1.5	9.5
		RRO	1.1	2.3
		Benzene	0.005	0.019
	2004	GRO	1.3	1.5 J
		DRO	1.5	11.3
		RRO	1.1	2.28 B
		Benzene	0.005	0.0297
	2010	DRO	1.5	12
		RRO	1.1	1.6
		Benzene	0.005	0.0093
	2011	DRO	1.5	7.5
				7.2*
		RRO	1.1	2
				1.8*
		Benzene	0.005	0.016
				0.02*
	2012	DRO	1.5	4.6
		Benzene	0.005	0.0064
MW88-10	2002	DRO	1.5	55
		RRO	1.1	1.3
	2004	Total Lead	0.015	0.0376
	2010	DRO	1.5	1.6

Notes:
* = field duplicate sample
For definitions, refer to the Acronyms and Abbreviations section.
For data qualifiers, refer to the DQA in Appendix B.

3.0 KEY FIELD PERSONNEL

The following table (Table 3-1) lists key project field personnel and their responsibilities.

Table 3-1
Key Personnel and Responsibilities

Title	Organizational Affiliation	Name	Responsibilities
Site Manager	Prime Contractor (ECC)	Kris Reidt	Implemented, oversaw, and coordinated project activities and ensured objectives were met. Supported PM as needed.
SSHO	Prime Contractor (ECC)	Stanley Seegars	Developed, implemented, and oversaw all safety and health-related project aspects.
Technical Lead/Lead Field Sampler	Subcontractor (Jacobs)	Hollee McLean	Collected field screening and analytical samples and managed and shipped analytical samples.
Project Chemist	Subcontractor (Jacobs)	Candace Ede Angela DiBerardino	Coordinated with the laboratory, reviewed data, and ensured data quality objectives were met.
Analytical Laboratory PM	Laboratory Subcontractor (ALS Environmental)	Greg Salata	Analyzed the samples in accordance with contract and QC requirements.
Emergency Medical Professional	Medical Subcontractor (Total Safety)	Christopher Carson	Provided medical services in accordance with contract.

Note:
For definitions, refer to the Acronyms and Abbreviations section.

(intentionally blank)

4.0 WORK PLAN DEVIATIONS

Deviations from the 2016 WP (USACE 2016b) occurred during the execution of fieldwork. None of the deviations significantly affected data usability or data quality. The WP deviations include the following:

- Analytical results from samples collected in 2016 were screened against SSCLs and Table C cleanup levels provided in Title 18 of the Alaska Administrative Code (AAC), Section 75 (18 AAC 75) promulgated in November 2016 (ADEC 2016b). Although the approved 2016 WP referenced Table C cleanup levels provided in the 18 AAC 75 promulgated in 2009, the USACE requested that the most recent ADEC levels be used for comparison purposes in this report.
- Monitoring wells at the MOC were purged according to the field SOP (which was consistent with ADEC sampling guidance), provided in the 2016 WP (USACE 2016b) with the exception of well MW10-1. A maximum drawdown of 0.6 feet was reached while purging well MW10-1, which is greater than the 0.3-foot target level. The purge flowrate was reduced to between 0.1 and 0.15 liters per minute according to the operating procedure, but the drawdown level remained at 0.50 feet.
- A project-specific matrix spike and matrix spike duplicate frequency was not analyzed with every analytical batch, as stated in the work plan. One matrix spike/matrix spike duplicate pair was submitted for the 15 groundwater samples.

(intentionally blank)

5.0 FIELD INVESTIGATION ACTIVITIES

Field activities at NEC took place from 4 through 23 August 2016.

5.1 MOBILIZATION AND DEMOBILIZATION

Mobilization and demobilization occurred during August 2016. Jacobs personnel traveled from Anchorage to Nome via commercial airline on 4 August 2016; ECC and Total Safety traveled from Anchorage to Nome via commercial airline on 5 August 2016. Most of the field gear was transported to NEC on 8 August 2016 and from NEC on 23 August 2016 via Bering Air charter in a CASA 212-200 Aviocar aircraft (Photo 5-1).

Personnel commuted from Nome to NEC via Bering Air charter in a Piper RA31-350 Navajo aircraft daily when weather permitted. At all times, the charter Navajo aircraft remained on standby at NEC while personnel were performing field activities. Travel while onsite at NEC was performed using ATVs.

Photo 5-1: Field gear unloaded from the Bering Air CASA. View facing north.

A 12-foot by 20-foot weatherport shelter was erected on 8 August 2016 to serve as an emergency shelter and to stage emergency supplies and field equipment (Photos 5-2 and 5-3) in accordance with EM 385-1-1 (USACE 2014b). Emergency supplies included food and water, bedding, utilities, and fuel. Fire safety and first aid supplies and two satellite phones were present at NEC at all times. The shelter was also used for onsite sample management activities. A Davis Weather Wizard III weather station was erected to monitor NEC weather conditions. The shelter was dismantled on 23 August 2016 after fieldwork was complete.

Photo 5-2: Emergency weatherport shelter, weather station, and ATV. View facing northeast.

Photo 5-3: Emergency and field gear stored inside weatherport shelter. View from inside.

Due to inclement weather that reduced visibility, there was no travel from Nome to NEC on 6, 7, 9, 19, and 21 August 2016. On 12 August 2016, personnel flew toward NEC via Bering Air charter Beechcraft King Air 200 but were unable to land due to low ground fog at NEC FUDS and returned to Nome.

5.2 SAMPLING ACTIVITIES

NEC sampling occurred from 10 through 22 August 2016. Groundwater sampling activities at the MOC occurred from 10 through 16 August 2016. Soil, sediment, and surface water sampling activities occurred from 13 through 22 August 2016 and are presented under separate cover (USACE 2017). Copies of the field logbooks are provided in Appendix D.

Depth to water and photoionization detector (PID) headspace readings were measured in all 15 monitoring wells prior to purging within a one-hour period between 1140 and 1235 on 10 August 2016 (Photo 5-4) (refer to Section 6.1, Table 6-1, and Appendix D). The oil-water interface probe used to collect depth measurements was decontaminated before use at each monitoring well.

Photo 5-4: Typical collection of groundwater depth at a monitoring well; well 14MW04. View facing down.

The calibration of equipment used to measure field parameters was verified daily before use or recalibrated. The MiniRae 2000 PID, YSI 556 meter, and turbidimeter were calibrated using appropriate solutions and techniques, as needed. Equipment calibration verification and/or calibration information was recorded in the field logbooks (Appendix D).

Low-flow techniques were used for purging and MNA groundwater sampling of the monitoring wells at the MOC in accordance with the SOPs included in the 2016 WP (USACE 2016b). Wells were purged at rates between 0.1 and 0.5 liters per minute using a variable speed submersible pump. Water levels within the wells were monitored to ensure minimal drawdown of the water column. A drawdown of less than 0.3 feet was maintained during purging for all monitoring wells, except for MW10-1. A maximum drawdown of 0.6 feet was reached while purging MW10-1; the flow rate was reduced to between 0.1 and 0.15 liters per minute but the drawdown remained at 0.5 feet (see Section 4.0).

Field stability parameters were measured and recorded during purging using a YSI water quality meter with flow through cell and a micro turbidimeter (Photo 5-5). These included pH, temperature, conductivity, turbidity, DO, and ORP. Readings were collected at approximately 3- to 5-minute intervals and recorded on Groundwater Sampling Data Sheets (Appendix D).

Photo 5-5: Purging groundwater at Monitoring Well 14MW01.
View facing southeast.

Purge water was collected and treated onsite using a granulated activated carbon (GAC) filter drum prior to discharge onsite (see Section 5.3).

Immediately following the completion of well purging, the inlet line was removed from the flow-thru cell, and groundwater was transferred directly into the pre-preserved ALS Environmental (ALS) supplied containers. Samples were collected, in order of volatility from most volatile to least volatile.

For consistency with historical sampling events, 2016 samples from all wells were analyzed for GRO by Alaska Method 101 (AK101), DRO by AK102, RRO by AK103, PAHs by U.S. Environmental Protection Agency (EPA) Method SW8270D-SIM, PCBs by SW8082A, benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method SW8260C, methane by RSK 175, sulfate by EPA Method 300.0, alkalinity by SM 2320B, and total Resources Conservation and Recovery Act (RCRA) metals plus nickel, vanadium, and zinc by EPA

Method SW6020A/SW7470A. Samples from wells MW10-1 and 14MW06 associated with Site 10 within the MOC were also analyzed for VOCs by SW8260C and glycols by EPA Method SW8015C. Additionally, filtered water samples were collected from all wells for analysis of dissolved metals (RCRA metals plus manganese, nickel, vanadium, and zinc) by EPA Method SW6020A/SW7470A using a disposable 0.45-micron in-line water filter following collection for the other parameters listed above.

Field test kits were used to measure nitrate and ferrous iron per SOP K-6904 and SOP K-6010 (Attachment A-3 of the 2016 WP [USACE 2016]).

Sample collection data, including sample identification, collection start and end times, collection date, sample containers, analyses, and qualitative water quality, were recorded on Groundwater Sampling Data Sheets. Additional monitoring well information was recorded in the field logbooks shared between the two 2016 sample collection efforts (groundwater sampling at Site 8 and Suqi River [Appendix D]).

Samples were immediately placed into a chilled cooler and maintained at 0 to 6 degrees Celsius (°C) during storage and transportation to ALS. Samples were retained in the custody of ECC and Jacobs prior to shipment. All groundwater samples were shipped via Alaska Airlines Goldstreak priority cargo to ALS of Kelso, Washington (chain-of-custody documents are provided electronically in Appendix B, Attachment B-4) within two days of sample collection.

5.3 WASTE MANAGEMENT

Investigation-derived waste (IDW) was transported and disposed of in accordance with all applicable local, state, and federal regulations. IDW included used personal protective equipment, sample tubing, decontamination water, and general refuse. Solid wastes were stored in contractor bags and five bags of approximately 5 cubic feet each were disposed of by ECC in accordance with the Resource Conservation and Recovery Act and state waste regulations. Wastewater generated during decontamination was collected in a 5-gallon bucket.

The liquid waste was transferred to a GAC filter drum and gravity-fed through the filter prior to discharge onsite. Discharge was performed near the group of wells presented in Table 5-1. After use, the GAC filter drum was transported to Anchorage via Northern Air Cargo and returned to ECC for reuse. Sanitary waste collected from the portable toilet system was collected and disposed of by ECC (USACE 2016b). All solid waste was disposed of at the Nome Municipal Landfill located in Nome, Alaska.

Table 5-1
MOC Project-Specific Waste Quantities[1]

Waste Type	Well ID or Source	Date	Approximate Disposal Quantity
Nonhazardous Purge and Decontamination Wastewater	14MW01, 14MW02	18 August 2016	6.9 gallons
	14MW06, 14MW07, MW10-1, MW88-1 MW88-10, decontamination water	13 August 2016	17.6 gallons
	17MW-1, 20MW-1, 22MW2, 26MW1, 14MW03, 14MW04, 14MW05	14 August 2016	16.1 gallons
	MW88-3	16 August 2016	4.4 gallons
	Decontamination water and used calibration solutions	17 August 2016	2.4 gallons
IDW	Monitoring Wells 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, 14MW06, 14MW07, 17MW-1, 20MW-1, 22MW2, 26MW1, MW88-1, MW88-3, MW88-10	15 August 2016	10 cubic feet
General refuse[2]	Camp refuse	23 August 2016	5 cubic feet
		24 August 2016	10 cubic feet

Notes:

[1] Although general refuse was collected together from concurrent projects (groundwater sampling at the MOC and soil, sediment, and surface water sampling at Site 8 and the Suqi River), waste quantities presented in Table 5-1 are project specific.

[2]General refuse included spent personal protective equipment, sanitary waste, sampling materials, and empty food containers.

For definitions, refer to the Acronyms and Abbreviations section.

(intentionally blank)

6.0 INVESTIGATION RESULTS AND DISCUSSION

The primary focus of this section is to summarize and interpret the 2016 field measurements and analytical results collected at the MOC. Some information from prior data collection efforts at the MOC is also included in Table 6-2 and Appendix C when needed for comparison purposes. The sample summary table, complete analytical results, and DQA for the 2016 data are included in Appendix B.

6.1 DATA QUALITY EVALUATION

Data quality was assessed by reviewing the laboratory case narrative, laboratory data deliverables, and completing ADEC checklists. A review of the analytical results and associated quality control samples was performed by the Jacobs Project Chemist, as per the 2016 WP (USACE 2016b).

Data quality was evaluated against the following requirements: *Quality Systems Manual for Environmental Laboratories*, version 5.0 (DoD 2013); ADEC analytical methods (ADEC 2009); and laboratory limits. Qualifiers were applied to sample results that did not meet the project data quality objective. Qualified results are considered estimated and, whenever possible, indicated as biased high or low. For data qualifier definitions, refer to Section 1.1 of the DQA (Appendix B).

The DQA found the overall quality of the project data to be acceptable, and no results were rejected. DRO results were reported from an analytical run outside of the 40-day extract hold time. The sample results run within extract hold time indicated an instrument bias that would have underrepresented sample concentrations. The complete data set, in addition to data validation details, is provided in the DQA (Appendix B).

6.2 GROUNDWATER ELEVATION

Water level measurements collected from each of the 15 currently installed and serviceable MOC monitoring wells are provided in Table 6-1. A comparison of the 2016 groundwater elevations to previous measurements is provided in Table 6-2.

The maximum water table elevation at the MOC in 2016 was 74.87 feet above mean sea level (AMSL) at well 26MW1. Generally, groundwater elevation was highest in monitoring wells located along the eastern perimeter of the MOC. Wells along the eastern perimeter of the MOC also demonstrated the greatest differences in groundwater elevation between 2015 and 2016 (Tables 6-1 and 6-2; Plot C-1.1 in Appendix C) with the maximum change in elevation of 3.45 feet observed at well 26MW01. Based on data collected during the 2016 sampling event, groundwater flow at the MOC was predominantly northwest (Figure A-3.1).

The MOC plan and section view diagrams were created along the general south to north and west to east transects (Figure A-3.2). Both the west to east and south to north section views (Figures A-3.3 and A-3.4, respectively) in Appendix A indicate that water levels were above the screened interval for several wells.

Table 6-1
2016 Depth to Groundwater and Groundwater Elevation Measurements from Currently Installed and Serviceable Monitoring Wells at the MOC

Well ID	Time	Stick-Up (feet)	DTW (feet btoc)	DTW (feet bgs)	GWE[1] (feet AMSL)	Change in GWE[2] (feet)
14MW01	1230	-0.15	15.65	15.80	59.54	0.79
14MW02	1227	-0.30	10.50	10.80	60.08	0.92
14MW03	1222	-0.20	12.05	12.25	62.09	1.36
14MW04	1219	-0.48	3.22	3.70	63.86	1.44
14MW05	1215	-0.52	3.10	3.62	63.53	1.02
14MW06	1144	-0.50	3.47	3.97	67.45	1.03
14MW07	1156	-0.25	25.63	25.88	69.36	2.28
17MW-1	1234	-0.15	12.15	12.30	61.32	0.91
20MW-1	1202	-0.15	22.60	22.75	68.86	2.22
22MW2	1205	-0.45	27.57	28.02	68.37	2.35
26MW1	1210	-0.40	34.96	35.36	74.87	3.45
MW10-1	1140	2.20	5.18	2.98	68.52	1.67
MW88-1	1153	-0.15	16.94	17.09	67.56	2.03
MW88-10	1200	-0.35	20.69	21.04	68.10	2.13
MW88-3	1149	-0.20	12.32	12.52	67.38	1.9

Notes:
[1] Groundwater elevation calculated from top of casing elevation measurement presented in Figure 5 (USACE 2015b) and depth to water from top of casing measured in 2016.
[2] Difference in groundwater elevation from 2015 (USACE 2016a) to 2016.
btoc = below top of casing
For additional definitions, refer to the Acronyms and Abbreviations section.

Table 6-2
Historical Groundwater Elevation Measurements from Select MOC Monitoring Wells

Well ID	2016 GWE[1] (ft AMSL)	2015 GWE[2] (ft AMSL)	2014 GWE[3] (ft AMSL)	2013 GWE[4] (ft AMSL)	2012 GWE[5] (ft AMSL)	2011 GWE[6] (ft AMSL)	2010 GWE[7] (ft AMSL)	2004 GWE[8] (ft AMSL)	2002 GWE[9] (ft AMSL)
14MW01	59.54	58.75	59.03	--	--	--	--	--	--
14MW02	60.08	59.16	59.32	--	--	--	--	--	--
14MW03	62.09	60.73	60.74	--	--	--	--	--	--
14MW04	63.86	62.42	62.66	--	--	--	--	--	--
14MW05	63.53	62.51	61.82	--	--	--	--	--	--
14MW06	67.45	66.42	65.27	--	--	--	--	--	--
14MW07	69.36	67.08	67.47	--	--	--	--	--	--
17MW-1	61.32	60.41	60.88	60.44	62.22	64.19	64.11	61.39	61.57
20MW-1	68.86	66.64	67.04	66.44	69.27	71.24	67.68	66.30	66.48
22MW2	68.37	66.02	66.46	65.92	69.14	65.69	67.27	65.51	65.9
26MW1	74.87	71.42	72.98	71.14	74.38	76.88	68.97	70.53	70.63
MW10-1	68.52	66.85	66.55	66.25	69.25	70.32	68.63	66.15	66.53
MW88-1	67.56	65.53	65.858	64.92	67.38	69.22	65.84	65.63	66.04
MW88-10	68.10	65.97	66.28	65.51	67.96	70.58	67.20	65.98	66.17
MW88-3	67.38	65.48	65.74	--	--	--	--	65.5	65.86
MW88-4[10]	--	--	--	--	62.41	63.06	62.11	60.53	60.62
MW88-5[10]	--	--	--	--	60.19	61.48	60.5	60.34	60.55

Notes:

[1] Groundwater elevation calculated from top of casing elevation measurement presented in Figure 5 (USACE 2015b) and depth to water from top of casing measured in 2016.

[2] Groundwater elevation presented in 2015 Annual Groundwater Sampling Report (USACE 2016a).

[3] Groundwater elevation presented in 2014 Northeast Cape HTRW Remedial Actions, Revision 1 (USACE 2015b).

[4] Groundwater elevation presented in Northeast Cape HTRW Remedial Actions (USACE 2014).

[5] Groundwater elevation presented in Northeast Cape HTRW Remedial Actions (USACE 2013).

[6] Groundwater elevation presented in Northeast Cape HTRW Remedial Actions (USACE 2012).

[7] Groundwater elevation presented in Northeast Cape HTRW Remedial Actions (USACE 2011a).

[8] Groundwater elevation presented in Phase IV Remedial Investigation (USACE 2005).

[9] Groundwater elevation presented in Site Characterization Technical Memorandum 2002 Phase III Remedial Investigation Sites 13, 15, 19, 27, and 22(USACE 2002).

[10] Wells not measured from 2013 through 2016 were removed before 2013 sampling as a result of soil excavation at the MOC.

-- = not measured

For definitions, refer to the Acronyms and Abbreviations section.

6.3 NATURAL ATTENUATION IN GROUNDWATER

The physical chemistry parameters of pH, temperature, conductivity, turbidity, DO, and ORP measurements recorded during the 2016 field effort are summarized in Table 6-3. Temperature ranged from 3.25 to 10.03°C and was inversely related to groundwater depth from the surface; as the depth to water increased the temperature decreased.

Conductivity ranged between 50 and 235 micro Siemens per centimeter (µS/cm) and was highest in downgradient source area wells. Turbidity was measured below 30 nephlometric turbidity units (NTU) in samples collected from all wells except in 14MW04; while measuring turbidity in the visually turbid water from 14MW04, the meter displayed a code indicating that turbidity was too high to measure. Measurements for pH were slightly acidic and ranged between 5.00 and 6.57. Positive ORP was measured in all groundwater monitoring wells and ranged from 0.60 millivolts (mV) to 231.40 mV. Values for DO ranged from 0.45 to 12.98 milligrams per liter (mg/L); higher DO values were typically measured in wells with high ORP.

Table 6-3
2016 Groundwater Field Parameters Prior to Sampling

Well ID	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (pH units)	ORP (mV)	Turbidity (NTU)
14MW01	4.37	94	0.53	6.02	0.6	20.40
14MW02	6.84	123	0.51	5.88	11.6	4.60
14MW03	4.14	93	0.60	5.99	26.7	26.10
14MW04	7.66	203	0.62	6.05	91.4	-
14MW05	6.82	127	0.46	5.87	71.6	8.45
14MW06	9.33	235	0.45	6.57	47.2	2.29
14MW07	3.74	52	10.09	5.42	187.7	3.35
17MW-1	3.94	56	10.31	5.45	223.4	2.84
20MW-1	4.63	73	11.65	5.60	222.5	6.05
22MW2	4.50	55	12.15	5.52	230.6	2.95
26MW1	4.54	50	12.98	5.48	231.4	3.98
MW10-1	10.03	69	4.75	5.25	225.1	11.10
MW88-1	6.15	58	4.09	5.23	183.7	2.19
MW88-10	4.50	62	1.06	5.54	184.6	8.50
MW88-3	3.25	57	4.70	5.00	218.1	7.98

Notes:
- = Turbidimeter displayed code indicating turbidity may be too high to read.
For definitions, refer to the Acronyms and Abbreviations section.

Table 6-4 presents natural attenuation analytical results from 2016 samples. Wells with the highest concentrations of ferrous iron also exhibited the highest dissolved manganese concentrations and were all source area wells. Typically, low nitrate was found in source area wells. Alkalinity was highest in the primary and field duplicate samples collected from

14MW06 at 140 and 138 mg/L, respectively. High sulfate was found in samples collected from source area wells 14MW04 and 14MW05; the highest methane concentrations were found in the same wells.

Table 6-4
2016 Analytical Natural Attenuation Parameter Results

Well ID	Ferrous Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)	Alkalinity (mg/L)	Methane (mg/L)
14MW01	10	0.916	17.7	0	18.7	0.024
14MW02	10	1.86	14.7	0	40	0.023
	10	1.84	14.6	0	40	0.025
14MW03	10	1.36	16.9	0	28	0.0082
14MW04	3.5	1.71	31.2	0	91	0.02
14MW05	10	2.71	23.1	0	47	0.01
14MW06	2	1.28	15.3	0.2	140	0.0083
	2	1.26	15.2	0.2	138	0.0093
14MW07	<0.03	0.0359	12.7	0.1	11.7	ND (0.00063)
17MW-1	<0.03	0.00156	16.9	0.2	10	ND (0.00063)
20MW-1	<0.03	0.00321	19.6	0.1	21	ND (0.00063)
22MW2	<0.03	0.000535	15.4	0.1	7	ND (0.00063)
26MW1	<0.03	0.000754	13.6	0	6.3	ND (0.00063)
MW10-1	<0.03	0.00344	7.37	0.2	17	ND (0.00063)
MW88-1	0.1	0.291	14.1	0.2	13	0.00043 J
MW88-10	0.2	0.203	17.8	0.1	17.7	0.0036
MW88-3	<0.03	0.364	14.8	0	16	ND (0.00063)

Notes:
ND = not detected
For data qualifiers, refer to the DQA in Appendix B.
For definitions, refer to the Acronyms and Abbreviations section.

Appendix C presents summaries of groundwater data from historical monitoring events. For a select list of field parameters and analytical natural attenuation parameters from samples collected since 2010 see Table C-2.1 in Appendix C. Graphs of select field and MNA parameters for monitoring wells with three or more sampling events are presented in Plots C-2.2.1 through C-2.2.11.2 (Appendix C). Figures A-4.1 through A-4.8 display select natural attenuation parameters over time. Figures A-5.1 through A-5.4 present historical data from 2002 through 2016 while A-6.1 through A-6.4 present historical data from 2014 through 2016.

Parameters used to measure water quality can also be used to interpret the likelihood and degree of natural attenuation. Natural attenuation involves natural processes to decrease concentrations of contaminants. These processes are chiefly dilution, dispersion, and biological degradation by bacteria in groundwater.

Monitoring wells 26MW1, 22MW2, 20MW-1, and 14MW07 are located upgradient of all known petroleum sources at the MOC. Groundwater quality in samples collected from these upgradient wells was typical of water not impacted by petroleum and contained high ORP and DO, low levels of ferrous iron, dissolved manganese and alkalinity, variable nitrate concentrations, and no detectable methane. Monitoring wells 17MW1 and MW10-1 are crossgradient to known petroleum sources at the MOC. Groundwater from crossgradient wells was similar to groundwater quality in samples collected from upgradient monitoring wells.

Groundwater quality in samples collected from monitoring wells in former source areas indicate natural attenuation of petroleum is occurring. Monitoring wells MW88-1, MW88-3, MW88-10, 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06 were considered former source area monitoring wells. Several monitoring wells within this group (wells 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06) have the lowest ORP and DO, the highest levels of ferrous iron and dissolved manganese, high alkalinity, low nitrate, and the highest methane; these conditions indicate that anaerobic petroleum degradation activities are occurring in groundwater. Ferrous iron concentrations in groundwater are likely related to reducing conditions in groundwater, not subsurface ferrous metal waste left in soil. To a lesser extent, wells MW88-1, MW88-3, and MW88-10 displayed similar conditions to the other source area wells.

6.4 CONTAMINANTS IN GROUNDWATER

This section provides two assessments of the 2016 MOC groundwater samples. The first assessment compares the 2016 MOC monitoring well data with the DD-established SSCLs. The second assessment compares the 2016 MOC monitoring well data with the 2016 promulgated ADEC evaluation criteria for informational purposes. The 2016 ADEC evaluation criteria were promulgated after the DD-specified SSCLs were determined and approved in the 2009 DD. Although more stringent cleanup levels for some MOC COCs have been promulgated by the State in 2016, the DD-specified SSCLs will remain unchanged until the next five-year review evaluates the protectiveness of the SSCLs. No assessment of the differences between the DD-specified SSCLs and the 2016 ADEC evaluation criteria is made in this report. The next five-year review of the MOC, scheduled for 2020, will assess the differences in DD-specified SSCLs and the recently promulgated ADEC groundwater evaluation criteria.

Filtered and unfiltered groundwater sample results are presented in this report as distinct results in an effort to distinguish if soil particles in unfiltered groundwater are contributing to metals levels. There are no distinct SSCLs or 2016 ADEC evaluation criteria associated with filtered or unfiltered samples. The 2016 ADEC evaluation criteria are typically calculated considering only the water soluble fraction. Therefore, metals results from unfiltered samples overestimate metals levels.

The currently installed and serviceable monitoring well network at the MOC consists of 15 monitoring wells. Figure A-3.2 in Appendix A shows the locations of the 15 wells available for sampling and the locations of 16 abandoned wells that are no longer available for sample collection.

6.4.1 Comparison of 2016 MOC Monitoring Well Data to DD-Specified Groundwater SSCLs

2016 Groundwater results from some monitoring wells at the MOC exceeded the DD-specified SSCLs. All of the wells with SSCL exceedances are found on the northern (downgradient) edge of the MOC. None of the monitoring wells located upgradient of known soil contamination at the MOC contained exceedances of the SSCLs or other notable detections.

DRO exceeded the DD-specified SSCL in three wells (wells 14MW02, 14MW04, and 14MW05) of the 15 wells. Lead also exceeded the DD-specified SSCL in one (well 14MW04) of the 15 wells for both filtered and unfiltered samples. No other analytes exceeded the DD-specified SSCLs in 2016 groundwater samples. Table 6-5 shows 2016 analytical results for compounds that historically have exceeded the DD-specified SSCLs in at least one well. The full list of 2016 analytical results can be found in the Table B-1-2 located in Appendix B.

DRO exceeded the SSCL of 1.5 mg/L in samples collected from wells 14MW02, 14MW04, and 14MW05. The DRO concentration was the highest, 3.2 mg/L, in the sample collected from well 14MW05. Samples collected from wells 14MW02 and 14MW04 had DRO concentrations of 1.6 mg/L (1.5 mg/L in the field duplicate sample) and 2.2 mg/L, respectively, and were qualified QL as the extracts were analyzed past 40 days from extraction. Other notable DRO detections of 1.4, 0.99, and 0.92 mg/L were reported in samples collected from wells 14MW06, 14MW03, and 14MW01, respectively, and were below the SSCL for DRO. Wells 14MW06, 14MW03, and 14MW01 are found adjacent to other MOC wells with DRO exceedances and they appear to define the east and western edges of the MOC DRO plume. Samples from wells 14MW06, 14MW03, and 14MW01 were also qualified QL as the extracts were analyzed past 40 days from extraction. The QL qualifier did not affect data usability in this case since analysis within hold time produced lower results than those obtained from the out of hold time analysis which occurred two days past the extract hold time. DRO results are discussed in the DQA in Appendix B.

Lead was the only metal to exceed SSCLs in 2016 groundwater samples (well 14MW04). Filtered and unfiltered groundwater samples were submitted for analysis to determine if small soil particles in groundwater were contributing to sample results. Both filtered and unfiltered results from well 14MW04 exceeded the 0.015 mg/L lead SSCL. Lead results from the unfiltered sample were 0.0582 mg/L and lead results from the filtered sample were 0.0349 mg/L. Although field observations noted that well 14MW04 had visually turbid water, turbidity did not account for the results reported in the filtered sample. Lead present in the groundwater in the vicinity of 14MW04 is likely due to the reducing conditions in groundwater at well 14MW04 that allow lead to leach from surrounding soil. The natural attenuation of DRO is the cause of the reducing conditions in groundwater near well 14MW04 (refer to Section 6.5).

Table 6-5
2016 MOC Groundwater Sample Results Compared To Historically Exceeded Site-Specific Cleanup Levels

	GRO[1] (mg/L)	**DRO[2] (mg/L)**	**RRO[3] (mg/L)**	**Benzene[4] (mg/L)**	**Arsenic-Total[5] (mg/L)**	**Arsenic-Dissolved[5] (mg/L)**	**Lead-Total[5] (mg/L)**	**Lead-Dissolved[5] (mg/L)**
SSCL	**1.3**	**1.5**	**1.1**	**0.005**	**0.01**	**0.01**	**0.015**	**0.015**
14MW01	0.065 J	0.92	0.12 J,B	ND (0.0001)	0.0046 QL	0.00439	0.00153 QL	0.000159
14MW02	0.14	**1.6**	0.18 J,B	ND (0.0001)	0.00244	0.00241	0.000496	0.000054 B, QN
	0.14	1.5	0.17 J,B	ND (0.0001)	0.00235	0.00237 QN	0.00045	0.000083 B, QN
14MW03	0.075 J	0.99 QL	0.16 J,B,QL	ND (0.0001)	0.00194	0.00186	0.00318	0.00126
14MW04	0.011 J	**2.2 QL**	0.61 B,QL	0.00013 J,QH	0.00524	0.00387	**0.0582**	**0.0349**
14MW05	0.072 J	**3.2 QL**	0.61 B,QL	ND (0.0001)	0.00207	0.00194	0.00165	0.000252
14MW06	0.011 J	1.4 QL	0.55 B,QL	ND (0.0001)	0.00203	0.00203	0.000861	0.000649 QN
	0.011 J	1.4 QL	0.47 B,QL	ND (0.0001)	0.00197	0.00197	0.000817	0.000208 B,QN
14MW07	ND (0.025)	0.12 J,B,QL	0.093 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000338	0.000052 B
17MW1	ND (0.025)	0.092 J,B,QL	0.13 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.00025	0.000045 B
20MW1	ND (0.025)	0.09 J,B,QL	0.13 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000866	0.000248
22MW2	ND (0.025)	0.1 J,B,QL	0.36 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000085 B	0.000026 B
26MW1	ND (0.025)	0.11 J,B,QL	0.79 B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000474	0.000025 B
MW10-1	ND (0.025)	0.49 J,B,QL	0.32 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000558	0.000042 B
MW88-1	ND (0.025)	0.52 J,B,QL	0.23 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000301	0.000075 B
MW88-10	ND (0.025)	0.3 J,B,QL	0.16 J,B,QL	ND (0.0001)	0.00022 J	0.00023 J	0.00143	0.000227
MW88-3	ND (0.025)	0.49 J,B,QL	0.15 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000383	0.000158 B

Notes:
[1] Analyzed by Method AK101
[2] Analyzed by Method AK102
[3] Analyzed by Method AK103
[4] Analyzed by Method SW8260C
[5] Analyzed by Method SW6020
Bold and highlighted text indicates result exceeding the SSCL (USACE 2009).
ND = not detected
For definitions, refer to the Acronyms and Abbreviations section.
For data qualifiers, refer to the DQA in Appendix B.

6.4.2 Comparison of 2016 MOC Monitoring Well Data to 2016 ADEC Evaluation Criteria

2016 Groundwater results from some monitoring wells at the MOC exceeded the 2016 ADEC evaluation criteria Table 6-6 shows analytical results for compounds that exceeded the ADEC evaluation criteria in at least one well. The full list of 2016 analytical results can be found in Table B-1-2 (Appendix B).

DRO exceeded the 2016 ADEC evaluation criteria in three wells (wells 14MW02, 14MW04, and 14MW05) of the 15 currently installed and serviceable MOC wells. Naphthalene exceeded ADEC evaluation criteria in two wells (wells 14MW01 and 14MW02) of the 15 currently installed and serviceable MOC wells. Metal exceedances for lead (well 14MW04) and arsenic (wells 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06) were also present in the monitoring well samples.

While no evidence of chromium speciation in groundwater exists at NEC, no known anthropogenic source for chromium in groundwater exists (USACE 2009). In accordance with state regulations and the 2016 ADEC evaluation criteria, analytical results reported for total chromium are considered background chromium(III) in the absence of an anthropogenic source (ADEC 2016b). Therefore, chromium concentrations did not exceed 2016 ADEC evaluation criteria of 22 mg/L for chromium(III).

Table 6-6
2016 MOC Groundwater Sample Results Compared To Select 2016 ADEC Evaluation Criteria

	DRO[1] (mg/L)	Naphthalene[2] (mg/L)	Arsenic-Total[3] (mg/L)	Arsenic-Dissolved[3] (mg/L)	Lead-Total[3] (mg/L)	Lead-Dissolved[3] (mg/L)
2016 ADEC Criteria	**1.5**	**0.0017**	**0.00052**	**0.00052**	**0.015**	**0.015**
14MW01	0.92	**0.0075**	**0.0046 QL**	**0.00439**	0.00153 QL	0.000159
14MW02	***1.6***	**0.0037**	**0.00244**	**0.00241**	0.000496	0.000054 B, QN
	1.5	**0.0038**	**0.00235**	**0.00237 QN**	0.00045	0.000083 B, QN
14MW03	0.99 QL	0.00072	**0.00194**	**0.00186**	0.00318	0.00126
14MW04	**2.2 QL**	0.000022	**0.00524**	**0.00387**	**0.0582**	**0.0349**
14MW05	**3.2 QL**	0.00072	**0.00207**	**0.00194**	0.00165	0.000252
14MW06	1.4 QL	0.00006 B,QN	**0.00203**	**0.00203**	0.000861	0.000649 QN
	1.4 QL	0.000033 B,QN	**0.00197**	**0.00197**	0.000817	0.000208 B,QN
14MW07	0.12 J,B,QL	0.0000061 J,B	ND (0.00025)	ND (0.00025)	0.000338	0.000052 B
17MW1	0.092 J,B,QL	0.0000076 J,B	ND (0.00025)	ND (0.00025)	0.00025	0.000045 B
20MW1	0.09 J,B,QL	0.0000054 J,B	ND (0.00025)	ND (0.00025)	0.000866	0.000248
22MW2	0.1 J,B,QL	ND (0.0000051)	ND (0.00025)	ND (0.00025)	0.000085 B	0.000026 B
26MW1	0.11 J,B,QL	0.0000045 J,B	ND (0.00025)	ND (0.00025)	0.000474	0.000025 B
MW10-1	0.49 J,B,QL	0.0000046 J,B	ND (0.00025)	ND (0.00025)	0.000558	0.000042 B
MW88-1	0.52 J,B,QL	0.0000071 J,B	ND (0.00025)	ND (0.00025)	0.000301	0.000075 B
MW88-10	0.3 J,B,QL	0.0000088 J,B	0.00022 J	0.00023 J	0.00143	0.000227
MW88-3	0.49 J,B,QL	0.000035 B	ND (0.00025)	ND (0.00025)	0.000383	0.000158 B

Notes:

[1] Analyzed by Method AK102

[2] Analyzed by Method SW8270SIM

[3] Analyzed by Method SW6020

Bold and highlighted text indicates result exceeding 2016 ADEC evaluation criteria (ADEC 2016b).

ND = not detected

For definitions, refer to the Acronyms and Abbreviations section.

For data qualifiers, refer to the DQA in Appendix B.

6.4.3 Analyte Concentration Trends in Groundwater

Historically, GRO, DRO, RRO, benzene, arsenic, and lead have exceeded groundwater SSCLs. In 2016 only DRO and lead exceeded the SSCLs. The DRO concentration in two wells (14MW04, and 14MW05) of the three wells (14MW02, 14MW04, and 14MW05) with 2016 SSCL exceedances have generally decreased over time since monitoring began in 2014. The DRO concentration in well 14MW02 have slightly increased since monitoring began in

2014. A table with historical results and charts displaying time series trends for each contaminant at select wells are presented in Table C-3.1 (Appendix C).

GRO historically exceeded screening levels in only one monitoring well (MW88-5). This well was located in the northern portion of the MOC in an area of soil contamination removed during 2012 MOC soil excavation activities. GRO exceedances in well MW88-5 occurred in 2002 (year of installation) and again in 2004 with concentrations of 1.3 and 1.5 mg/L, respectively. Monitoring did not occur again at well MW88-5 until 2010 and a GRO concentration of 0.19 mg/L was reported at that time. Monitoring continued at well MW88-5 in 2011 and 2012 with reported GRO concentrations of 0.25 and 0.16 mg/L, respectively. The MW88-5 well time series plot for GRO (Plot C-3.2.7 in Appendix C) shows concentration levels for the most recent sampling events (2010, 2011, and 2012) are significantly lower than those seen in 2002 and 2004 and less than 50 percent of the SSCL. Due to the lack of monitoring data between 2004 and 2010, the trend line assumes that a gradual decrease occurred. However, there is no information to confirm or disprove this assumption. Similar fluctuations in GRO levels were observed at well MW88-4 (Plots C-3.2.6.1 and C-3.2.6.2 in Appendix C) located approximately 200 feet east (crossgradient) of well MW88-5 suggesting similar factors were affecting both wells at the times of sample collection. Although more data points would be helpful to put the older results in perspective, both wells MW88-4 and MW88-5 were removed in 2012 and are no longer available for sampling.

DRO has historically exceeded the SSCL of 1.5 mg/L in 10 monitoring wells (Table C-3.1 and Plots C-3.2.1 through C-3.2.9 in Appendix C). The highest DRO concentrations for wells MW88-4, MW88 10, and MW88-3 were in 2002 at 72 mg/L (56 mg/L duplicate sample), 55 mg/L, and 34 mg/L, respectively. Samples collected from these wells in 2004 were much lower; only the sample collected from well MW88-4 exceeded the SSCL at 3.89 mg/L. In well MW88-5, the highest DRO concentration of 12 mg/L was found in a sample collected in 2010. Samples collected from wells MW88-4 and MW88-5 exceeded the SSCL for DRO through 2012 after which both wells were decommissioned and removed as a result of POL-contaminated soil excavation. In 2012, a sample collected from well MW88-1 contained a DRO exceedance of the SSCL at a concentration of 1.9 mg/L. In 2014, samples collected from 14MW03 and 14MW06 had their highest DRO concentrations at 2.4 and 5.2 mg/L, respectively; the result from well 14MW06 was qualified QL. While DRO concentrations in samples collected from well 14MW06 remained above the SSCL in 2015, samples from well 14MW03 exceeded the DRO SSCL in 2014 only. Monitoring wells 14MW04 and 14MW05 contained their highest DRO concentrations at 2.8 mg/L, qualified QN (1.68 mg/L, qualified QL, QN duplicate sample) and 12 mg/L (11 mg/L duplicate sample), respectively, in samples collected in 2015. Samples from wells 14MW04 and 14MW05 have exceeded the SSCL for DRO during every sampling event (2014, 2015, and 2016). DRO had its highest concentration in a sample collected from 14MW02 at 1.6 mg/L in both 2015 and 2016, slightly greater than the 1.3 mg/L found in its first year of monitoring (2014). As of 2016, only samples collected from wells 14MW02, 14MW04, and 14MW05 exceeded the DRO SSCL.

Samples collected from three monitoring wells have exceeded the RRO SSCL of 1.1 mg/L (Table C-3.1 and Plots C-3.2.1 through C-3.2.9 in Appendix C). At 1.3 mg/L, a sample collected from well MW88-10 exceeded the RRO SSCL in only 2002. In 2002 and 2004, RRO in samples collected from well MW88-4 exceeded the SSCL; RRO was at its highest, 1.9 mg/L, in well MW88-4 in 2002. RRO was also at its highest in a sample collected from well MW88-5 in 2002, at 2.3 mg/L and continued to exceed the SSCL in 2004, 2010, and 2011. No groundwater sample results have exceeded the RRO SSCL since 2011.

Benzene exceeded the SSCL of 0.005 mg/L in every year well MW88-5 was sampled and three of five years well MW88-4 was sampled (Table C-3.1 and Plots C-3.2.1 through C-3.2.9 in Appendix C). Samples collected from both wells had their highest benzene concentration in 2004. In samples collected in 2004, benzene was 0.0337 mg/L in well MW88-4 and 0.0297 mg/L in well MW88-5. Between 2004 and 2012, benzene concentrations decreased in samples collected from both wells. Prior to the removal of well MW88-4 after 2012 sampling, benzene in samples collected from well MW88-4 was below the SSCL of 0.005 mg/L while in samples collected from well MW88-5, benzene was 0.0064 mg/L. No groundwater samples have exceeded the benzene SSCL since 2012. In addition to historical exceedances of the SSCL for benzene, a sample collected from well MW88-4 in 2012 exceeded the 2016 ADEC evaluation criteria of 0.0046 mg/L at 0.0048 mg/L.

Monitoring well MW88-4 is the only well where sample results exceeded the SSCL of 0.1 mg/L for total and dissolved arsenic (Table C-3.1 and Plot C-3.2.6 in Appendix C). Total arsenic was 0.011 mg/L in 2012. Dissolved arsenic was 0.011 mg/L in both 2011 and 2012. Arsenic has never been detected in samples collected from wells 17MW-1, 22MW2, 26MW1, MW88-1, and MW88-3. Only samples collected from wells 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, 14MW06, 14MW07, MW88-4, and MW88-5 have had detectable levels of arsenic above the 2016 ADEC evaluation criteria. The 2016 ADEC evaluation criteria of 0.00052 mg/L was nearly 20 times lower than the SSCL. Due to analytical limits of detection nearly an order of magnitude greater than the 2016 ADEC evaluation criteria, all currently sampled monitoring wells, well MW88-4, and well MW88-5 may have exceeded the 2016 ADEC evaluation criteria for arsenic. Since no anthropogenic source for arsenic in MOC groundwater exists, arsenic levels in MOC groundwater are not likely the result of military impacts at NEC (USACE 2009). Elevated arsenic concentrations in groundwater should be attributed to background concentrations (ADEC 2016b).

Historically, total and dissolved lead levels have exceeded the SSCL of 0.015 mg/L once in samples collected from five monitoring wells (Table C-3.1 and Plots C-3.2.1 through C-3.2.9 in Appendix C). In 2004, total lead was 0.0517 and 0.0376 mg/L in samples collected from wells 20MW1 and MW88-10, respectively; samples collected in 2004 were not analyzed for dissolved lead. In 2014, total lead was 0.13 and 0.052 mg/L in samples collected from wells 17MW1 and 14MW03, respectively; dissolved lead was not detected. A sample from well 14MW03 contained total lead equal to the SSCL at 0.015 mg/L in 2015. In 2016, the sample collected from well 14MW04 was the only sample to have concentrations of total and dissolved lead above the SSCL at 0.0582 and 0.0349 mg/L, respectively.

While the 2016 ADEC evaluation criteria for DRO, RRO, and lead equal the SSCL and the 2016 evaluation criteria for benzene and arsenic are lower than SSCLs, the 2016 evaluation criterion for GRO is higher than the GRO SSCL of 1.3 mg/L. The 2016 ADEC evaluation criteria of 2.2 mg/L for GRO has not been exceeded in any groundwater samples collected from the currently installed and serviceable wells at the MOC.

At the time of the 2009 DD, naphthalene was not assigned an SSCL in groundwater. In 2016, naphthalene exceeded 2016 ADEC evaluation criteria in samples collected from wells 14MW01 and 14MW02. Since naphthalene exceeded the 2016 ADEC evaluation criteria, the applicability of a future SSCL for naphthalene will be addressed during the next five-year review. Plots C-3.3.1 through C-3.3.9 (Appendix C) presents naphthalene concentrations in samples collected from select wells over time. Naphthalene concentrations have decreased over time in all well samples except samples collected from well 14MW01.

6.5 NATURAL ATTENUATION OF DRO

MNA is the selected remedy for MOC groundwater. Natural attenuation relies on in situ biological, physical, and chemical processes to reduce contaminant concentrations over time. Typically, the primary line of evidence of natural attenuation is a steady decreasing trend of analyte levels over time. Geochemical parameters provide a secondary line of evidence that biological or chemical processes are occurring and help identify what type of biological processes are taking place. Tracking geochemical conditions with COC concentrations over time will assist in the ongoing evaluation of remedy performance. Analyte levels over time and geochemical groundwater parameters were evaluated at all 15 of the currently installed and serviceable MOC monitoring wells through field measurements and laboratory analysis.

The current DRO plume at the MOC is located at the northern portion of the site in the area of wells 14MW02, 14MW04, 14MW05, and MW88-4. Although historically DRO exceedances in groundwater were found in the central portion of the site near wells 14MW03 and 14MW06, removal of contaminated soil appears to have contributed to reductions in DRO groundwater concentrations in this area indicating the area was likely contributing to DRO levels observed in MOC groundwater.

Three monitoring wells were selected for additional statistical trend analysis based on DRO concentrations remaining above the SSCL in 2016 samples. DRO levels in samples collected from the existing in-plume wells 14MW02, 14MW04 and 14MW05 continue to exceed the SSCL for DRO of 1.5 mg/L and ranged from 1.6 to 3.2 mg/L. The three years of monitoring results for these wells were assessed for statistical trends using both the Mann-Kendall trend test and geometric regression plots. However, the low number of measurements can only provide a coarse assessment of this primary line of evidence.

The Mann-Kendall trend test identifies whether a trend exists and, if a trend is present, it identifies the trend as increasing or decreasing. The Mann-Kendall test did not identify any significant trends in samples collected from wells 14MW02, 14MW04 and 14MW05. The Mann-Kendall trend test analysis input and results are provided in Tables C-4.3.1 through C-4.3.4 (Appendix C).

At well 14MW02, DRO had its highest concentration in a sample collected from well 14MW02 at 1.6 mg/L in both 2015 and 2016, slightly greater than the 1.3 mg/L found in its first year of monitoring (2014). No geometric regression was prepared for 14MW02 since the 2016 result was not lower than the 2015 result.

At wells 14MW04 and 14MW05, DRO levels have demonstrated some fluctuation with results from 2015 being the highest of the three years and results from 2016 being the lowest, however the slope of the regression line for 14MW04 and 14MW05 is negative. A degradation rate was estimated using a geometric first-order regression, expressed as a half-life, to time-series data for wells 14MW04 and 14MW05. The intersection of the 95-percent upper confidence limit (UCL95) of the regression line with the SSCL provides an estimate of the cleanup date accounting for data scatter. This geometric regression approach is consistent with EPA guidance (EPA 2014). Following the aforementioned process of geometric regression, DRO in well 14MW04 had a half-life of 10.6 years, DRO SSCL attainment was expected to start in 2023, and attenuation is predicted to be complete in 2037 (Plot C-4.1.1 and Tables C-4.1.1 and C-4.1.2 in Appendix C). In well 14MW05, DRO had a half-life of 3.2 years, attainment of the SSCL for DRO is expected to begin in 2021, and attenuation is predicted to be complete in 2047 (Plot C-4.2.1 and Tables C-4.2.1 and C-4.2.2 in Appendix C). Additional monitoring events in the future will be needed to fully assess trends and provide higher confidence in half-life values.

The groundwater geochemical parameters measured in the field included ferrous iron, nitrate, conductivity, DO, and ORP . The groundwater geochemical parameters tested at the analytical laboratory included methane, manganese, sulfate, and alkalinity. Isopleth figures of selected geochemical parameters can be found in Appendix A (Figures A-4.1 through A-4.8).

The geochemical parameter results indicate that anaerobic biological processes are currently dominant at the core of the DRO plume along the north portion of the MOC. This is evident from the elevated levels of methane, ferrous iron, and manganese coupled with reduced levels of sulfate, nitrate, DO, and ORP in the area. Aerobic processes will be dominant at the exterior margins of the plume where higher DO levels and higher ORP values are observed.

Based on both the geometric regression plots from wells 14MW04 and 14MW05 and the results of the geochemical parameters in the area, natural attenuation is occurring.

(intentionally blank)

7.0 CONCLUSIONS

The following conclusions are separated into two groups: conclusions based on the evaluation of 2016 MOC groundwater sampling data and conclusions based on the comparison of 2016 data to the historical data set.

7.1 CONCLUSIONS FOR 2016 DATA EVALUATION

- The 2016 groundwater flow direction at the MOC is predominantly northwest. The 2016 MOC water table elevation resulted in some of the well screened intervals to be submerged at the time of sampling.
- The DRO plume is located along the northern margin of the MOC. Groundwater from wells located in the central portion of the MOC did not exceed the DRO SSCL.
- DRO and lead exceeded groundwater SSCLs in 2016. DRO in samples collected from wells 14MW02, 14MW04, and 14MW05 exceeded the DRO SSCL of 1.5 mg/L at 1.6, 2.2, and 3.2 mg/L, respectively. The lead results for both filtered and unfiltered samples collected from well 14MW04 exceeded the lead SSCL of 0.015 mg/L at 0.0582 and 0.0349 mg/L, respectively.
- Comparisons of 2016 MOC groundwater results for analytes without a SSCL to 2016 ADEC evaluation criteria identified that naphthalene was present above the ADEC evaluation criteria in samples collected from wells 14MW01 and 14MW02.
- In general, dissolved metals concentrations obtained from field-filtered samples were less than the metals concentrations reported in corresponding unfiltered samples.
- Groundwater geochemical parameters measured in 2016 at the 15 currently installed and serviceable MOC monitoring wells indicated that natural attenuation of petroleum is occurring. Anaerobic processes are dominant for in-plume wells and aerobic processes are dominant at the margins of the plume.

7.2 CONCLUSIONS FOR COMPARISON OF 2016 DATA WITH HISTORICAL DATA

- DRO levels at in-plume MOC monitoring wells is predicted to reach the SSCL by 2023 with attenuation complete by 2047. The cleanup dates are based on a small data set comprised of 2014, 2015, and 2016 results. Additional monitoring data are needed to provide higher confidence in the predicted cleanup dates.
- Groundwater elevation in 2016 was higher than the elevations observed in the previous two monitoring events at the MOC.

(intentionally blank)

8.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2009 (March). *Environmental Laboratory Data and Quality Assurance Requirements; Technical Memorandum*. Division of Spill Prevention and Response. Contaminated Sites Program.

ADEC. 2016a (March). *Field Sampling Guidance*. Division of Spill Prevention and Response Contaminated Sites Program.

ADEC. 2016b (November). *Oil and Other Hazardous Pollution Control Regulations. Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances.* 18 AAC 75.

DoD (U.S. Department of Defense). 2013 (July). *Quality Systems Manual for Environmental Laboratories.* DoD Environmental Quality Workgroup, Department of the Navy, Lead Service. Version 5.0, Final.

EPA (U.S. Environmental Protection Agency). 2014 (August). *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well*. OSWER 9283.1-44.

Patton, W. and B. Csejtey. 1980. Geologic map of St. Lawrence Island, Alaska: U.S. Geological Survey Miscellaneous Investigation Series. Map I-1203. 1 sheet, scale 1:250,000. RAB (Restoration Advisory Board). 2012a (5 December). *St. Lawrence Island Restoration Advisory Board and Public Meeting, Meeting Minutes*. City Hall, Savoonga, Alaska. F10AK096904_08.10_0019_p.

USACE (U.S. Army Corps of Engineers). 2002 (October). *Site Characterization Technical memorandum 2002 Phase III Remedial Investigation Sites 13, 15, 19, 27 and 22, Northeast Cape, St. Lawrence Island, Alaska*. Prepared by Montgomery Watson Harza. F10AK096903_03.10_0006_a.

USACE (U.S. Army Corps of Engineers). 2003 (March). *Phase III Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska*. Final. Prepared by Montgomery Watson Harza. F10AK096903_03.10_0007_a.

USACE. 2005 (June). *Phase IV Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska*. Prepared by Shannon & Wilson, Inc. F10AK096903_03.10_0020_a_200-1e.

USACE. 2007 (March). *Feasibility Study, Northeast Cape FUDS, St. Lawrence Island, Alaska*. Prepared by Jacobs Engineering Group Inc. F10AK096904_04.09_0500_a and F10AK096905_0500_a.

USACE. 2009 (30 September). *Decision Document: Hazardous, Toxic, and Radioactive Waste Project #F10AK096903*. Northeast Cape Formerly Used Defense Site St. Lawrence Island, Alaska. Signed 3 September 2009. F10AK09603_05.09_0500_a_200-1e.

USACE. 2011a (July). *Northeast Cape HTRW Remedial Actions,* Northeast Cape, St. Lawrence Island, Alaska. F10AK09603_07.08_0502_a_200-1e.

USACE. 2011b (October). *Manual for Electronic Deliverables, Requirements for Submittals of Documents, Laboratory, Data, and Other Items*. Prepared by USACE-Alaska District.

USACE. 2012 (June). *Northeast Cape HTRW Remedial Actions, Final Removal Action Report,* Northeast Cape, St. Lawrence Island, Alaska. F10AK09603_07.08_0503_a_200-1e.

USACE. 2013 (May). *Northeast Cape HTRW Remedial Action Report,* Revision 1 Northeast Cape Formerly Used Defense Site St. Lawrence Island, Alaska. F10AK09603_07.08_0505_a_200-1e.

USACE. 2014a (January). *Northeast Cape HTRW Remedial Actions, Northeast Cape, St. Lawrence Island, Alaska, Remedial Action Report.* Prepared by Bristol Environmental Remediation Services, LLC. F10AK096903_xx.xx_xxxx_x.

USACE. 2014b (30 November). *Safety and Health Requirements Manual.* EM 385-1-1. Note: This Manual supersedes EM 385-1-1, dated 15 September 2008. <http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_385-1-1.pdf.> Accessed 19 March 2015.

USACE. 2015a (February). *First Five-Year Review Report, Northeast Cape FUDS*. Final. St. Lawrence Island, Alaska. Prepared by Jacobs Engineering Group Inc. F10AK096903_07.11_0507_p.

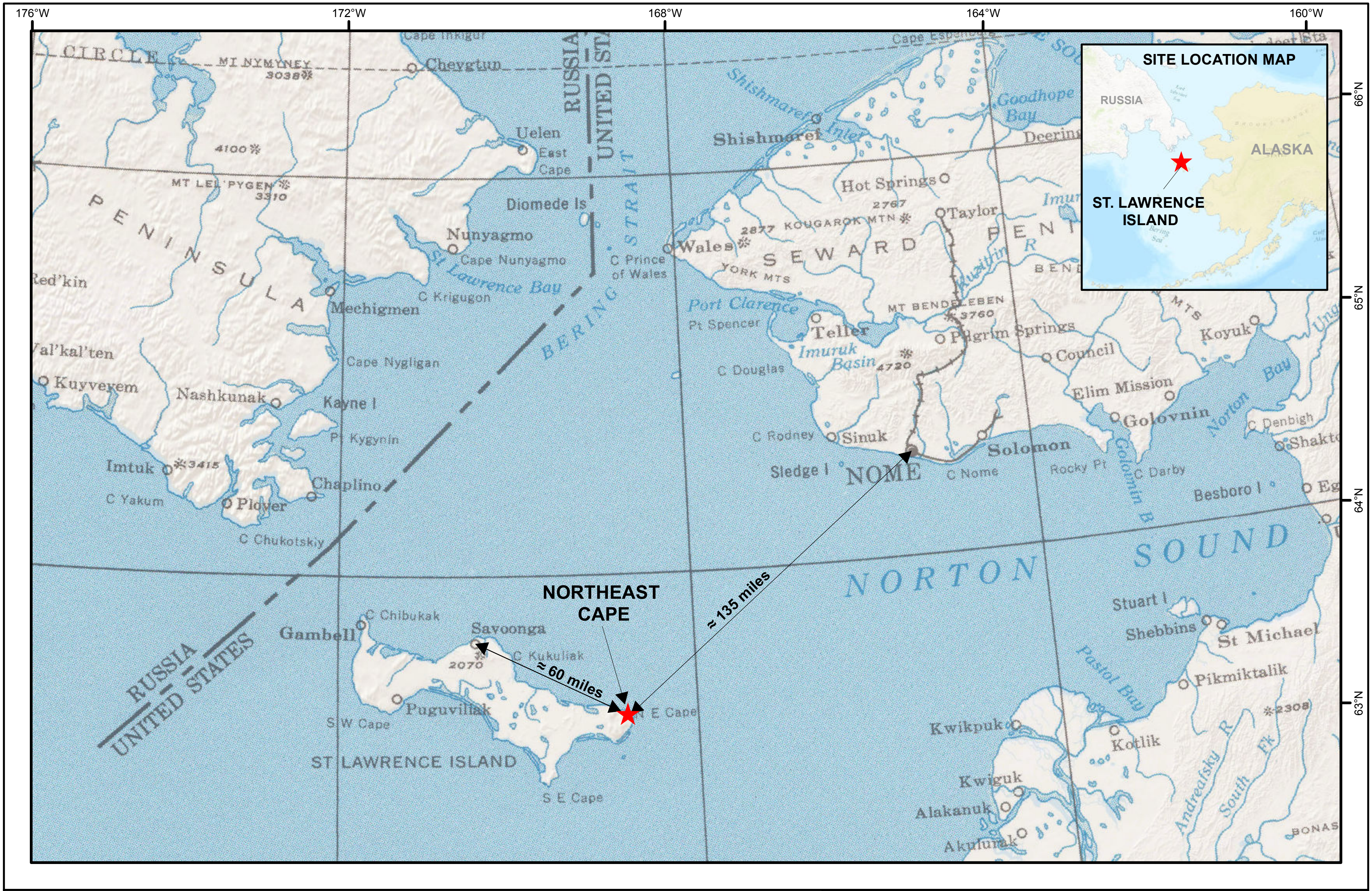
USACE. 2015b (April). *2014 Northeast Cape HTRW Remedial Actions Report, Revision 1*. St. Lawrence Island, Alaska. Prepared by Bristol Environmental Remediation Services. LLC. F10AK096903_xx.xx_yyyy_a and F10AK096905_xx.xx_yyyy_p.

USACE. 2016a (April). *2015 Annual Groundwater Sampling Report*. Prepared by Bristol Environmental Remediation Services. LLC. F10AK0969-03_07.08_0508_p.

USACE. 2016b (August). *2016 Groundwater Monitoring at the Main Operations Complex and Other Field Activities Work Plan*. Prepared by Jacobs Engineering Group Inc. F10AK0969-03_07.04_0513_a.

USACE. 2017 (April). *2016 Site 8 and Suqi River Surface Water and Sediment Sampling Report, Northeast Cape St. Lawrence Island, Alaska*. Draft. Prepared by Jacobs Engineering Group Inc. F10AK096903_07.11_0510_a.

APPENDIX A
Figures



All Locations Are Approximate

N

0 25 50 75 100

Miles

WGS 1984 UTM Zone 2N

NORTHEAST CAPE
LOCATION AND VICINITY

ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
14 DEC 2016	K. MAHER	A-1

P:\StLawrenceIsland\MXD\AEECC_T002_2016WP\MonitoringReport\Fig_1_StLawrenceVic.mxd jonesmj

Road

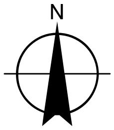
Trail

Surface Water Feature

2016 Area of Interest

Remediation Site

All Locations Are Approximate



NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

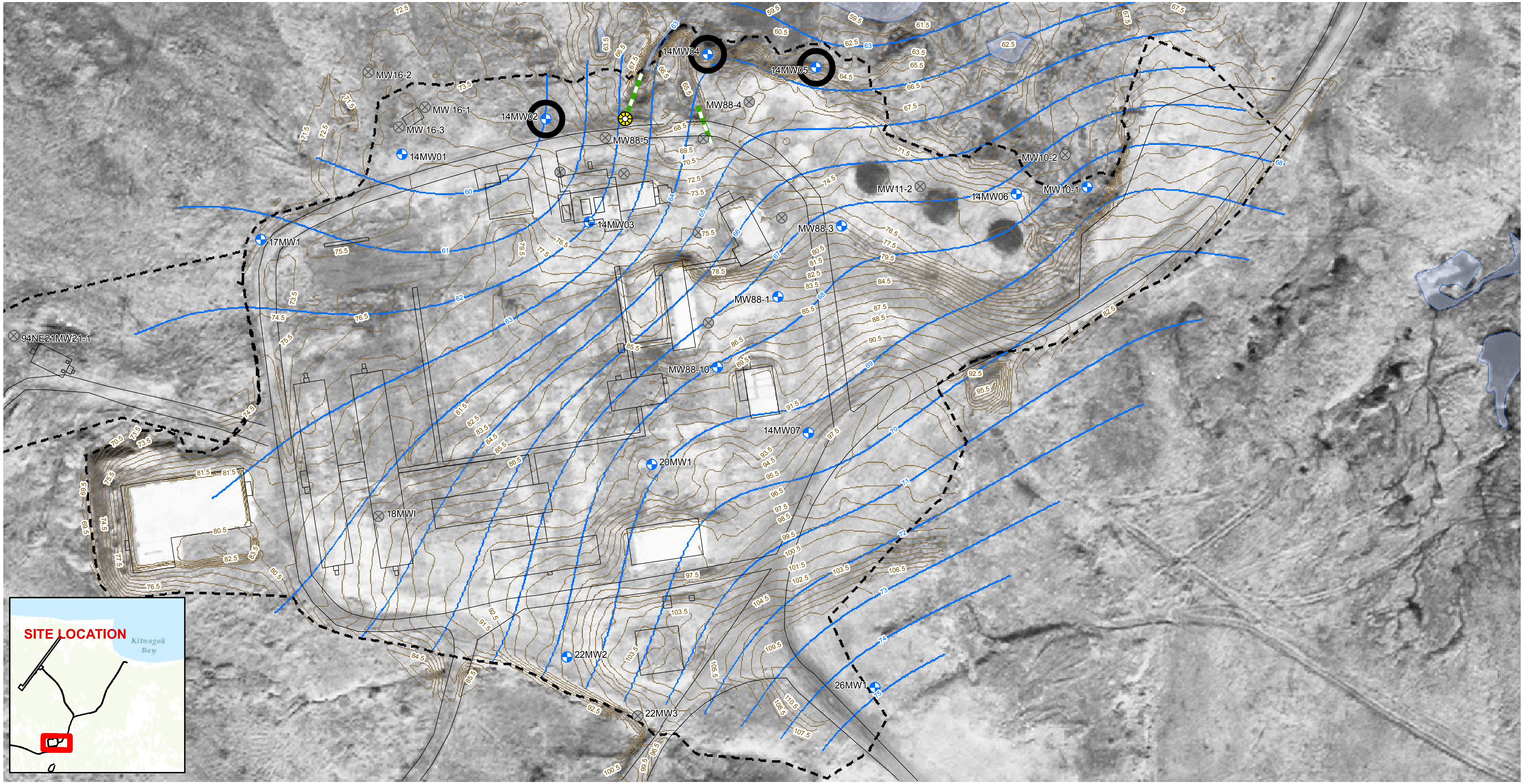
NORTHEAST CAPE
SITE LAYOUT

SAINT LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
02 AUG 2017	K. MAHER	A-2

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A2_ManagmentPlan_SiteLayout.mxd JONESMJ



◯ Wells with Current Contaminant Concentrations Exceeding Site-Specific Cleanup Levels

● Current Monitoring Wells

⊗ Abandoned Well

☼ Former Manhole

Former Culvert

Topographic Contours

2016 Groundwater Contours

Surface Water Feature

Administrative Site Boundary Surveyed in 2014

Notes:
The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
2016 POTENTIOMETRIC SURFACE AT THE MOC

ST. LAWRENCE ISLAND, ALASKA

JACOBS	DATE: 18 AUG 2017	PROJECT MANAGER: K. MAHER	FIGURE NO: A-3.1

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A3_1_PotentiometricSurface.mxd JONESMJ

⊕ Current Monitoring Wells

⊗ Abandoned Well

•– Cross-Section Line

— Road

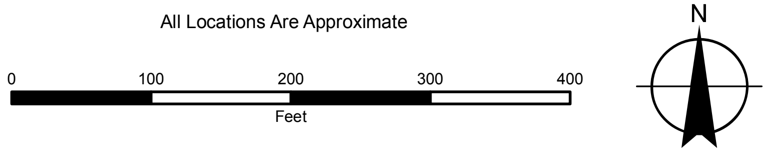
▭ Administrative Site Boundary Surveyed in 2014

☐ Former Building

🟦 Surface Water Feature

Notes:
The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

All Locations Are Approximate



NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet Transverse Mercator

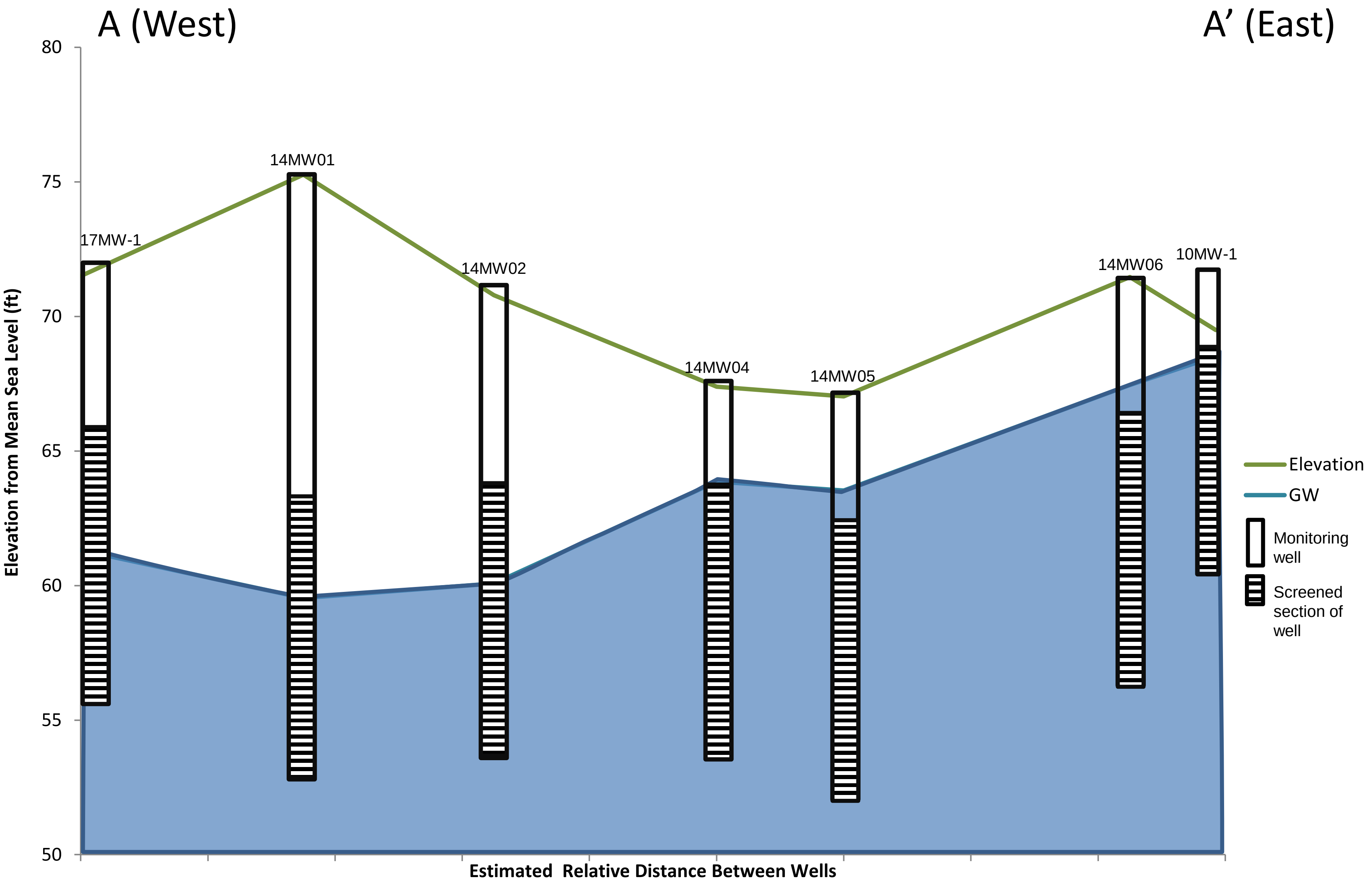
NORTHEAST CAPE
2016 MOC PLAN VIEW FOR CROSS-SECTIONS
ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
02 AUG 2017	K. MAHER	A-3.2

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A3_2_MOCPlan_View.mxd JONESMJ

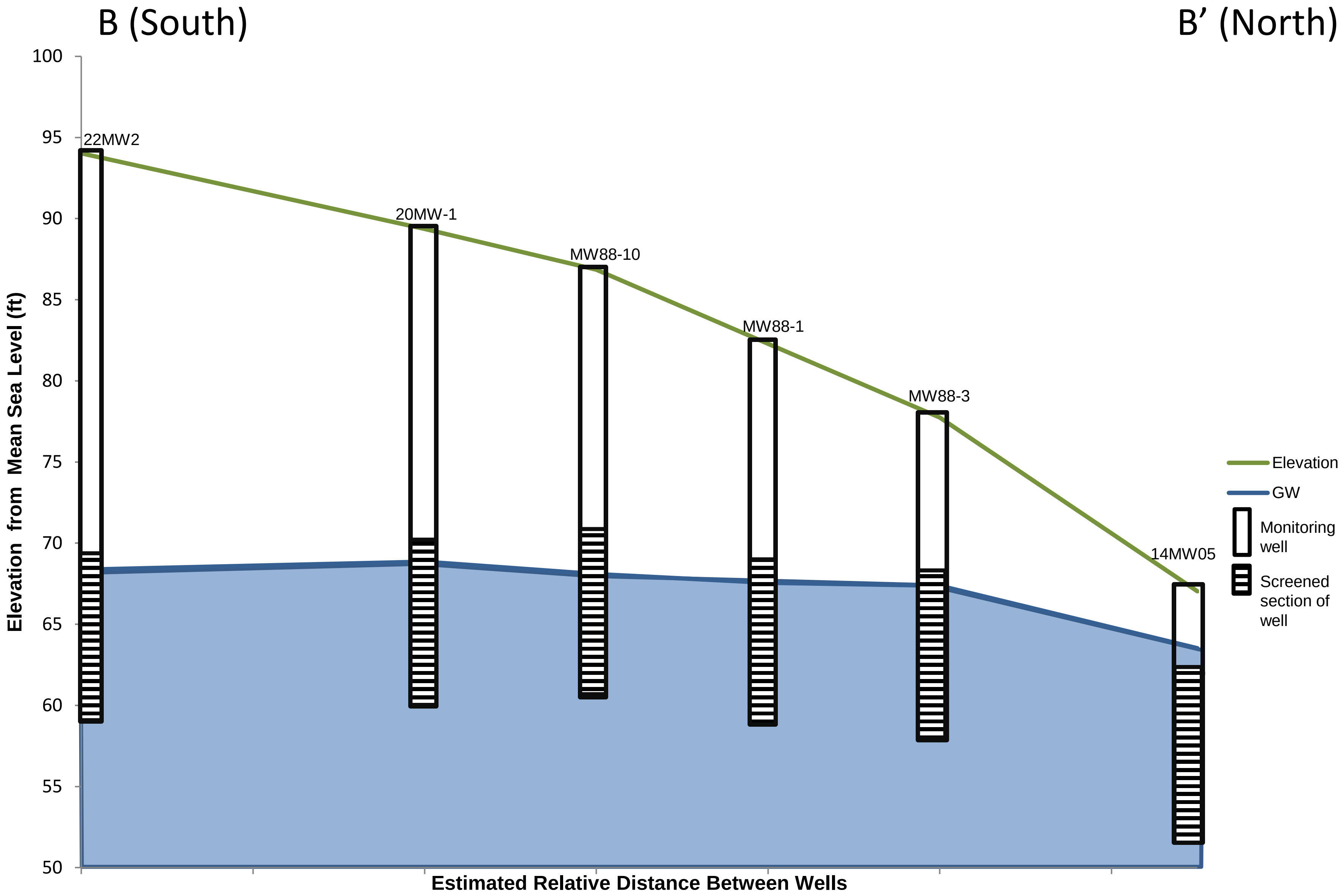
I:\AE-ECC\TO02 Northeast Cape\COMMON\2016 Monitoring Report\MOC\Appendix\A Figures\MOC Cross Section\NEC_GW_Xsection A-3.3 and A-3.4



NORTHEAST CAPE
2016 WEST-EAST CROSS-SECTION OF THE MOC

ST. LAWRENCE ISLAND, ALASKA

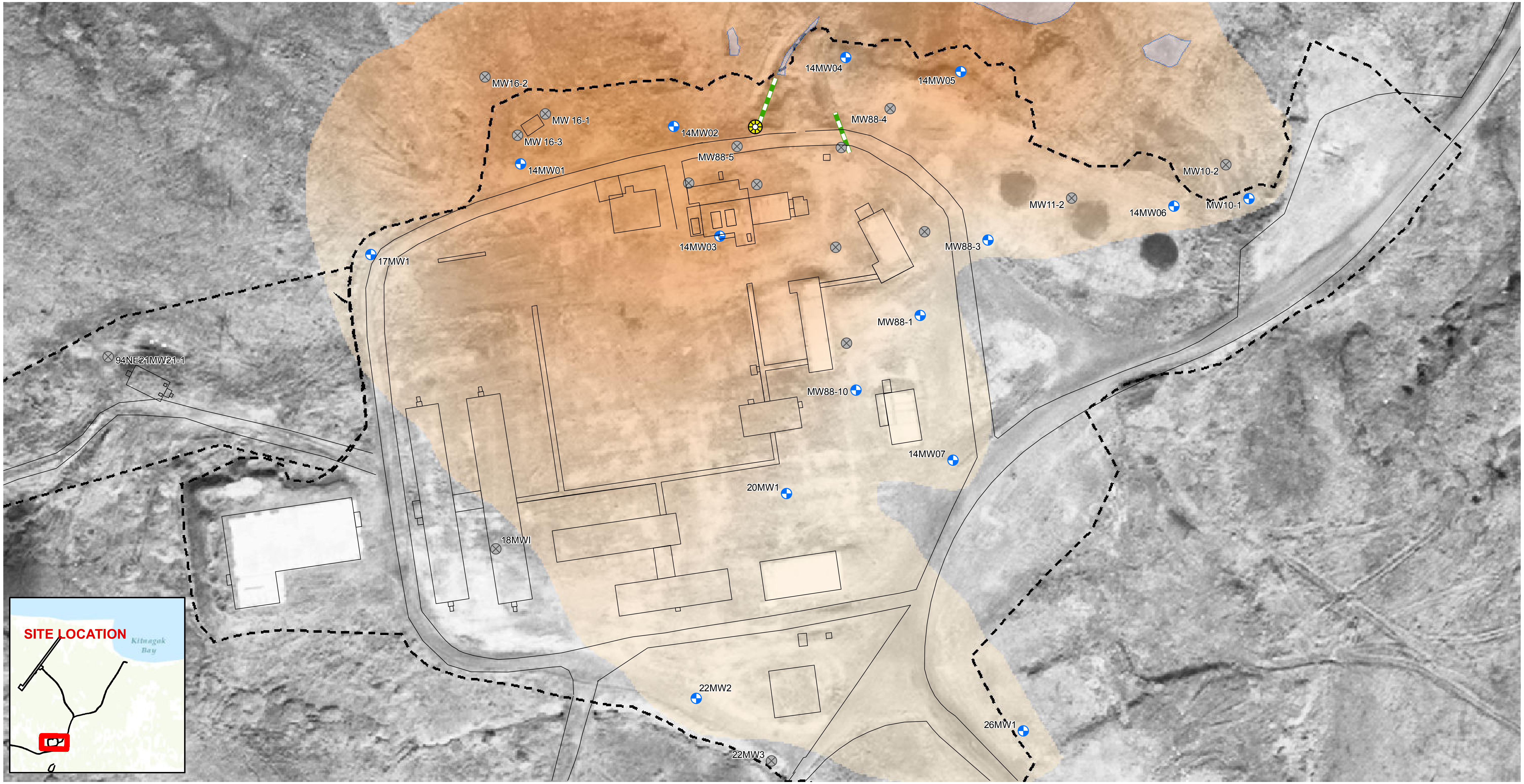
JACOBS	DATE: 29 June 2017	PROJECT MANAGER: K. MAHER	FIGURE NO: A-3.3



NORTHEAST CAPE
2016 SOUTH-NORTH CROSS-SECTION OF THE MOC

ST. LAWRENCE ISLAND, ALASKA

JACOBS	DATE: 29 June 2017	PROJECT MANAGER: K. MAHER	FIGURE NO: A-3.4



🔵 Current Monitoring Wells
⊗ Abandoned Well
Former Manhole
Former Culvert
Surface Water Feature
Administrative Site Boundary Surveyed in 2014

Ferrous Iron
mg/L
12
10
8
6
4
2
0

Notes:
- Abandoned wells were decomissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
FERROUS IRON IN GROUNDWATER AT THE MOC IN 2016

ST. LAWRENCE ISLAND, ALASKA

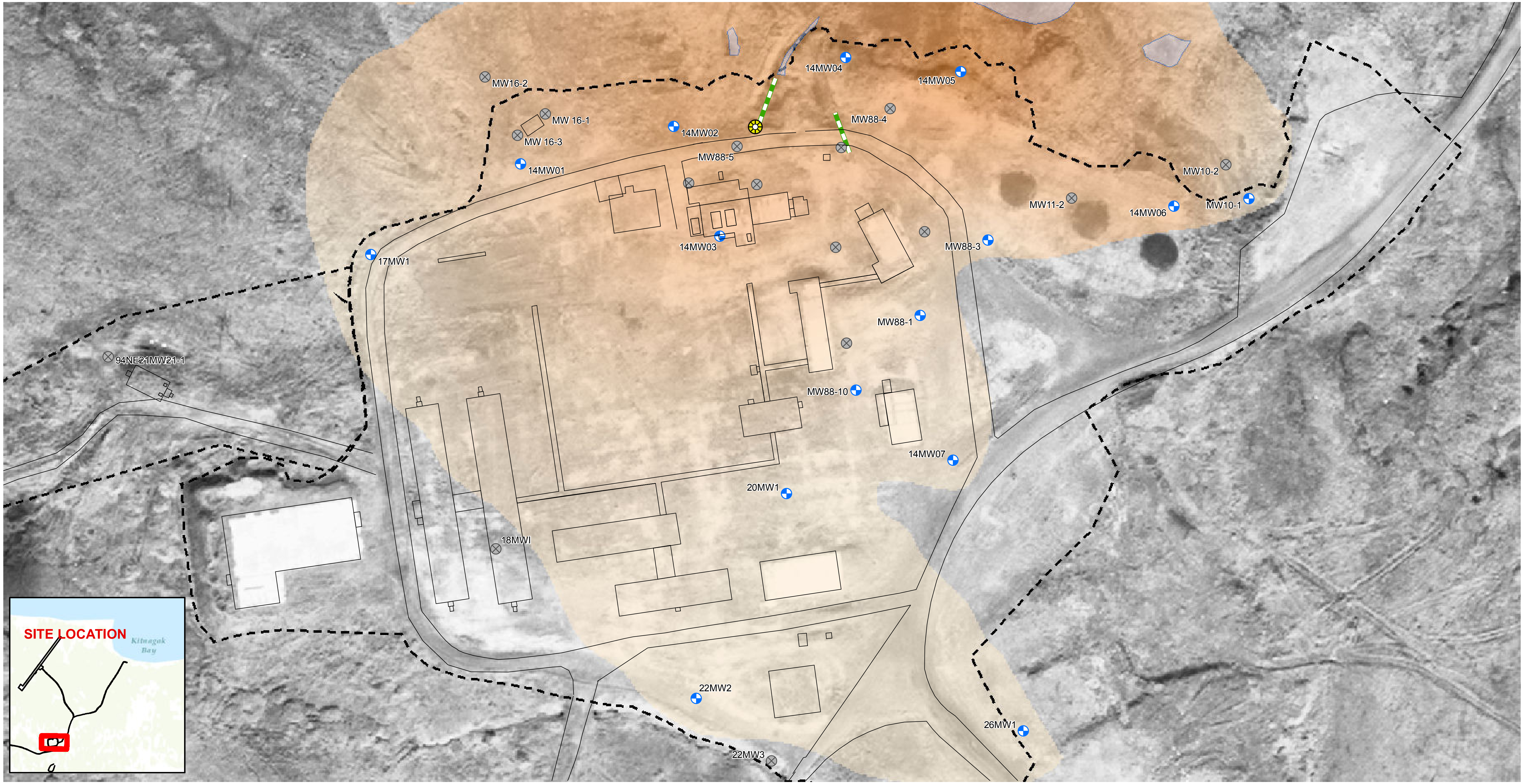
JACOBS

DATE: 02 AUG 2017

PROJECT MANAGER: K. MAHER

A4 A-4.1

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_1_MNA_FerrousIron.mxd JONESMJ



- 🔵 Current Monitoring Wells
- ⊗ Abandoned Well
- ✪ Former Manhole
- ▬ Former Culvert
- ☁ Surface Water Feature
- ▬ ▬ Administrative Site Boundary Surveyed in 2014

Manganese mg/L

2.4
2
1.6
1.2
0.8
0.4
0

Notes:

- Abandoned wells were decomissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

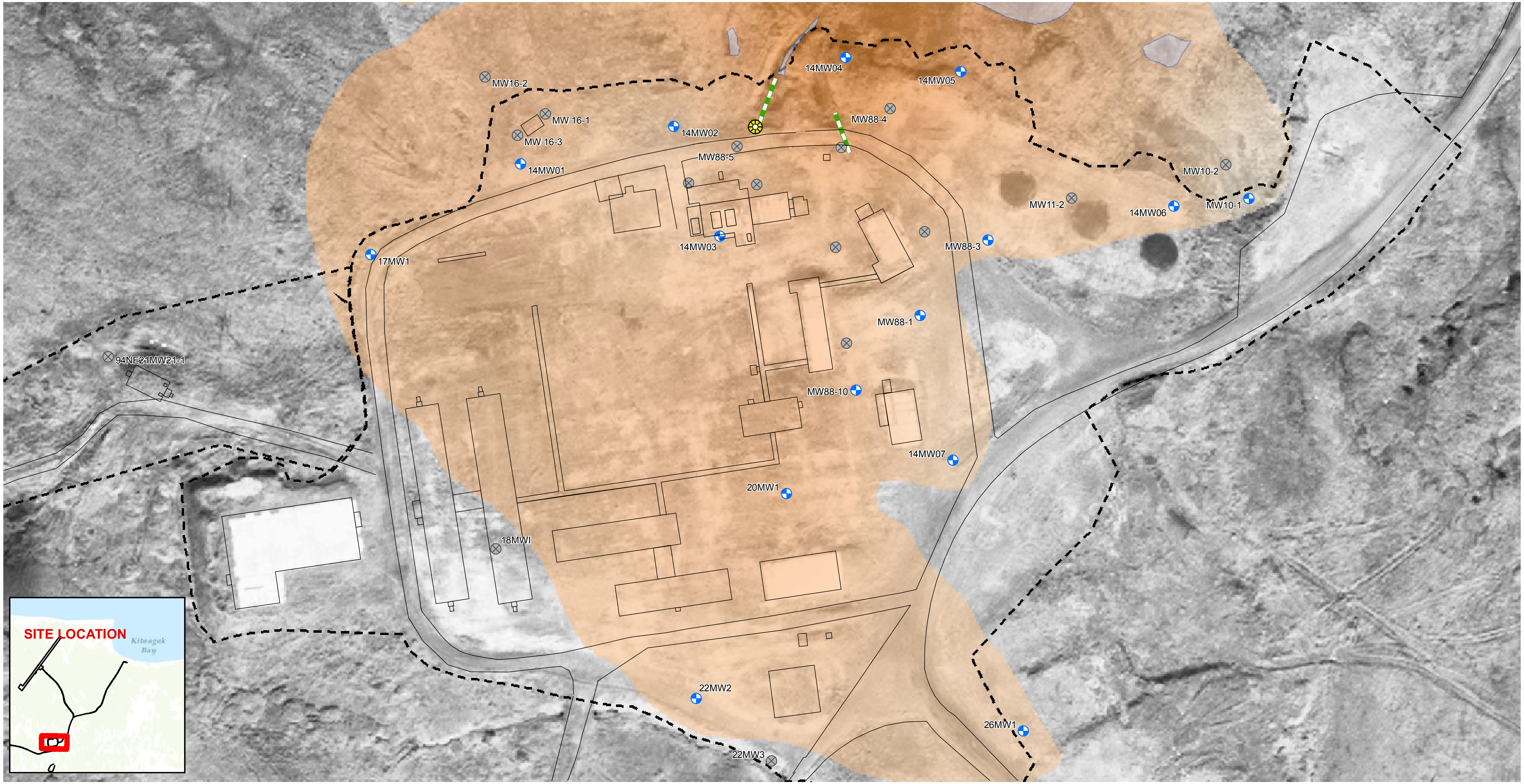
All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
MANGANESE IN GROUNDWATER AT THE MOC IN 2016

ST. LAWRENCE ISLAND, ALASKA

	DATE:	PROJECT MANAGER:	A4
JACOBS	02 AUG 2017	K. MAHER	A-4.2

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_2_MNA_Manganese.mxd JONESMJ



- ● Current Monitoring Wells
- ⊗ Abandoned Well
- ✺ Former Manhole
- ▬ Former Culvert
- ⬭ Surface Water Feature
- ▬ ▬ Administrative Site Boundary Surveyed in 2014

Sulfate
mg/L
24
16
8
0

Notes:
- Abandoned wells were decommissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
SULFATE IN GROUNDWATER AT THE MOC IN 2016

ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:
02 AUG 2017

PROJECT MANAGER:
K. MAHER

A4
A-4.3

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_3_MNA_Sulfate.mxd JONESMJ

- 🔵 Current Monitoring Wells
- ⊗ Abandoned Well
- ✪ Former Manhole
- ▬ Former Culvert
- ◌ Surface Water Feature
- ⌐¬ Administrative Site Boundary Surveyed in 2014

Nitrate mg/L

0.2
0.15
0.1
0.05
0

Notes:

- Abandoned wells were decomissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
NITRATE IN GROUNDWATER AT THE MOC IN 2016

ST. LAWRENCE ISLAND, ALASKA

JACOBS	DATE: 02 AUG 2017	PROJECT MANAGER: K. MAHER	A4 A-4.4

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WPMonitoringReport\JULY2017\A4_4_MNA_Nitrate.mxd JONESMJ

- 🔵 Current Monitoring Wells
- ⊗ Abandoned Well
- ✹ Former Manhole
- ▬ Former Culvert
- ☁ Surface Water Feature
- ▬ ▬ Administrative Site Boundary Surveyed in 2014

Alkalinity
mg/L
120
80
40
0

Notes:
- Abandoned wells were decommissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
ALKALINITY IN GROUNDWATER AT THE MOC IN 2016

ST. LAWRENCE ISLAND, ALASKA

JACOBS	DATE: 02 AUG 2017	PROJECT MANAGER: K. MAHER	A4 A-4.5

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_5_MNA_Alkalinity.mxd JONESMJ

- 🔵 Current Monitoring Wells
- ⊗ Abandoned Well
- 🟡 Former Manhole
- 🟩 Former Culvert
- Surface Water Feature
- Administrative Site Boundary Surveyed in 2014

Oxidation Reduction Potential

mV

225
150
75
0

Notes:
- Abandoned wells were decommissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mv - millivolt
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
OXIDATION REDUCTION POTENTIAL IN GROUNDWATER
AT THE MOC IN 2016
ST. LAWRENCE ISLAND, ALASKA

JACOBS	DATE: 02 AUG 2017	PROJECT MANAGER: K. MAHER	A4 A-4.6

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_6_MNA_ORP.mxd JONESMJ

- 🔵 Current Monitoring Wells
- ⊗ Abandoned Well
- ⊛ Former Manhole
- ▬ Former Culvert
- Surface Water Feature
- ▬ ▬ Administrative Site Boundary Surveyed in 2014

Dissolved Oxygen

mg/L

15

11.25

7.5

3.75

0

Notes:
- Abandoned wells were decomissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200

Feet

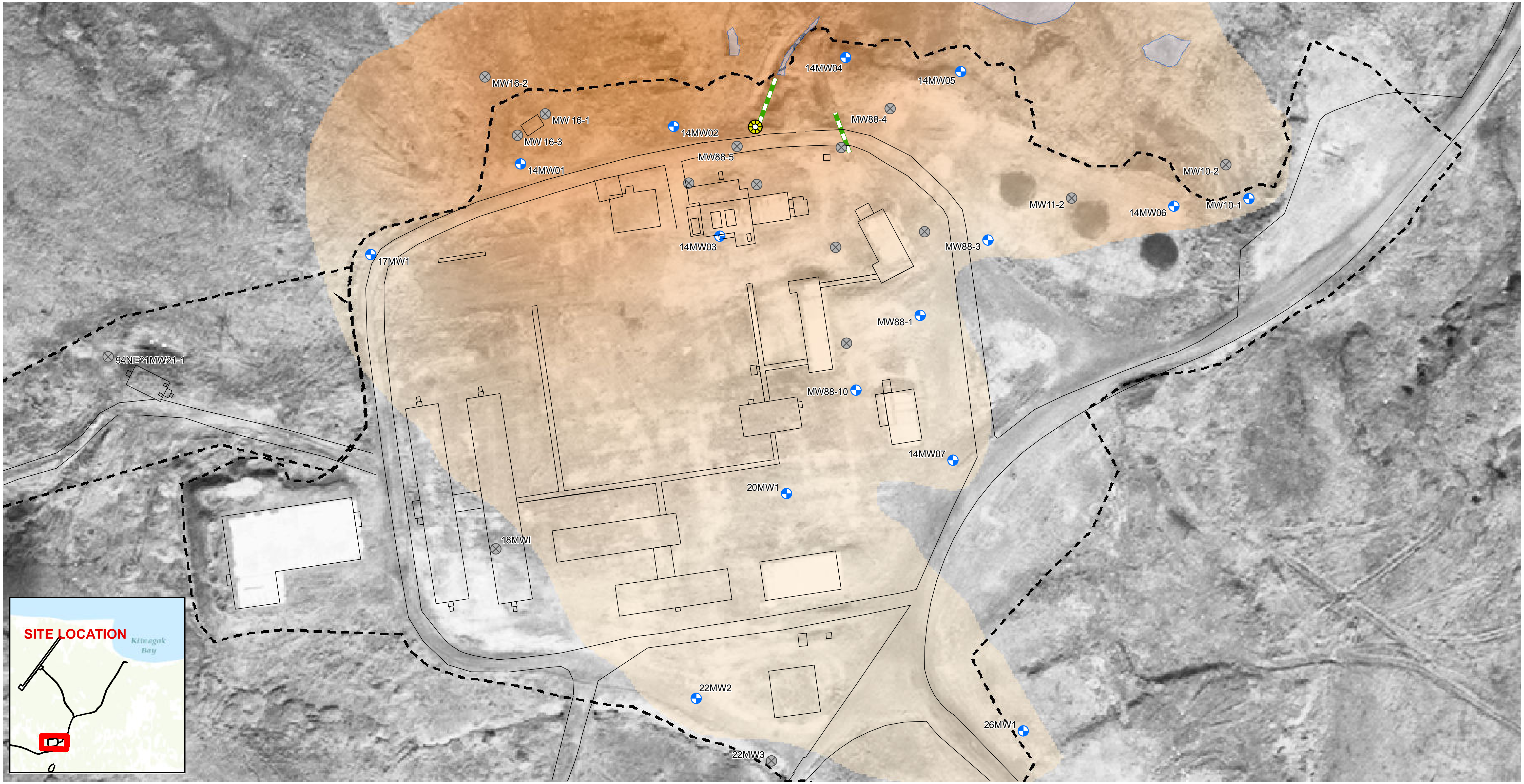
NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
DISSOLVED OXYGEN IN GROUNDWATER
AT THE MOC IN 2016
ST. LAWRENCE ISLAND, ALASKA

JACOBS	DATE: 02 AUG 2017	PROJECT MANAGER: K. MAHER	A4 A-4.7

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_7_MNA_DO.mxd JONESMJ



- ● Current Monitoring Wells
- ⊗ Abandoned Well
- ✺ Former Manhole
- ▬ Former Culvert
- ☁ Surface Water Feature
- ▬ ▬ Administrative Site Boundary Surveyed in 2014

Methane mg/L

0.0225
0.015
0.0075
0

Notes:
- Abandoned wells were decommissioned due to site conditions or demolished during Remedial Actions.
- Isopleths are limited to areas in close proximity to or between current monitoring wells
- MOC - Main Operations Complex
- mg/L - milligram per liter

•The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
METHANE IN GROUNDWATER AT THE MOC IN 2016

ST. LAWRENCE ISLAND, ALASKA

JACOBS

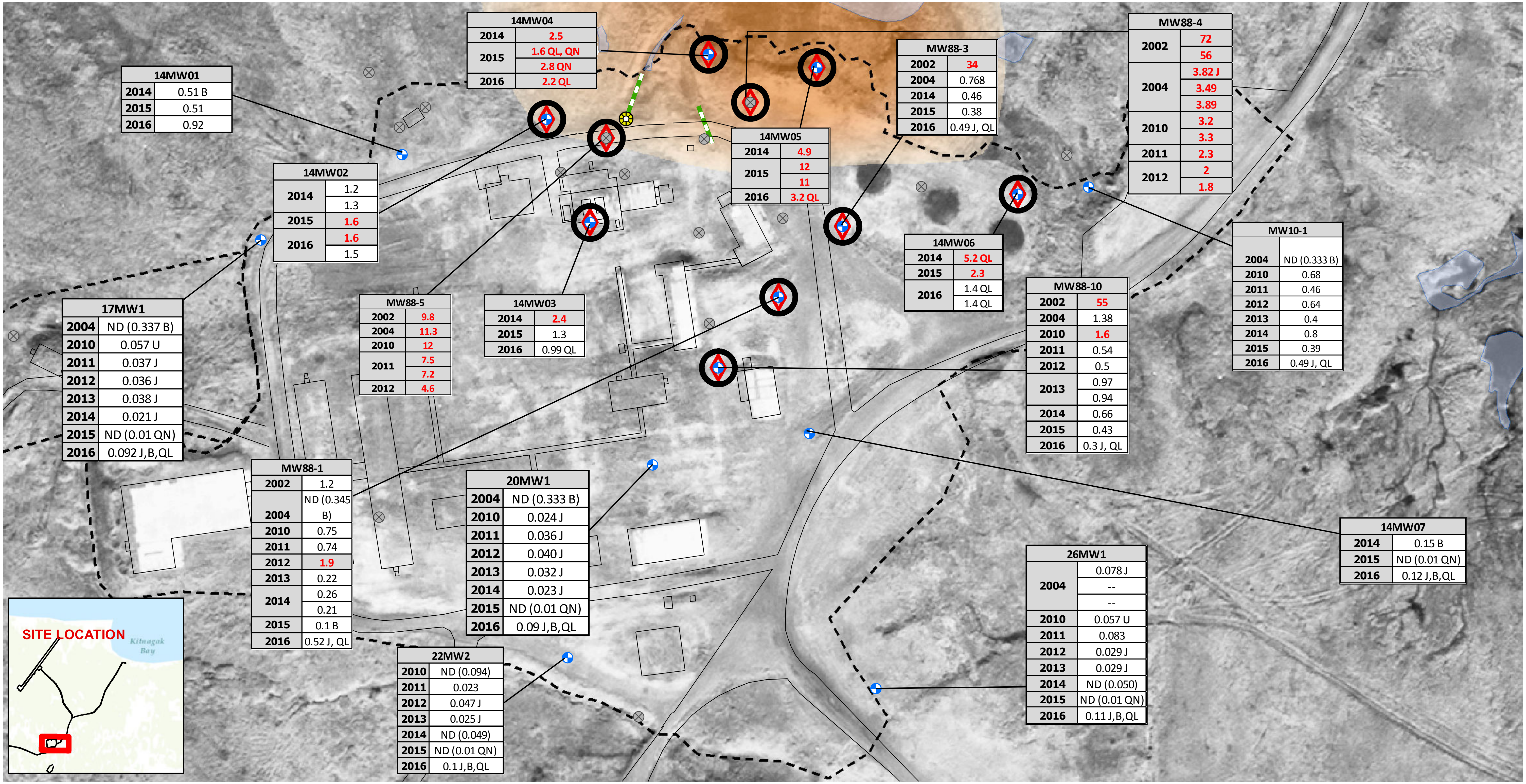
DATE: 02 AUG 2017

PROJECT MANAGER: K. MAHER

A4

A-4.8

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A4_8_MNA_Methane.mxd JONESMJ



14MW01	
2014	0.51 B
2015	0.51
2016	0.92

14MW04	
2014	2.5
2015	1.6 QL, QN
	2.8 QN
2016	2.2 QL

MW88-3	
2002	34
2004	0.768
2014	0.46
2015	0.38
2016	0.49 J, QL

MW88-4	
2002	72
	56
2004	3.82 J
	3.49
	3.89
2010	3.2
	3.3
2011	2.3
2012	2
	1.8

14MW02	
2014	1.2
	1.3
2015	1.6
2016	1.6
	1.5

14MW05	
2014	4.9
2015	12
	11
2016	3.2 QL

MW10-1	
2004	ND (0.333 B)
2010	0.68
2011	0.46
2012	0.64
2013	0.4
2014	0.8
2015	0.39
2016	0.49 J, QL

14MW06	
2014	5.2 QL
2015	2.3
2016	1.4 QL
	1.4 QL

17MW1	
2004	ND (0.337 B)
2010	0.057 U
2011	0.037 J
2012	0.036 J
2013	0.038 J
2014	0.021 J
2015	ND (0.01 QN)
2016	0.092 J,B,QL

MW88-5	
2002	9.8
2004	11.3
2010	12
2011	7.5
	7.2
2012	4.6

14MW03	
2014	2.4
2015	1.3
2016	0.99 QL

MW88-10	
2002	55
2004	1.38
2010	1.6
2011	0.54
2012	0.5
2013	0.97
	0.94
2014	0.66
2015	0.43
2016	0.3 J, QL

MW88-1	
2002	1.2
2004	ND (0.345 B)
2010	0.75
2011	0.74
2012	1.9
2013	0.22
2014	0.26
	0.21
2015	0.1 B
2016	0.52 J, QL

20MW1	
2004	ND (0.333 B)
2010	0.024 J
2011	0.036 J
2012	0.040 J
2013	0.032 J
2014	0.023 J
2015	ND (0.01 QN)
2016	0.09 J,B,QL

14MW07	
2014	0.15 B
2015	ND (0.01 QN)
2016	0.12 J,B,QL

26MW1	
2004	0.078 J
	--
	--
2010	0.057 U
2011	0.083
2012	0.029 J
2013	0.029 J
2014	ND (0.050)
2015	ND (0.01 QN)
2016	0.11 J,B,QL

22MW2	
2010	ND (0.094)
2011	0.023
2012	0.047 J
2013	0.025 J
2014	ND (0.049)
2015	ND (0.01 QN)
2016	0.1 J,B,QL

◯	Wells with Historical or Current Contaminant Concentrations That Exceed Site-Specific Cleanup Level
◇	Wells with Historical or Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria
●	Current Monitoring Wells
⊗	Abandoned Well
⊛	Former Manhole
▬	Former Culvert
▨	Surface Water Feature
▬ ▬	Administrative Site Boundary Surveyed in 2014

Contaminant Levels
mg/L
3
1.5
0

Notes:
- All units are mg/L
- -- = not sampled, ND = non-detect
- DRO = diesel range organics
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per liter
- All available results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

Notes (continued):

Evaluation Criteria

DRO	mg/L
SSCL	1.5
2016 ADEC	1.5

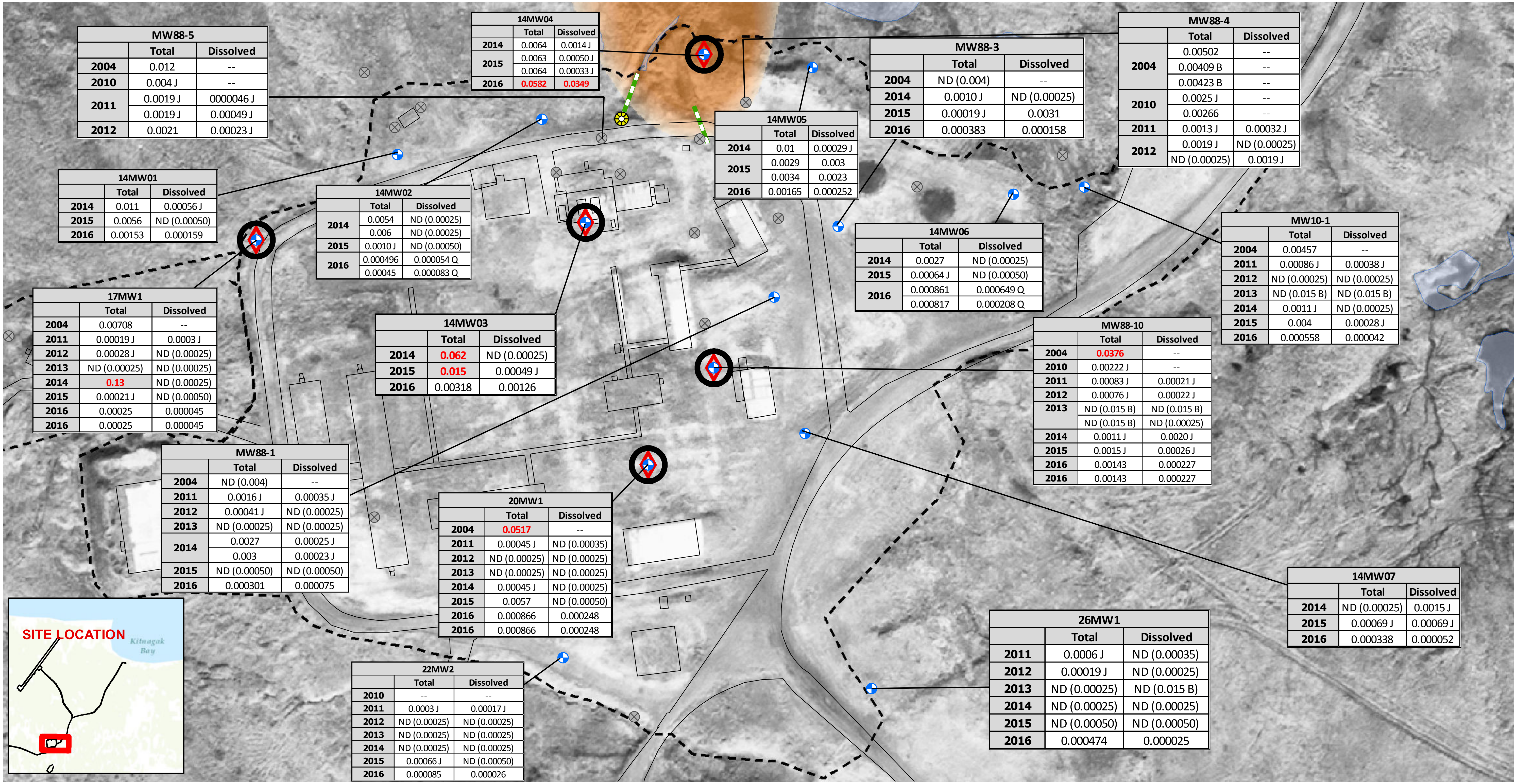
NORTHEAST CAPE
DRO RESULTS IN GROUNDWATER AT THE MOC
FROM 2002 THROUGH 2016

ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE: 24 AUG 2017
PROJECT MANAGER: K. MAHER
FIGURE NO: A-5.1

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A5_1_Exceedances_DRO.mxd beatyrj



MW88-5		
	Total	Dissolved
2004	0.012	--
2010	0.004 J	--
2011	0.0019 J	0000046 J
	0.0019 J	0.00049 J
2012	0.0021	0.00023 J

14MW04		
	Total	Dissolved
2014	0.0064	0.0014 J
2015	0.0063	0.00050 J
	0.0064	0.00033 J
2016	0.0582	0.0349

MW88-3		
	Total	Dissolved
2004	ND (0.004)	--
2014	0.0010 J	ND (0.00025)
2015	0.00019 J	0.0031
2016	0.000383	0.000158

MW88-4		
	Total	Dissolved
2004	0.00502	--
	0.00409 B	--
	0.00423 B	--
2010	0.0025 J	--
	0.00266	--
2011	0.0013 J	0.00032 J
2012	0.0019 J	ND (0.00025)
	ND (0.00025)	0.0019 J

14MW05		
	Total	Dissolved
2014	0.01	0.00029 J
2015	0.0029	0.003
	0.0034	0.0023
2016	0.00165	0.000252

14MW01		
	Total	Dissolved
2014	0.011	0.00056 J
2015	0.0056	ND (0.00050)
2016	0.00153	0.000159

14MW02		
	Total	Dissolved
2014	0.0054	ND (0.00025)
	0.006	ND (0.00025)
2015	0.0010 J	ND (0.00050)
2016	0.000496	0.000054 Q
	0.00045	0.000083 Q

14MW06		
	Total	Dissolved
2014	0.0027	ND (0.00025)
2015	0.00064 J	ND (0.00050)
2016	0.000861	0.000649 Q
	0.000817	0.000208 Q

MW10-1		
	Total	Dissolved
2004	0.00457	--
2011	0.00086 J	0.00038 J
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.015 B)	ND (0.015 B)
2014	0.0011 J	ND (0.00025)
2015	0.004	0.00028 J
2016	0.000558	0.000042

17MW1		
	Total	Dissolved
2004	0.00708	--
2011	0.00019 J	0.0003 J
2012	0.00028 J	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.13	ND (0.00025)
2015	0.00021 J	ND (0.00050)
2016	0.00025	0.000045
2016	0.00025	0.000045

14MW03		
	Total	Dissolved
2014	0.062	ND (0.00025)
2015	0.015	0.00049 J
2016	0.00318	0.00126

MW88-10		
	Total	Dissolved
2004	0.0376	--
2010	0.00222 J	--
2011	0.00083 J	0.00021 J
2012	0.00076 J	0.00022 J
2013	ND (0.015 B)	ND (0.015 B)
	ND (0.015 B)	ND (0.00025)
2014	0.0011 J	0.0020 J
2015	0.0015 J	0.00026 J
2016	0.00143	0.000227
2016	0.00143	0.000227

MW88-1		
	Total	Dissolved
2004	ND (0.004)	--
2011	0.0016 J	0.00035 J
2012	0.00041 J	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.0027	0.00025 J
	0.003	0.00023 J
2015	ND (0.00050)	ND (0.00050)
2016	0.000301	0.000075

20MW1		
	Total	Dissolved
2004	0.0517	--
2011	0.00045 J	ND (0.00035)
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.00045 J	ND (0.00025)
2015	0.0057	ND (0.00050)
2016	0.000866	0.000248
2016	0.000866	0.000248

14MW07		
	Total	Dissolved
2014	ND (0.00025)	0.0015 J
2015	0.00069 J	0.00069 J
2016	0.000338	0.000052

26MW1		
	Total	Dissolved
2011	0.0006 J	ND (0.00035)
2012	0.00019 J	ND (0.00025)
2013	ND (0.00025)	ND (0.015 B)
2014	ND (0.00025)	ND (0.00025)
2015	ND (0.00050)	ND (0.00050)
2016	0.000474	0.000025

22MW2		
	Total	Dissolved
2010	--	--
2011	0.0003 J	0.00017 J
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	ND (0.00025)	ND (0.00025)
2015	0.00066 J	ND (0.00050)
2016	0.000085	0.000026

Current Monitoring Wells

⊗ Abandoned Well

○ Wells with Historical or Current Contaminant Concentrations that Exceed Site-Specific Cleanup Levels

◇ Wells with Historical or Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria

Former Manhole

Former Culvert

Surface Water Feature

Site Boundary Surveyed in 2014

Contaminant Levels
mg/L
0.03
0.015
0

Notes:
- All units are mg/L
- - - = not sampled, ND = non-detect
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per liter
- All available results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

Notes (continued):

Evaluation Criteria

Lead (Total and Dissolved)	mg/L
SSCL	0.015
2016 ADEC	0.015

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
LEAD RESULTS IN GROUNDWATER AT THE MOC FROM 2004 THROUGH 2016
ST. LAWRENCE ISLAND, ALASKA

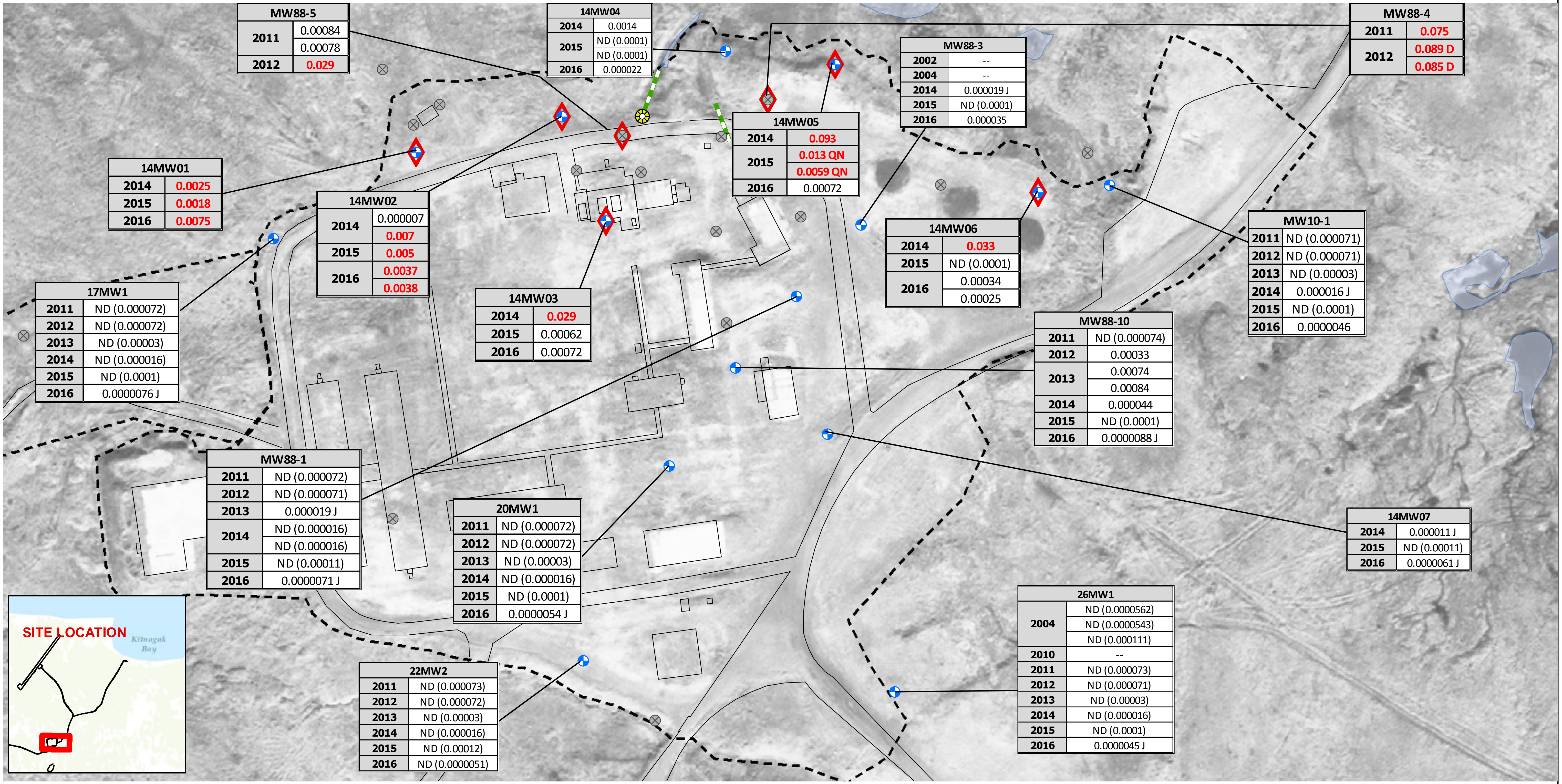
JACOBS

DATE: 24 AUG 2017

PROJECT MANAGER: K. MAHER

FIGURE NO: A-5.2

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A5_2_Exceedances_Lead.mxd beatyq



MW88-5	
2011	0.00084
	0.00078
2012	0.029

14MW04	
2014	0.0014
2015	ND (0.0001)
	ND (0.0001)
2016	0.000022

MW88-3	
2002	--
2004	--
2014	0.000019 J
2015	ND (0.0001)
2016	0.000035

MW88-4	
2011	0.075
2012	0.089 D
	0.085 D

14MW05	
2014	0.093
2015	0.013 QN
	0.0059 QN
2016	0.00072

14MW01	
2014	0.0025
2015	0.0018
2016	0.0075

14MW02	
2014	0.000007
	0.007
2015	0.005
2016	0.0037
	0.0038

14MW06	
2014	0.033
2015	ND (0.0001)
2016	0.00034
	0.00025

MW10-1	
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000016 J
2015	ND (0.0001)
2016	0.0000046

17MW1	
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000076 J

14MW03	
2014	0.029
2015	0.00062
2016	0.00072

MW88-10	
2011	ND (0.000074)
2012	0.00033
2013	0.00074
	0.00084
2014	0.000044
2015	ND (0.0001)
2016	0.0000088 J

MW88-1	
2011	ND (0.000072)
2012	ND (0.000071)
2013	0.000019 J
2014	ND (0.000016)
	ND (0.000016)
2015	ND (0.00011)
2016	0.0000071 J

20MW1	
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000054 J

14MW07	
2014	0.000011 J
2015	ND (0.00011)
2016	0.0000061 J

26MW1	
2004	ND (0.0000562)
	ND (0.0000543)
	ND (0.000111)
2010	--
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000045 J

22MW2	
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.00012)
2016	ND (0.0000051)

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A5_3_Exceedances_Naphthalene.mxd beatycj

●	Current Monitoring Wells
⊗	Abandoned Well
◇	Wells with Historical or Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria
⊛	Former Manhole
▭	Former Culvert
🟦	Surface Water Feature
⌐¬	Site Boundaries Surveyed in 2014

Notes:
- All units are mg/L
- - - = not sampled, ND = non-detect
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per liter
- All available results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

Notes (continued):

Evaluation Criteria

Naphthalene	mg/L
2016 ADEC	0.0017

N

0 50 100 150 200
Feet

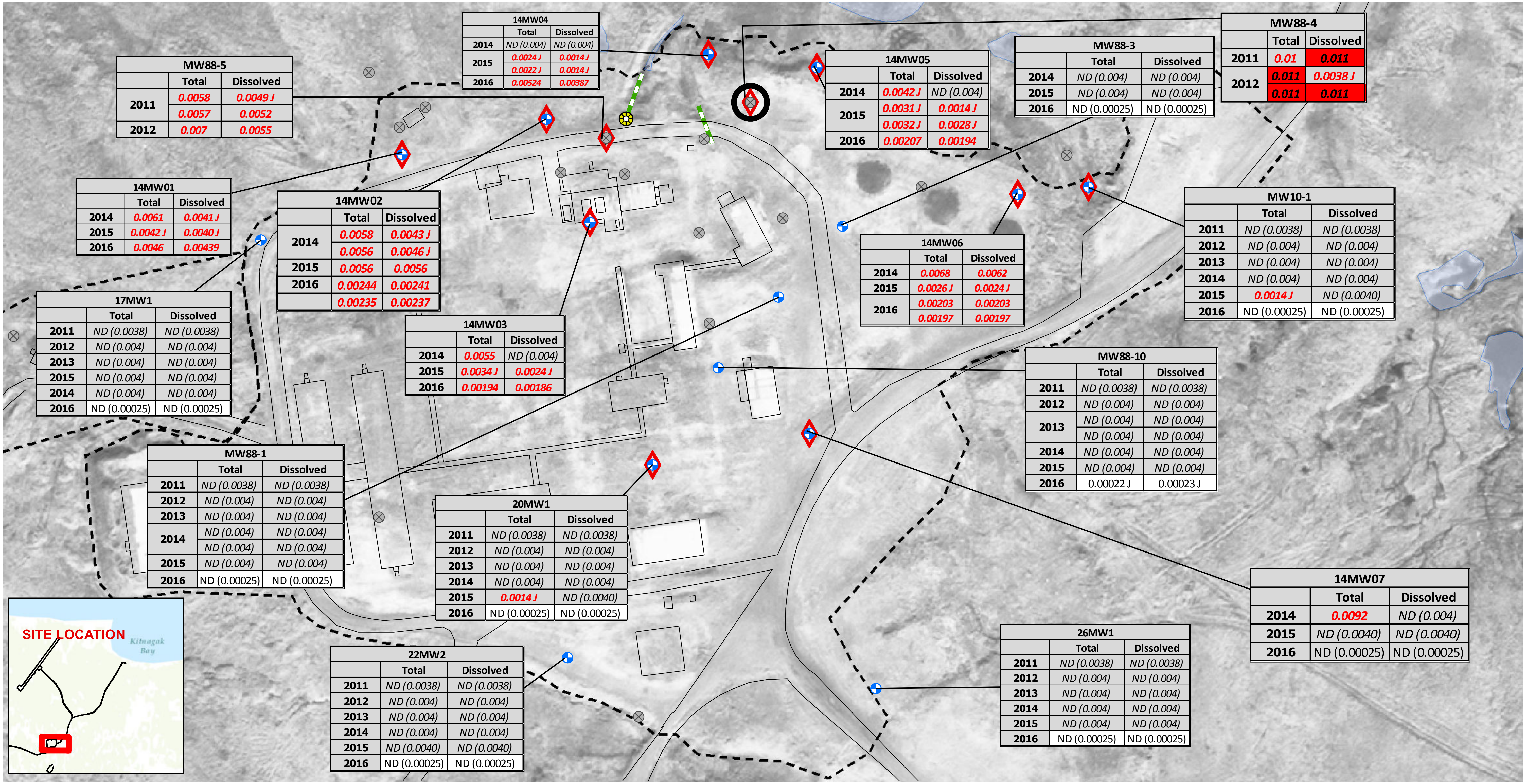
NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
NAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC FROM 2004 THROUGH 2016
ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
25 AUG 2017	K. MAHER	A-5.3



MW88-5

	Total	Dissolved
2011	0.0058	0.0049 J
	0.0057	0.0052
2012	0.007	0.0055

14MW04

	Total	Dissolved
2014	ND (0.004)	ND (0.004)
2015	0.0024 J	0.0014 J
	0.0022 J	0.0014 J
2016	0.00524	0.00387

14MW05

	Total	Dissolved
2014	0.0042 J	ND (0.004)
2015	0.0031 J	0.0014 J
	0.0032 J	0.0028 J
2016	0.00207	0.00194

MW88-3

	Total	Dissolved
2014	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)

MW88-4

	Total	Dissolved
2011	0.01	0.011
2012	0.011	0.0038 J
	0.011	0.011

14MW01

	Total	Dissolved
2014	0.0061	0.0041 J
2015	0.0042 J	0.0040 J
2016	0.0046	0.00439

14MW02

	Total	Dissolved
2014	0.0058	0.0043 J
	0.0056	0.0046 J
2015	0.0056	0.0056
2016	0.00244	0.00241
	0.00235	0.00237

MW10-1

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	0.0014 J	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)

14MW06

	Total	Dissolved
2014	0.0068	0.0062
2015	0.0026 J	0.0024 J
2016	0.00203	0.00203
	0.00197	0.00197

17MW1

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)

14MW03

	Total	Dissolved
2014	0.0055	ND (0.004)
2015	0.0034 J	0.0024 J
2016	0.00194	0.00186

MW88-10

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	0.00022 J	0.00023 J

MW88-1

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)

20MW1

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	0.0014 J	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)

14MW07

	Total	Dissolved
2014	0.0092	ND (0.004)
2015	ND (0.0040)	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)

26MW1

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)

22MW2

	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	ND (0.0040)	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)

○ Wells with Historical or Current Contaminant Concentrations That Exceed Site-Specific Cleanup Level

◇ Wells with Historical or Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria

◑ Current Monitoring Wells

⊗ Abandoned Well

☼ Former Manhole

▭ Former Culvert

Surface Water Feature

- - Site Boundaries Surveyed in 2014

Notes:
- All units are mg/L
- Italicized only text indicates ND result with LOD greater than SSCL and/or 2016 ADEC Evaluation Criteria
- -- = not sampled, ND = non-detect
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per lite
- All available results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

Notes (continued):

Evaluation Criteria

Arsenic (Total and Dissolved)	mg/L
SSCL	0.01
2016 ADEC	0.00052

N

0 50 100 150 200
Feet

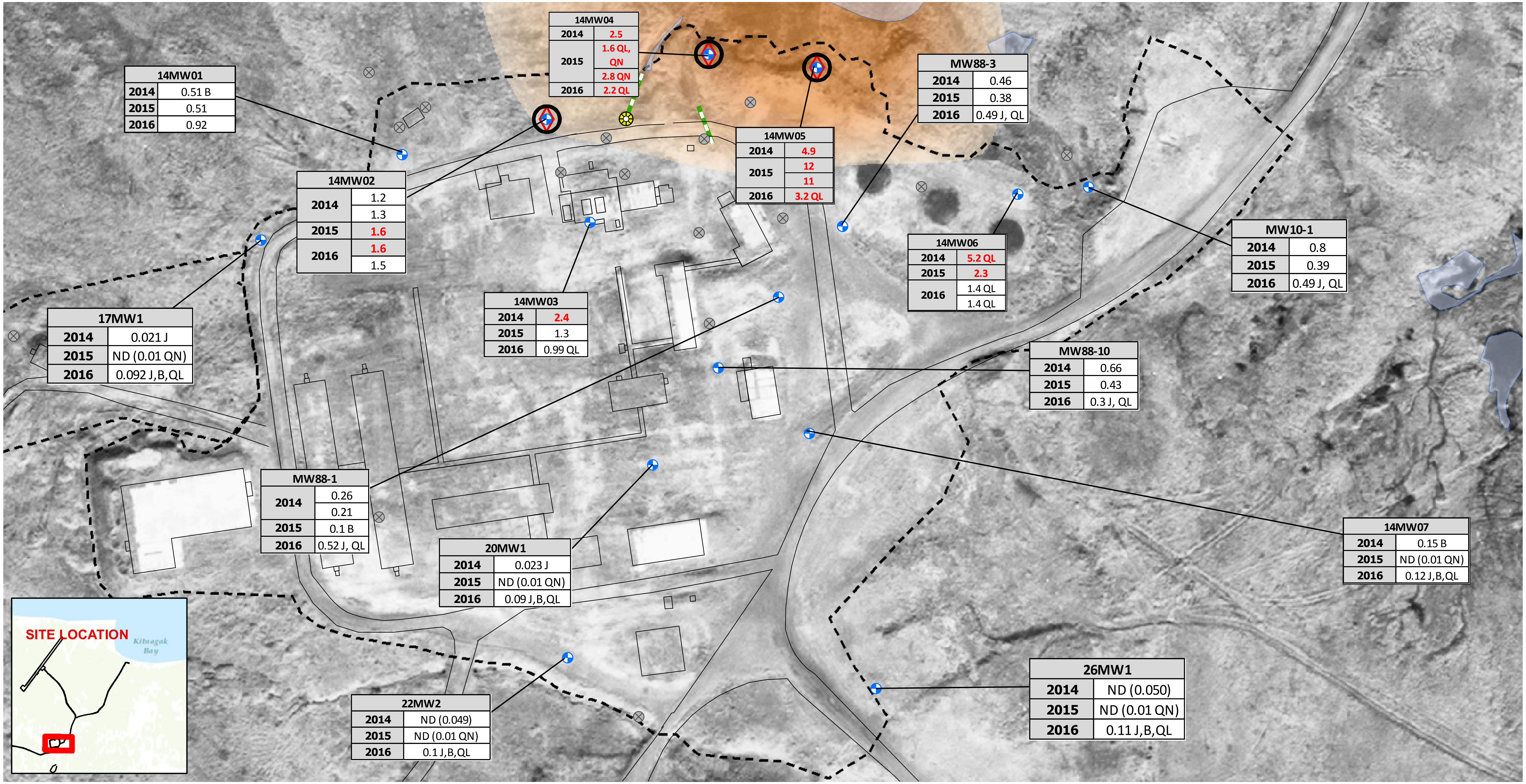
NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
ARSENIC RESULTS IN GROUNDWATER AT THE MOC
FROM 2011 THROUGH 2016
ST. LAWRENCE ISLAND, ALASKA

JACOBS
DATE: 25 AUG 2017
PROJECT MANAGER: K. MAHER
FIGURE NO: A-5.4

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A5_4_Exceedances_Arsenic.mxd beatyg



○ Wells with Current Contaminant Concentrations that Exceed Site-Specific Cleanup Level

◇ Wells with Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria

◒ Current Monitoring Wells

⊗ Abandoned Well

✺ Former Manhole

▬ Former Culvert

▨ Surface Water Feature

- - - Administrative Site Boundary Surveyed in 2014

Contaminant Levels
mg/L
3
1.5
0

Notes:
- All units are mg/L
- -- = not sampled, ND = non-detect
- DRO = diesel range organics
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per liter
- 2014 through 2016 results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

Notes (continued):

Evaluation Criteria

DRO	mg/L
SSCL	1.5
2016 ADEC	1.5

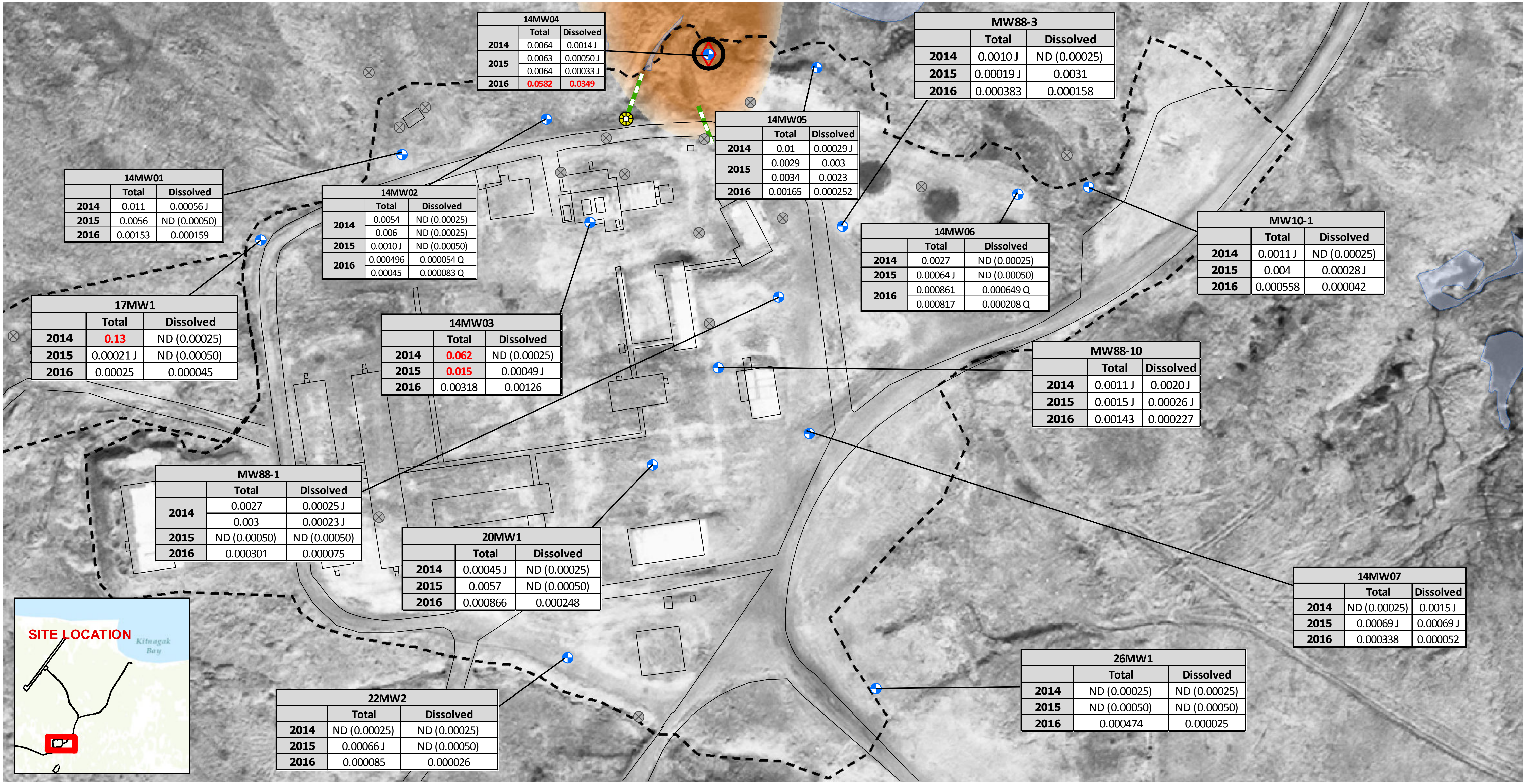
NORTHEAST CAPE
DRO RESULTS IN GROUNDWATER AT THE MOC
FROM 2014 THROUGH 2016

ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
25 AUG 2017	K. MAHER	A-6.1

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A6_1_Exceedances_DRO_2014_16.mxd beatycj



14MW04		
	Total	Dissolved
2014	0.0064	0.0014 J
2015	0.0063	0.00050 J
	0.0064	0.00033 J
2016	0.0582	0.0349

MW88-3		
	Total	Dissolved
2014	0.0010 J	ND (0.00025)
2015	0.00019 J	0.0031
2016	0.000383	0.000158

14MW05		
	Total	Dissolved
2014	0.01	0.00029 J
2015	0.0029	0.003
	0.0034	0.0023
2016	0.00165	0.000252

14MW01		
	Total	Dissolved
2014	0.011	0.00056 J
2015	0.0056	ND (0.00050)
2016	0.00153	0.000159

14MW02		
	Total	Dissolved
2014	0.0054	ND (0.00025)
	0.006	ND (0.00025)
2015	0.0010 J	ND (0.00050)
2016	0.000496	0.000054 Q
	0.00045	0.000083 Q

14MW06		
	Total	Dissolved
2014	0.0027	ND (0.00025)
2015	0.00064 J	ND (0.00050)
2016	0.000861	0.000649 Q
	0.000817	0.000208 Q

MW10-1		
	Total	Dissolved
2014	0.0011 J	ND (0.00025)
2015	0.004	0.00028 J
2016	0.000558	0.000042

17MW1		
	Total	Dissolved
2014	0.13	ND (0.00025)
2015	0.00021 J	ND (0.00050)
2016	0.00025	0.000045

14MW03		
	Total	Dissolved
2014	0.062	ND (0.00025)
2015	0.015	0.00049 J
2016	0.00318	0.00126

MW88-10		
	Total	Dissolved
2014	0.0011 J	0.0020 J
2015	0.0015 J	0.00026 J
2016	0.00143	0.000227

MW88-1		
	Total	Dissolved
2014	0.0027	0.00025 J
	0.003	0.00023 J
2015	ND (0.00050)	ND (0.00050)
2016	0.000301	0.000075

20MW1		
	Total	Dissolved
2014	0.00045 J	ND (0.00025)
2015	0.0057	ND (0.00050)
2016	0.000866	0.000248

14MW07		
	Total	Dissolved
2014	ND (0.00025)	0.0015 J
2015	0.00069 J	0.00069 J
2016	0.000338	0.000052

26MW1		
	Total	Dissolved
2014	ND (0.00025)	ND (0.00025)
2015	ND (0.00050)	ND (0.00050)
2016	0.000474	0.000025

22MW2		
	Total	Dissolved
2014	ND (0.00025)	ND (0.00025)
2015	0.00066 J	ND (0.00050)
2016	0.000085	0.000026

◯	Wells with Current Contaminant Concentrations that Exceed Site-Specific Cleanup Level
◇	Wells with Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria
◐	Current Monitoring Wells
⊗	Abandoned Well
✺	Former Manhole
▭	Former Culvert
▨	Surface Water Feature
- -	Site Boundaries Surveyed in 2014

Contaminant Levels

mg/L

0.03

0.015

0

Notes:
- All units are mg/L
- - - = not sampled, ND = non-detect
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per liter
- 2014 through 2016 results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

Notes (continued):

Evaluation Criteria

Lead (Total and Dissolved)	mg/L
SSCL	0.015
2016 ADEC	0.015

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
LEAD RESULTS IN GROUNDWATER AT THE MOC FROM 2014 THROUGH 2016
ST. LAWRENCE ISLAND, ALASKA

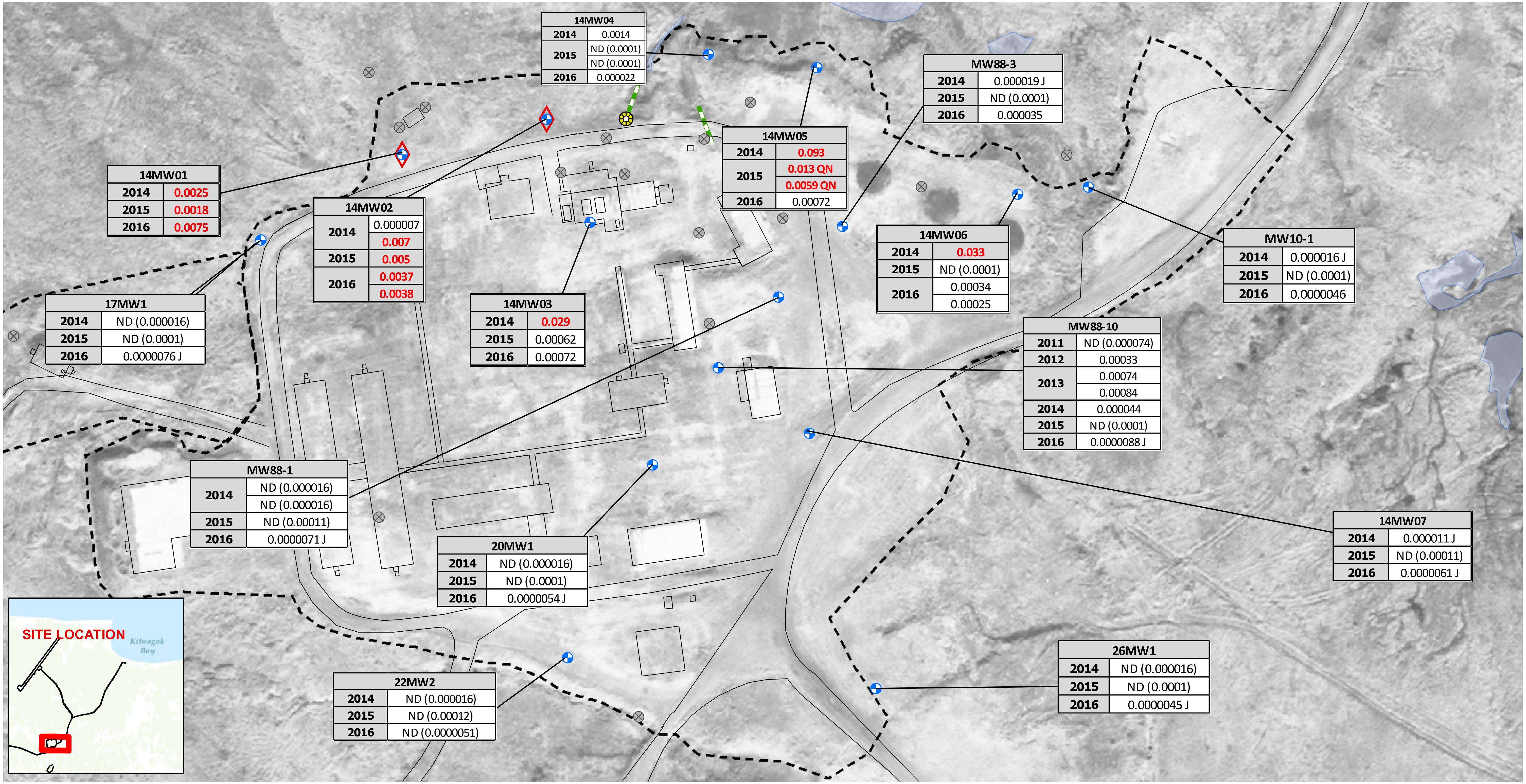
JACOBS

DATE: 25 AUG 2017

PROJECT MANAGER: K. MAHER

FIGURE NO: A-6.2

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A6_2_Exceedances_Lead_2014_16.mxd beatycj



P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A6_3_Exceedances_Naphthalene_2014_16.mxd beatycj

- ◕ Current Monitoring Wells
- ⊗ Abandoned Well
- ◇ Wells with Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria
- ✪ Former Manhole
- ▬ Former Culvert
- ▨ Surface Water Feature
- ⌐ ¬ Site Boundaries Surveyed in 2014

Notes:
- All units are mg/L
- - - = not sampled, ND = non-detect
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per liter
- 2014 through 2016 results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

Notes (continued):

Evaluation Criteria

Naphthalene	mg/L
2016 ADEC	0.0017

N

0 50 100 150 200
Feet

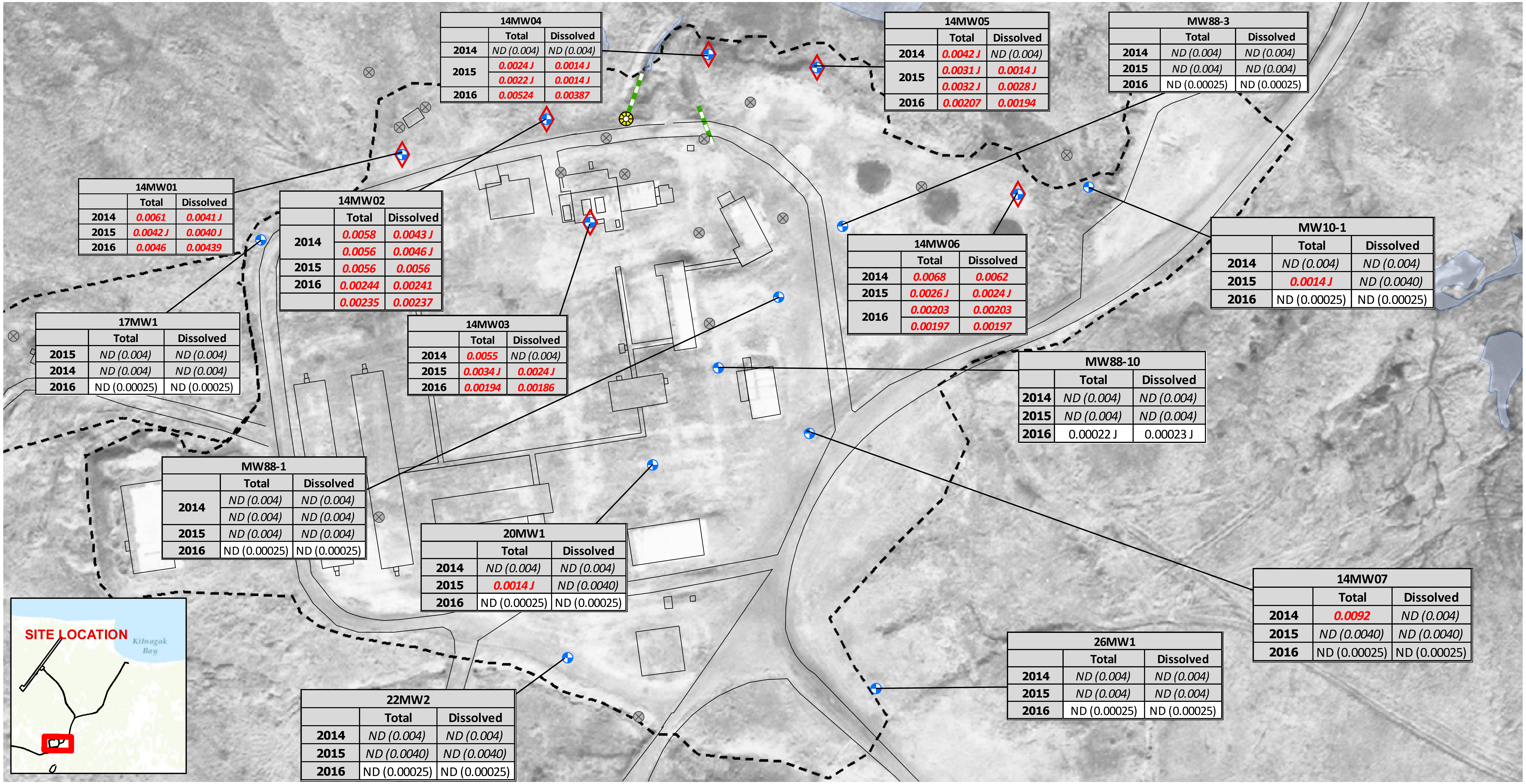
NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
NAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC
FROM 2014 THROUGH 2016
ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
25 AUG 2017	K. MAHER	A-6.3



14MW04

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	***0.0024 J***	***0.0014 J***
	0.0022 J	***0.0014 J***
2016	***0.00524***	***0.00387***

14MW05

	Total	Dissolved
2014	***0.0042 J***	*ND (0.004)*
2015	***0.0031 J***	***0.0014 J***
	0.0032 J	***0.0028 J***
2016	***0.00207***	***0.00194***

MW88-3

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)

14MW01

	Total	Dissolved
2014	***0.0061***	***0.0041 J***
2015	***0.0042 J***	***0.0040 J***
2016	***0.0046***	***0.00439***

14MW02

	Total	Dissolved
2014	***0.0058***	***0.0043 J***
	0.0056	***0.0046 J***
2015	***0.0056***	***0.0056***
2016	***0.00244***	***0.00241***
	0.00235	***0.00237***

14MW06

	Total	Dissolved
2014	***0.0068***	***0.0062***
2015	***0.0026 J***	***0.0024 J***
2016	***0.00203***	***0.00203***
	0.00197	***0.00197***

MW10-1

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	***0.0014 J***	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)

17MW1

	Total	Dissolved
2015	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)

14MW03

	Total	Dissolved
2014	***0.0055***	*ND (0.004)*
2015	***0.0034 J***	***0.0024 J***
2016	***0.00194***	***0.00186***

MW88-10

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	0.00022 J	0.00023 J

MW88-1

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
	ND (0.004)	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)

20MW1

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	***0.0014 J***	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)

14MW07

	Total	Dissolved
2014	***0.0092***	*ND (0.004)*
2015	*ND (0.0040)*	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)

26MW1

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)

22MW2

	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.0040)*	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)

◇ Wells with Current Contaminant Concentrations that Exceed 2016 ADEC Evaluation Criteria
● Current Monitoring Wells
⊗ Abandoned Well
⊛ Former Manhole
▭ Former Culvert
Surface Water Feature
- - Site Boundaries Surveyed in 2014

Notes:
- All units are mg/L
- Italicized only text indicates ND result with LOD greater than SSCL and/or 2016 ADEC evaluation criteria
- -- = not sampled, ND = non-detect
- See DQA (Appendix B) for all qualifiers
- SSCL - Site-Specific Cleanup Level (USACE 2009)
- 2016 ADEC - Table C Groundwater Cleanup Levels (ADEC 2016b)
- mg/L - milligram per lite
- 2014 through 2016 results are presented in tables
- The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination

Notes (continued):

Evaluation Criteria

Arsenic (Total and Dissolved)	mg/L
SSCL	0.01
2016 ADEC	0.00052

N

0 50 100 150 200
Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

All Locations Are Approximate
Due to survey shifting, well locations may not be accurate.

NORTHEAST CAPE
ARSENIC RESULTS IN GROUNDWATER AT THE MOC
FROM 2014 THROUGH 2016
ST. LAWRENCE ISLAND, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
25 AUG 2017	K. MAHER	A-6.4

P:\StLawrenceIsland\MXD\AEECC_TO02_2016WP\MonitoringReport\JULY2017\A6_4_Exceedances_Arsenic_2014_16.mxd beatyc

APPENDIX B
Data Quality Assessment

U.S. Army Corps of Engineers Alaska District

2016 MONITORED NATURAL ATTENUATION GROUNDWATER ANNUAL SAMPLING REPORT AT THE MAIN OPERATIONS COMPLEX AT NORTHEAST CAPE

APPENDIX B: DATA QUALITY ASSESSMENT

NORTHEAST CAPE
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03

FINAL
AUGUST 2017

TABLE OF CONTENTS

TABLE

ATTACHMENTS

(intentionally blank)

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ADEC	Alaska Department of Environmental Conservation
ALS	ALS Environmental
BTEX	benzene, toluene, ethylbenzene, and xylenes
CCV	continuing calibration verification
DL	detection limit
DoD	U.S. Department of Defense
DQA	data quality assessment
DQO	data quality objective
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
FD	field duplicate
GRO	gasoline-range organics
Jacobs	Jacobs Engineering Group Inc.
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
MB	method blank
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
ND	nondetect
NEC	Northeast Cape
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
QAPP	quality assurance project plan
QC	quality control
QSM	Quality Systems Manual
RPD	relative percent difference
RRO	residual-range organics
SDG	sample data group
SIM	selective ion monitoring
SSCL	site-specific cleanup level
TB	test blank

ACRONYMS AND ABBREVIATIONS (Continued)

UCL	upper control limit
VOC	volatile organic compound
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

The following data quality assessment (DQA) and accompanying Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklists (Attachment B-3) assess the overall quality and usability of data from the 2016 groundwater monitoring activities at Northeast Cape (NEC) on St. Lawrence Island, Alaska.

The 2016 fieldwork at NEC was conducted in August 2016. ALS Environmental (ALS) of Kelso, Washington, provided analytical services for the test methods, sample types, and matrices summarized in Table B-1. ALS subcontracted analysis of RSK 175 to ALS of Simi Valley, California. The laboratories delivered the results in electronic formats.

The attachments to this DQA contain the following: sample summary and analytical data tables (Attachment B-1), tables of sample results that did not meet the project data quality objectives (DQOs) (Attachment B-2), ADEC Laboratory Data Review Checklists (Attachment B-3), and laboratory deliverables (Attachment B-4).

Table B-1
Field Quality Control Sample Quantities

Method	Analyte	Primary	Duplicate	MS/MSD	Equipment Blank	Trip Blank
SW6020A/7470	Total Metals	15	2	1	-	-
SW6020A/7470	Dissolved Metals	15	2	1	1	-
SW8082A	PCB	15	2	1	1	-
SW8260B	BTEX/VOC[1]	15	2	1	1	5
SW8270DSIM	PAH	15	2	1	1	-
AK101	GRO	15	2	1	1	5
AK102/103	DRO/RRO	15	2	1	1	-
2320B	Alkalinity, Total	15	2	1	-	-
EPA 300.0	Sulfate	15	2	1	-	-
RSK 175	Methane, Ethane, Ethene	15	2	1	-	5
SW8015C	Glycol	2	1	1	1	-

Notes:

[1] Full list VOC was analyzed and reported for two of the 15 primary samples and one of the two duplicate.

– = not-applicable

For definitions, refer to the Acronyms and Abbreviations section.

1.1 QUALITY CONTROL CRITERIA

Jacobs Engineering Group Inc. (Jacobs) performed this DQA and completed ADEC laboratory data review checklists for records associated with the analytical data, as per the *2016 Groundwater Monitoring at the Main Operations Complex and Other Field Activities Work Plan* (U.S. Army Corps of Engineers [USACE] 2016). Data quality was evaluated against the following requirements: U.S. Department of Defense (DoD) quality systems manual (QSM), version 5.0 (DoD 2013); ADEC and U.S. Environmental Protection Agency (EPA) analytical methods (ADEC 2009, 2014; EPA 2014); and laboratory limits.

The Jacobs project chemist performed a completeness check of the electronic data to verify that data packages and electronic files included all of the requested information. All analytical data were reviewed, including the chain-of-custody and sample receipt records, laboratory case narratives, and laboratory data. Analytical data were reviewed for methodology, sample holding times, laboratory blanks, limits of quantitation (LOQs), limits of detection (LODs), detection limits (DL), surrogate recoveries, laboratory control sample (LCS) and LCS duplicate (LCSD) recoveries, matrix spike (MS) and MS duplicate (MSD) recoveries, and precision. Other quality control (QC) parameters (initial calibration, continuing calibration, tuning, internal standards, interference check solutions, post-digestion spikes, and serial dilutions) were reviewed by means of the laboratory case narrative. These QC parameters met acceptance criteria; any sample results outside QC parameters are listed in Section 1.2 and in the associated ADEC laboratory data review checklist (Attachment B-3). Analytical DQOs were considered met when the quality of the sample data met precision, accuracy, representativeness, completeness, comparability, and sensitivity requirements. The overall quality of the data was acceptable as qualified. Flagged data are considered usable but estimated.

The following data qualifiers are applicable to the 2016 NEC analytical data:

J	Analyte result was considered an estimated value because the level was below the laboratory LOQ but above the DL.
B	Analyte result was considered a high estimated value due to contamination present in the method or trip blank.
QH	Analyte result was considered an estimated value (biased high) due to a QC failure.
QL	Analyte result was considered an estimated value (biased low) due to a QC failure.
QN	Analyte result was considered an estimated value (unknown bias) due to a QC failure.

Qualification was not required in the following circumstances:

- Surrogate or MS/MSD recoveries were outside QC limits, and the sample was diluted by a factor of 5 or greater.
- MS/MSD recoveries were outside QC limits, and the spiked concentration was less than that of the parent sample.
- An analyte was detected in the method blank, but there was no detection in the sample.
- MS or LCS recoveries exceeded UCLs, and there was no detection in the sample(s).

1.2 DATA QUALITY SUMMARY

In general, the overall quality of project data was acceptable. All analytical results were 100 percent complete (no results were rejected), and for all parameters the completeness goal of 95 percent was met. Complete details of the evaluation and associated samples are provided in the ADEC laboratory review checklists (Attachment B-3). The tables in Attachment B-2 include analytical results that did not meet project DQOs and required qualification.

The following anomalies were identified during the data review process as follows:

- Sample handling/preservation
- Holding time exceedance
- Method blank and trip blank contamination
- MS accuracy

- Surrogate spike accuracy
- Continuing calibration accuracy
- Field duplicate (FD) precision
- Reporting limit assessment
- Confirmation column precision
- Equipment blanks

The following sections 1.2.1 through 1.2.10 describe anomalies and their effects on data quality and usability.

1.2.1 Sample Handling/Preservation

A total of 13 coolers (chilled) were shipped to ALS over the course of the 2016 NEC groundwater sampling events. Sample temperatures of 4 ± 2 degrees Celsius (°C) were considered acceptable for the chilled coolers. Several coolers were received at the laboratory with a sample temperature below 2°C. The laboratory did not identify any frozen samples in any of the coolers received below the acceptable temperature range and no results were qualified.

Three samplers were utilized to collect groundwater samples. The daily sampling teams each consisted of two or three samplers. Because more than one field staff member was involved with the collection, packaging, and transporting of samples, multiple initials appear on the sample tracking form in the sampler column and on groundwater sampling forms.

1.2.2 Holding Time Exceedance

Groundwater samples were re-analyzed out of the method AK102 and AK103 specified hold time by 2 days. The laboratory needed to re-analyze due to an instrument malfunction on the first analysis. Sample results were qualified QL indicating a low bias. The samples and results are presented in Table B-2-1 (Attachment B-2). Data quality is minimally affected since results were either significantly greater than or less than the site-specific cleanup level (SSCL) with the exception of two samples, 16NEC-14MW06-WG and 16NEC-14MW06-WG-9, that had detections for diesel-range organics (DRO) at 1.4 mg/L which is just less than the SSCL of 1.5 mg/L.

1.2.3 Method Blank and Trip Blank Contamination

All method blanks and trip blanks were evaluated to the DL. Sample results that were within 10 times of the concentration detected in the method blank and/or trip blank were flagged B. Results that were qualified B may be false positives or biased high.

The following analytes were detected above the DL in method blanks or trip blanks that resulted in the qualification of sample results:

- SW6020: chromium (total and dissolved) and vanadium (total and dissolved)
- SW8260B: methylene chloride, carbon disulfide, chloroform
- SW8082: PCB-1260
- AK102/AK103: DRO and RRO
- A2320B: total alkalinity

Data usability was minimally affected. All results that were qualified B were less than the 2016 ADEC evaluation criteria.

Table B-2-2 (Attachment B-2) summarizes the sample results that were qualified due to method blank or trip blank contamination. The table also provides concentrations that were detected in the associated blanks.

1.2.4 Matrix Spike Accuracy

MS/MSDs were collected to evaluate the accuracy and precision of matrix and/or laboratory procedures. Table B-1 provides a summary of the MS/MSD quantities, summarized by analytical method and matrix. The MS/MSD recoveries and relative percent differences (RPDs) for several analytes and analyses were outside of the QC criteria. Sample results with MS/MSD recoveries that were outside of QC criteria were flagged as estimated except in the following cases: nondetect samples with high recoveries, samples with concentrations greater than the spike amount, or samples with a dilution factor of 5 or greater. All MS/MSD recoveries were within required QC limits except for VOCs and metals, but no qualification was necessary due to the exceptions listed above.

1.2.5 Surrogate Spike Accuracy

Sample results with surrogates outside of QC criteria were flagged as estimated except in the following cases: nondetect samples with high surrogate recoveries or samples with a dilution factor of 5 or greater. Sample results with low surrogate recoveries were qualified QL, and may be biased low. Sample results with high surrogate recoveries were qualified QH, and may be biased high.

The result for Sample 16NEC-14MW04-WG was qualified QL for PCBs. The water sample contained significant amount of particulates, which required the sample to be extracted by 3520C. The low surrogate suggests there was matrix interference. Five sample results, 16NEC-14MW06-WG, 16NEC-14MW03-WG, 16NEC-14MW04-WG, 16NEC-14MW05-WG, and 16NEC-MW88-3-WG, qualified QH from the SW8260 method. The effect of using the higher of the results between the primary and field duplicate sample for trend analysis and reporting was minimal since all the QN-qualified results were less than the 2016 ADEC evaluation criteria.

Table B-2-3 (Attachment B-2) provides a summary of the surrogate recovery outliers and the affected sample results.

1.2.6 Continuing Calibration Accuracy

The following opening continuing calibration verification (CCV) recoveries for method SW8260 analytes were greater than ±20 percent of the true value; dichlorodifluoromethane, chloromethane, and carbon disulfide. The associated sample results were qualified QL and were considered estimated and biased low. The effect was minimal since the results and reporting limits are significantly less than the 2016 ADEC evaluation criteria.

Table B-2-4 (Attachment B-2) provides a summary of the CCV recovery outliers and the affected sample results.

1.2.7 Field Duplicate Precision

FDs were collected to evaluate the precision of matrix and/or laboratory procedures. Table B-1 provides a summary of the FD quantities, summarized by analytical method and matrix. The frequency criterion of at least one FD per 10 primary samples was met for the project.

FD precision was evaluated against the recommended RPD limit of 30 percent for water, as stated in the ADEC laboratory data review checklists (ADEC 2009). RPD values for sample pair results, where one was nondetect and the other was detected, were calculated using the LOD value for the nondetect result. Results were qualified as estimated (QN) in several samples, due to high FD RPD values. The high RPD values can likely be attributed to the sample matrix or non-homogeneity. The higher value between the sample and the FD will be used for reporting. The effect of using the higher of the results between the primary and field duplicate sample for trend analysis and reporting was minimal since all the QN-qualified results were less than the 2016 ADEC evaluation criteria.

Table B-2-5 (Attachment B-2) provides a summary of sample results that were qualified QN, due to high FD RPD values.

1.2.8 Reporting Limit Assessment

Laboratory LODs for nondetect sample results were evaluated against the corresponding ADEC 18 AAC 75 Table C. Groundwater Cleanup Levels for Human Health (ADEC 2016) and the SSCL (USACE 2009). The confidence level at the LOD was 99 percent (1 percent false negative rate) as per the DoD QSM definition. This level of uncertainty was deemed acceptable for the purpose of the report.

Laboratory LODs were greater than the 2016 ADEC evaluation criteria due to limitation of the methodology for method SW8260. LODs for 1,2-dibromoethane and

1,2,3-trichloropropane did not meet the 2016 ADEC evaluation criteria. The data quality was affected since it may lead to the reporting of false negative results (in relation to an analyte's respective 2016 ADEC evaluation criteria). Nondetect sample results that had LODs exceeding the 2016 ADEC evaluation criteria were shown in italics and highlighted in Table B-1-2 (Attachment B-1) and Tables B-2-6 (Attachment B-2).

1.2.9 Confirmation Column Precision

PCB results were confirmed on dual columns as per method SW8082. If the RPD between the results on the primary and confirmation columns was greater than 40 percent, the reported result was qualified as estimated (QN). The effect was minimal since all qualified results were less than the 2016 ADEC evaluation criteria.

Table B-2-7 (Attachment B-2) summarizes results with high RPD confirmation values that were qualified QN.

1.2.10 Equipment Blanks

An equipment blank, 16NEC-MW10-1-DVW (16NEC-MW10-1-DVWF for dissolved metals), was collected from decontaminated reusable water sampling equipment to verify that decontamination procedures were effective. The following analytes were detected above the DL in the equipment blank:

- SW6020: nickel, barium, manganese, lead, vanadium, zinc, and chromium
- SW8270SIM: naphthalene and 2-methylnaphthalene
- SW8260: ethylbenzene, PCE, chloroform, xylene, isomers m & p, toluene, o-xylene
- AK102/AK103: DRO and RRO

Sample results that were within 10 times of the concentration detected in the equipment blank were flagged B. Results that were qualified B may be false positives or biased high. Data usability was minimally affected. All results that were qualified B were less than the 2016 ADEC evaluation criteria.

Table B-2-8 (Attachment B-2) summarizes the sample results that were qualified due to equipment blank detections.

1.3 CONCLUSION

In general, the overall quality of project data was acceptable. The completeness goal of 100 percent for all parameters was met and exceeded the work plan completeness goal of 95 percent; no sample results were rejected. All reported data were considered usable for the 2016 Groundwater Monitoring at NEC on St. Lawrence Island, Alaska; limitations are discussed in this DQA and ADEC laboratory data review checklists (Attachment B-3). The qualifications applied during data validation did not adversely affect data usability. Several samples were qualified low due to DRO re-analysis outside of the hold time. Samples 16NEC-14MW06-WG and 16NEC-14MW06-WG-9 were affected by this low bias and had DRO results just below the 2016 ADEC evaluation criteria and SSCL.

2.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2009 (March). *Environmental Laboratory Data and Quality Assurance Requirements; Technical Memorandum.* Division of Spill Prevention and Response. Contaminated Sites Program.

ADEC. 2014 (August). *Underground Storage Tanks Procedures Manual*. Division of Spill Prevention and Response. Contaminated Sites Program.

ADEC. 2016 (November). *Oil and Other Hazardous Substances Pollution Control*. 18 AAC 75.

DoD (U.S. Department of Defense). 2013 (July). *Department of Defense (DoD)/Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories*. Version 5.0.

EPA (U.S. Environmental Protection Agency) 2014 (July). *Test Methods for Evaluating Solid Waste*. SW846, Third Edition, Update V.

USACE (U.S. Army Corps of Engineers). 2009 (September). *Decision Document: Hazardous, Toxic, and Radioactive Waste Project #F10AK096903*. Northeast Cape Formerly Used Defense Site St. Lawrence Island, Alaska. Signed 3 September 2009. F10AK09603_05.09_0500_a.

USACE. 2016 (August). *2016 Groundwater Monitoring at the Main Operations Complex and Other Field Activities Work Plan, Northeast Cape, St. Lawrence Island, Alaska*. Final. Prepared by Jacobs Engineering Group Inc.

(intentionally blank)

ATTACHMENT B-1

Sample Summary Table and Analytical Data Tables

Northeast Cape FUDS 2016 Main Operations Complex
Table B-1-1 Sample Summary Table

Location ID	COC Sample ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Vol	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	CoC Number	Cooler Name	Cooler Date	Lab	SDG Number
TBW01	16NEC-TBW01	10-Aug-16	1030	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	TB	30	BTEX, GRO, Methane	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW01	16NEC-14MW01-WGF	10-Aug-16	1625	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW01	16NEC-14MW01-WG	10-Aug-16	1625	HM	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW01	16NEC-14MW01-WG	10-Aug-16	1625	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW01	16NEC-14MW01-WG	10-Aug-16	1625	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW01	16NEC-14MW01-WG	10-Aug-16	1625	HM	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC02	Mounds	11-Aug-16	ALS	K1609317
14MW01	16NEC-14MW01-WG	10-Aug-16	1625	HM	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC02	Mounds	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WGF	10-Aug-16	1817	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Primary	30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG	10-Aug-16	1817	HM	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	Primary	30	DRO/RRO	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG	10-Aug-16	1817	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Primary	30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG	10-Aug-16	1817	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	Primary	30	BTEX, GRO, Methane	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG	10-Aug-16	1817	HM	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	Primary	30	PAHs, PCBs	2016NEC02	Mounds	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG	10-Aug-16	1817	HM	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320	Primary	30	Sulfate, Alkalinity	2016NEC02	Mounds	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG-9F	10-Aug-16	1817	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Dup	30	(May not be pH<2) Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG-9	10-Aug-16	1817	HM	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	Dup	30	DRO/RRO	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG-9	10-Aug-16	1817	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Dup	30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG-9	10-Aug-16	1817	HM	7	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	Dup	30	(Limited Volume) BTEX, GRO, Methane	2016NEC01	Almond Joy	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG-9	10-Aug-16	1817	HM	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	Dup	30	PAHs, PCBs	2016NEC02	Mounds	11-Aug-16	ALS	K1609317
14MW02	16NEC-14MW02-WG-9	10-Aug-16	1817	HM	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320	Dup	30	Sulfate, Alkalinity	2016NEC02	Mounds	11-Aug-16	ALS	K1609317
TB02	16NEC-TB02	13-Aug-16	0930	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	TB	30	VOCs, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WG	13-Aug-16	1254	HM	9	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	MS/MSD	30	PAHs, PCBs	2016NEC03	Milky Way	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WG	13-Aug-16	1254	HM	3	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320	MS/MSD	30	Sulfate, Alkalinity	2016NEC03	Milky Way	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WGF	13-Aug-16	1254	HM	3	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	MS/MSD	30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WG	13-Aug-16	1254	HM	3	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	MS/MSD	30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WG	13-Aug-16	1254	HM	6	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	MS/MSD	30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WG	13-Aug-16	1254	HM	23	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	MS/MSD	30	(Limited Volume) OCs, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW10-1	16NEC-MW10-1-WG	13-Aug-16	1254	HM	6	VOA vial	40 mL	4°C	WG	SW8015	MS/MSD	30	Glycols	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG	13-Aug-16	1310	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	Primary	30	PAHs, PCBs	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WGF	13-Aug-16	1310	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Primary	30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG	13-Aug-16	1310	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320	Primary	30	Sulfate, Alkalinity	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG	13-Aug-16	1310	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Primary	30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG	13-Aug-16	1310	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	Primary	30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG	13-Aug-16	1310	KR	2	VOA vial	40 mL	4°C	WG	SW8015	Primary	30	Glycols	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG	13-Aug-16	1310	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	Primary	30	VOCs, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9	13-Aug-16	1310	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	Dup	30	PAHs, PCBs	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9F	13-Aug-16	1310	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Dup	30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9	13-Aug-16	1310	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320	Dup	30	Sulfate, Alkalinity	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9	13-Aug-16	1310	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Dup	30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9	13-Aug-16	1310	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	Dup	30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9	13-Aug-16	1310	KR	7	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	Dup	30	(Limited Volume) VOCs, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
14MW06	16NEC-14MW06-WG-9	13-Aug-16	1310	KR	2	VOA vial	40 mL	4°C	WG	SW8015	Dup	30	Glycols	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW10-1-DVW	16NEC-MW10-1-DVW	13-Aug-16	1421	HM	2	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	EB	30	(Limited Volume) PAHs, PCBs	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW10-1-DVW	16NEC-MW10-1-DVWF	13-Aug-16	1421	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	EB	30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW10-1-DVW	16NEC-MW10-1-DVW	13-Aug-16	1421	HM	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	EB	30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
MW10-1-DVW	16NEC-MW10-1-DVW	13-Aug-16	1421	HM	2	VOA vial	40 mL	4°C	WG	SW8015	EB	30	Glycols	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW10-1-DVW	16NEC-MW10-1-DVW	13-Aug-16	1421	HM	6	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101	EB	30	VOCS, GRO	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW88-1	16NEC-MW88-1-WG	13-Aug-16	1628	HM	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
MW88-1	16NEC-MW88-1-WG	13-Aug-16	1628	HM	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC03	Milky Way	15-Aug-16	ALS	K1609434
MW88-1	16NEC-MW88-1-WGF	13-Aug-16	1628	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW88-1	16NEC-MW88-1-WG	13-Aug-16	1628	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW88-1	16NEC-MW88-1-WG	13-Aug-16	1628	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW88-1	16NEC-MW88-1-WG	13-Aug-16	1628	HM	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
14MW03	16NEC-14MW03-WG	13-Aug-16	1644	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082	Not Tested	30	PAHs, PCBs Cancelled due to improper sample collection. Will be re-collected.	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434
14MW03	16NEC-14MW03-WG	13-Aug-16	1644	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320	Not Tested	30	Sulfate, Alkalinity Cancelled due to improper sample collection. Will be re-collected.	2016NEC04	100 Grand	15-Aug-16	ALS	K1609434

Northeast Cape FUDS 2016 Main Operations Complex
Table B-1-1 Sample Summary Table

Location ID	COC Sample ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Vol	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	CoC Number	Cooler Name	Cooler Date	Lab	SDG Number
14MW03	16NEC-14MW03-WGF	13-Aug-16	1644	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Not Tested	30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn) Cancelled due to improper sample collection. Will be re-collected.	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
14MW03	16NEC-14MW03-WG	13-Aug-16	1644	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470	Not Tested	30	Total RCRA Metals (plus Ni, Zn, V) Cancelled due to improper sample collection. Will be re-collected.	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
14MW03	16NEC-14MW03-WG	13-Aug-16	1644	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103	Not Tested	30	DRO/RRO Cancelled due to improper sample collection. Will be re-collected.	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
14MW03	16NEC-14MW03-WG	13-Aug-16	1644	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	Not Tested	30	BTEX, GRO, Methane Cancelled due to improper sample collection. Will be re-collected.	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
14MW07	16NEC-14MW07-WG	13-Aug-16	1815	HM	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC03	Milky Way	15-Aug-16	ALS	K1609434
14MW07	16NEC-14MW07-WG	13-Aug-16	1815	HM	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
14MW07	16NEC-14MW07-WGF	13-Aug-16	1815	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
14MW07	16NEC-14MW07-WG	13-Aug-16	1815	HM	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
14MW07	16NEC-14MW07-WG	13-Aug-16	1815	HM	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
14MW07	16NEC-14MW07-WG	13-Aug-16	1815	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW88-10	16NEC-MW88-10-WG	13-Aug-16	1829	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC06	Caramello	15-Aug-16	ALS	K1609434
MW88-10	16NEC-MW88-10-WG	13-Aug-16	1829	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC03	Milky Way	15-Aug-16	ALS	K1609434
MW88-10	16NEC-MW88-10-WGF	13-Aug-16	1829	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW88-10	16NEC-MW88-10-WG	13-Aug-16	1829	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
MW88-10	16NEC-MW88-10-WG	13-Aug-16	1829	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC07	Butterfinger	15-Aug-16	ALS	K1609434
MW88-10	16NEC-MW88-10-WG	13-Aug-16	1829	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC05	Snickers	15-Aug-16	ALS	K1609434
TB03	16NEC-TB03	14-Aug-16	0945	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	TB	30	BTEX, GRO, Methane	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
17MW1	16NEC-17MW1-WG	14-Aug-16	1422	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC08	Twix	15-Aug-16	ALS	K1609434
17MW1	16NEC-17MW1-WGF	14-Aug-16	1422	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
17MW1	16NEC-17MW1-WG	14-Aug-16	1422	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC08	Twix	15-Aug-16	ALS	K1609434
17MW1	16NEC-17MW1-WG	14-Aug-16	1422	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
17MW1	16NEC-17MW1-WG	14-Aug-16	1422	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
17MW1	16NEC-17MW1-WG	14-Aug-16	1422	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
22MW2	16NEC-22MW2-WG	14-Aug-16	1542	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC08	Twix	15-Aug-16	ALS	K1609434
22MW2	16NEC-22MW2-WGF	14-Aug-16	1542	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
22MW2	16NEC-22MW2-WG	14-Aug-16	1542	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC08	Twix	15-Aug-16	ALS	K1609434
22MW2	16NEC-22MW2-WG	14-Aug-16	1542	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
22MW2	16NEC-22MW2-WG	14-Aug-16	1542	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
22MW2	16NEC-22MW2-WG	14-Aug-16	1542	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
26MW1	16NEC-26MW1-WGF	14-Aug-16	1737	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
26MW1	16NEC-26MW1-WG	14-Aug-16	1737	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC08	Twix	15-Aug-16	ALS	K1609434
26MW1	16NEC-26MW1-WG	14-Aug-16	1737	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
26MW1	16NEC-26MW1-WG	14-Aug-16	1737	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
26MW1	16NEC-26MW1-WG	14-Aug-16	1737	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
26MW1	16NEC-26MW1-WG	14-Aug-16	1737	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
20MW-1	16NEC-20MW-1-WG	14-Aug-16	1858	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC08	Twix	15-Aug-16	ALS	K1609434
20MW-1	16NEC-20MW-1-WGF	14-Aug-16	1858	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
20MW-1	16NEC-20MW-1-WG	14-Aug-16	1858	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC08	Twix	15-Aug-16	ALS	K1609434
20MW-1	16NEC-20MW-1-WG	14-Aug-16	1858	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC08	Twix	15-Aug-16	ALS	K1609434
20MW-1	16NEC-20MW-1-WG	14-Aug-16	1858	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
20MW-1	16NEC-20MW-1-WG	14-Aug-16	1858	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC09	Kit Kat	15-Aug-16	ALS	K1609434
TB04	16NEC-TB04	15-Aug-16	0900	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	TB	30	BTEX, GRO, Methane	2016NEC10	Whatchamacallit	17-Aug-16	ALS	K1609581
14MW03	16NEC-14MW03-WG	15-Aug-16	1354	KR	9	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC10	Whatchamacallit	17-Aug-16	ALS	K1609581
14MW03	16NEC-14MW03-WGF	15-Aug-16	1354	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
14MW03	16NEC-14MW03-WG	15-Aug-16	1354	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
14MW03	16NEC-14MW03-WG	15-Aug-16	1354	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
14MW03	16NEC-14MW03-WG	15-Aug-16	1354	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
14MW03	16NEC-14MW03-WG	15-Aug-16	1354	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC13	3 Musketeers	17-Aug-16	ALS	K1609581
14MW05	16NEC-14MW05-WG	15-Aug-16	1553	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC10	Whatchamacallit	17-Aug-16	ALS	K1609581
14MW05	16NEC-14MW05-WG	15-Aug-16	1553	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
14MW05	16NEC-14MW05-WG	15-Aug-16	1553	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC11	PayDay	17-Aug-16	ALS	K1609581

Northeast Cape FUDS 2016 Main Operations Complex
Table B-1-1 Sample Summary Table

Location ID	COC Sample ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Vol	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	CoC Number	Cooler Name	Cooler Date	Lab	SDG Number
14MW05	16NEC-14MW05-WGF	15-Aug-16	1553	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
14MW05	16NEC-14MW05-WG	15-Aug-16	1553	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
14MW05	16NEC-14MW05-WG	15-Aug-16	1553	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC13	3 Musketeers	17-Aug-16	ALS	K1609581
14MW04	16NEC-14MW04-WG	15-Aug-16	1840	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC10	Whatchamacallit	17-Aug-16	ALS	K1609581
14MW04	16NEC-14MW04-WG	15-Aug-16	1840	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
14MW04	16NEC-14MW04-WG	15-Aug-16	1840	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
14MW04	16NEC-14MW04-WGF	15-Aug-16	1840	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
14MW04	16NEC-14MW04-WG	15-Aug-16	1840	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
14MW04	16NEC-14MW04-WG	15-Aug-16	1840	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC13	3 Musketeers	17-Aug-16	ALS	K1609581
TB05	16NEC-TB05	16-Aug-16	0905	HM	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175	TB	30	BTEX, GRO, Methane	2016NEC10	Whatchamacallit	17-Aug-16	ALS	K1609581
MW88-3	16NEC-MW88-3-WG	16-Aug-16	1330	KR	8	VOA vial	40 mL	4°C, HCl	WG	SW8260B, AK101, RSK 175		30	BTEX, GRO, Methane	2016NEC10	Whatchamacallit	17-Aug-16	ALS	K1609581
MW88-3	16NEC-MW88-3-WG	16-Aug-16	1330	KR	3	glass amber	1 L	4°C	WG	SW8270DSIM, SW8082		30	PAHs, PCBs	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
MW88-3	16NEC-MW88-3-WG	16-Aug-16	1330	KR	1	HDPE	250 mL	4°C	WG	EPA 300.0, SM2320		30	Sulfate, Alkalinity	2016NEC11	PayDay	17-Aug-16	ALS	K1609581
MW88-3	16NEC-MW88-3-WGF	16-Aug-16	1330	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Dissolved RCRA Metals (plus Mn, Ni, V, Zn)	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
MW88-3	16NEC-MW88-3-WG	16-Aug-16	1330	KR	1	HDPE	250 mL	4°C, HNO3	WG	SW6020/7470		30	Total RCRA Metals (plus Ni, Zn, V)	2016NEC12	O'Henry	17-Aug-16	ALS	K1609581
MW88-3	16NEC-MW88-3-WG	16-Aug-16	1330	KR	2	glass amber	250 mL	4°C, HCl	WG	AK102/AK103		30	DRO/RRO	2016NEC13	3 Musketeers	17-Aug-16	ALS	K1609581

Northeast Cape FUDS 2016 Sampling at Main Operations Complex

Table B-1-2 Groundwater Analytical Data Table

				Location ID	**14MW01**	**14MW01**	**14MW02**	**14MW02**	**14MW02**	**14MW02**	**14MW03**
				Sample ID	**16NEC-14MW01-WG**	**16NEC-14MW01-WGF**	**16NEC-14MW02-WG**	**16NEC-14MW02-WGF**	**16NEC-14MW02-WG-9**	**16NEC-14MW02-WG-9F**	**16NEC-14MW03-WG**
				Lab Sample ID	**K160931701**	**K160931701F[3]**	**K160931702**	**K160931702F[3]**	**K160931703**	**K160931703F[3]**	**K160958101**
				SDG	**K1609317**	**K1609317**	**K1609317**	**K1609317**	**K1609317**	**K1609317**	**K1609581**
				Sample Date	**8/10/16**	**8/10/16**	**8/10/16**	**8/10/16**	**8/10/16**	**8/10/16**	**8/15/16**
				Matrix	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**
				Laboratory	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**
				QA/QC	**Primary**	**Primary**	**Primary**	**Primary**	**Duplicate**	**Duplicate**	**Primary**
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
8270SIM	1-Methylnaphthalene	mg/L	0.011	-	0.0083 [0.000005]	-	0.0035 [0.000005]	-	0.0036 [0.000005]	-	0.000056 [0.0000056]
8270SIM	2-Methylnaphthalene	mg/L	0.036	-	0.0042 [0.000005]	-	0.00074 [0.000005]	-	0.00075 [0.000005]	-	0.000015 [0.0000056] J, B
8270SIM	Acenaphthene	mg/L	0.53	-	0.00037 [0.000005]	-	0.00026 [0.000005]	-	0.00027 [0.000005]	-	0.00023 [0.0000056]
8270SIM	Acenaphthylene	mg/L	0.26	-	0.00011 [0.000005]	-	0.000048 [0.000005]	-	0.000045 [0.000005]	-	0.000012 [0.0000056] J
8270SIM	Anthracene	mg/L	0.043	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Benzo(a)anthracene	mg/L	0.00012	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	0.0000033 [0.0000056] J
8270SIM	Benzo(a)pyrene	mg/L	0.000034	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Benzo(b)fluoranthene	mg/L	0.00034	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Benzo(g,h,i)perylene	mg/L	0.00026	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Benzo(k)fluoranthene	mg/L	0.0008	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Chrysene	mg/L	0.002	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Dibenzo(a,h)anthracene	mg/L	0.000034	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Fluoranthene	mg/L	0.26	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.000023]
8270SIM	Fluorene	mg/L	0.29	-	0.00088 [0.000005]	-	0.00053 [0.000005]	-	0.00051 [0.000005]	-	0.00033 [0.0000056]
8270SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Naphthalene	mg/L	0.0017	-	**0.0075 [0.000005]**	-	**0.0037 [0.000005]**	-	**0.0038 [0.000005]**	-	0.00072 [0.0000056]
8270SIM	Phenanthrene	mg/L	0.17	-	0.000091 [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.0000056]
8270SIM	Pyrene	mg/L	0.12	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.000012]
A2320B	Alkalinity, Total	mg/L	-	-	18.7 [2]	-	40 [6] B	-	40 [6] B	-	28 [6] B
AK101	Gasoline Range Organics	mg/L	2.2	1.3	0.065 [0.025] J	-	0.14 [0.025]	-	0.14 [0.025]	-	0.075 [0.025] J
AK102	Diesel Range Organics	mg/L	1.5	1.5	0.92 [0.021]	-	**1.6 [0.022]**	-	**1.5 [0.022]**	-	0.99 [0.021] QL
AK103	Residual Range Organics	mg/L	1.1	1.1	0.12 [0.051] J, B	-	0.18 [0.053] J, B	-	0.17 [0.053] J, B	-	0.16 [0.053] J, B, QL
E300.0	Sulfate	mg/L	-	-	17.7 [0.04]	-	14.7 [0.04]	-	14.6 [0.04]	-	16.9 [0.04]
RSK175	Ethane	mg/L	-	-	-	-	-	-	-	-	-
RSK175	Ethene	mg/L	-	-	-	-	-	-	-	-	-
RSK175	Methane	mg/L	-	-	0.024 [0.00063]	-	0.023 [0.00063]	-	0.025 [0.00063]	-	0.0082 [0.00063]
SW6020A	Arsenic	mg/L	0.00052	0.01	**0.0046 [0.00025]**	**0.00439 [0.00025]**	**0.00244 [0.00025]**	**0.00241 [0.00025]**	**0.00235 [0.00025]**	**0.00237 [0.00025] QN**	**0.00194 [0.00025]**
SW6020A	Barium	mg/L	3.8	-	0.0201 [0.000025]	0.0174 [0.000025]	0.0233 [0.000025]	0.0229 [0.000025]	0.0227 [0.000025]	0.0228 [0.000025] QN	0.0155 [0.000025]
SW6020A	Cadmium	mg/L	0.0092	-	0.000018 [0.00002] J	ND [0.00002]	0.000066 [0.00002]	0.000018 [0.00002] J, QN	0.000059 [0.00002]	0.000029 [0.00002] QN	0.000066 [0.00002]
SW6020A	Chromium[4]	mg/L	22	-	0.00078 [0.00005] B	0.00035 [0.00005] B	0.00053 [0.00005] B	0.00034 [0.00005] B	0.00051 [0.00005] B	0.00035 [0.00005] B, QN	0.00176 [0.00005]
SW6020A	Lead	mg/L	0.015	0.015	0.00153 [0.00001]	0.000159 [0.00001] B	0.000496 [0.00001]	0.000054 [0.00001] B, QN	0.00045 [0.00001]	0.000083 [0.00001] B, QN	0.00318 [0.00001]
SW6020A	Manganese	mg/L	-	-	-	0.916 [0.000013]	-	1.86 [0.000013]	-	1.84 [0.000013] QN	-
SW6020A	Nickel	mg/L	0.392	-	0.00105 [0.00005] B	0.00124 [0.00005] B	0.00111 [0.00005] B	0.00094 [0.00005] B	0.00106 [0.00005] B	0.00105 [0.00005] B, QN	0.00289 [0.00005] B
SW6020A	Selenium	mg/L	0.1	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001] QN	ND [0.001]
SW6020A	Silver	mg/L	0.094	-	0.000007 [0.00001] J	0.000004 [0.00001] J	0.00001 [0.00001] J, QN	ND [0.00001]	0.000005 [0.00001] J, QN	ND [0.00001] QN	0.000008 [0.00001] J
SW6020A	Vanadium	mg/L	0.0864	-	0.0009 [0.00005]	0.00034 [0.00005] B	0.00056 [0.00005]	0.00042 [0.00005]	0.00052 [0.00005]	0.00043 [0.00005] QN	0.00095 [0.00005]
SW6020A	Zinc	mg/L	6	-	0.00322 [0.0005] B	0.00313 [0.0005] B	0.00254 [0.0005] B	0.00259 [0.0005] B	0.00237 [0.0005] B	0.0034 [0.0005] B, QN	0.00587 [0.0005] B
SW7470A	Mercury	mg/L	0.00052	-	ND [0.00005]	ND [0.00005]	ND [0.00005] QL	ND [0.00005]	ND [0.00005]	ND [0.00005] QN	ND [0.00005]
SW8015C	Ethylene glycol	mg/L	40	-	-	-	-	-	-	-	-
SW8015C	Propylene glycol	mg/L	-	-	-	-	-	-	-	-	-
SW8082A	PCB-1016 (Aroclor 1016)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000004]	-	ND [0.0000021]
SW8082A	PCB-1221 (Aroclor 1221)	mg/L	0.0005	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.000011]	-	ND [0.000011]
SW8082A	PCB-1232 (Aroclor 1232)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.0000048]	-	ND [0.0000053]	-	ND [0.0000021]
SW8082A	PCB-1242 (Aroclor 1242)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.0000029]	-	ND [0.0000063]	-	ND [0.0000021]
SW8082A	PCB-1248 (Aroclor 1248)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.0000025]	-	ND [0.0000046]	-	ND [0.0000021]
SW8082A	PCB-1254 (Aroclor 1254)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.0000059]	-	ND [0.0000021]	-	ND [0.0000028]
SW8082A	PCB-1260 (Aroclor 1260)	mg/L	0.0005	-	ND [0.000002]	-	0.0000028 [0.000002] J	-	0.0000032 [0.000002] J	-	0.0000029 [0.0000021] J, B, QN
SW8082A	PCB-1262 (Aroclor 1262)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	-
SW8082A	PCB-1268 (Aroclor 1268)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	-
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	0.0057	-	-	-	-	-	-	-	-
SW8260C	1,1,1-Trichloroethane	mg/L	8	-	-	-	-	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	14MW01	14MW01	14MW02	14MW02	14MW02	14MW02	14MW03
				Sample ID	16NEC-14MW01-WG	16NEC-14MW01-WGF	16NEC-14MW02-WG	16NEC-14MW02-WGF	16NEC-14MW02-WG-9	16NEC-14MW02-WG-9F	16NEC-14MW03-WG
				Lab Sample ID	K160931701	K160931701F[3]	K160931702	K160931702F[3]	K160931703	K160931703F[3]	K160958101
				SDG	K1609317	K1609317	K1609317	K1609317	K1609317	K1609317	K1609581
				Sample Date	8/10/16	8/10/16	8/10/16	8/10/16	8/10/16	8/10/16	8/15/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Primary	Primary	Primary	Primary	Duplicate	Duplicate	Primary
Method	Analyte	Units	2016 ADEC Evaluation Criteria[1]	SSCL[2]							
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.00076	-	-	-	-	-	-	-	-
SW8260C	1,1,2-Trichloroethane	mg/L	0.00041	-	-	-	-	-	-	-	-
SW8260C	1,1-Dichloroethane	mg/L	0.028	-	-	-	-	-	-	-	-
SW8260C	1,1-Dichloroethene	mg/L	0.28	-	-	-	-	-	-	-	-
SW8260C	1,1-Dichloropropene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,2,3-Trichlorobenzene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,2,3-Trichloropropane	mg/L	0.0000075	-	-	-	-	-	-	-	-
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.004	-	-	-	-	-	-	-	-
SW8260C	1,2,4-Trimethylbenzene	mg/L	0.015	-	-	-	-	-	-	-	-
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,2-Dibromoethane	mg/L	0.000075	-	-	-	-	-	-	-	-
SW8260C	1,2-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	-	-
SW8260C	1,2-Dichloroethane	mg/L	0.0017	-	-	-	-	-	-	-	-
SW8260C	1,2-Dichloropropane	mg/L	0.0044	-	-	-	-	-	-	-	-
SW8260C	1,3,5-Trimethylbenzene	mg/L	0.12	-	-	-	-	-	-	-	-
SW8260C	1,3-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	-	-
SW8260C	1,3-Dichloropropane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,4-Dichlorobenzene	mg/L	0.0048	-	-	-	-	-	-	-	-
SW8260C	2,2-Dichloropropane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	2-Butanone	mg/L	5.6	-	-	-	-	-	-	-	-
SW8260C	2-Chlorotoluene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	2-Hexanone	mg/L	0.038	-	-	-	-	-	-	-	-
SW8260C	4-Chlorotoluene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	4-Isopropyltoluene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	4-Methyl-2-pentanone	mg/L	6.3	-	-	-	-	-	-	-	-
SW8260C	Acetone	mg/L	14	-	-	-	-	-	-	-	-
SW8260C	Benzene	mg/L	0.0046	0.005	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Bromobenzene	mg/L	0.062	-	-	-	-	-	-	-	-
SW8260C	Bromochloromethane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	Bromodichloromethane	mg/L	0.0013	-	-	-	-	-	-	-	-
SW8260C	Bromoform	mg/L	0.033	-	-	-	-	-	-	-	-
SW8260C	Bromomethane	mg/L	0.0075	-	-	-	-	-	-	-	-
SW8260C	Carbon disulfide	mg/L	0.81	-	-	-	-	-	-	-	-
SW8260C	Carbon tetrachloride	mg/L	0.0046	-	-	-	-	-	-	-	-
SW8260C	Chlorobenzene	mg/L	0.078	-	-	-	-	-	-	-	-
SW8260C	Chloroethane	mg/L	21	-	-	-	-	-	-	-	-
SW8260C	Chloroform	mg/L	0.0022	-	-	-	-	-	-	-	-
SW8260C	Chloromethane	mg/L	0.19	-	-	-	-	-	-	-	-
SW8260C	cis-1,2-Dichloroethene	mg/L	0.036	-	-	-	-	-	-	-	-
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	-	-
SW8260C	Dibromochloromethane	mg/L	0.0087	-	-	-	-	-	-	-	-
SW8260C	Dibromomethane	mg/L	0.0083	-	-	-	-	-	-	-	-
SW8260C	Dichlorodifluoromethane	mg/L	0.2	-	-	-	-	-	-	-	-
SW8260C	Ethylbenzene	mg/L	0.015	0.7	0.0005 [0.0001] B	-	0.00071 [0.0001]	-	0.0007 [0.0001]	-	0.00025 [0.0001] J, B, QH
SW8260C	Hexachlorobutadiene	mg/L	0.0014	-	-	-	-	-	-	-	-
SW8260C	Isopropylbenzene	mg/L	0.45	-	-	-	-	-	-	-	-
SW8260C	Methylene chloride	mg/L	0.11	-	-	-	-	-	-	-	-
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.14	-	-	-	-	-	-	-	-
SW8260C	Naphthalene	mg/L	0.0017	-	-	-	-	-	-	-	-
SW8260C	n-Butylbenzene	mg/L	1	-	-	-	-	-	-	-	-
SW8260C	n-Propylbenzene	mg/L	0.66	-	-	-	-	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	**14MW01**	**14MW01**	**14MW02**	**14MW02**	**14MW02**	**14MW02**	**14MW03**
				Sample ID	**16NEC-14MW01-WG**	**16NEC-14MW01-WGF**	**16NEC-14MW02-WG**	**16NEC-14MW02-WGF**	**16NEC-14MW02-WG-9**	**16NEC-14MW02-WG-9F**	**16NEC-14MW03-WG**
				Lab Sample ID	**K160931701**	**K160931701F^3**	**K160931702**	**K160931702F^3**	**K160931703**	**K160931703F^3**	**K160958101**
				SDG	**K1609317**	**K1609317**	**K1609317**	**K1609317**	**K1609317**	**K1609317**	**K1609581**
				Sample Date	**8/10/16**	**8/10/16**	**8/10/16**	**8/10/16**	**8/10/16**	**8/10/16**	**8/15/16**
				Matrix	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**
				Laboratory	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**
				QA/QC	**Primary**	**Primary**	**Primary**	**Primary**	**Duplicate**	**Duplicate**	**Primary**
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria^1**	**SSCL^2**							
SW8260C	o-Xylene	mg/L	0.193	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]
SW8260C	sec-Butylbenzene	mg/L	2	-	-	-	-	-	-	-	-
SW8260C	Styrene	mg/L	1.2	-	-	-	-	-	-	-	-
SW8260C	tert-Butylbenzene	mg/L	0.69	-	-	-	-	-	-	-	-
SW8260C	Tetrachloroethene (PCE)	mg/L	0.041	-	-	-	-	-	-	-	-
SW8260C	Toluene	mg/L	1.1	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]
SW8260C	trans-1,2-Dichloroethene	mg/L	0.36	-	-	-	-	-	-	-	-
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	-	-
SW8260C	Trichloroethene (TCE)	mg/L	0.0028	-	-	-	-	-	-	-	-
SW8260C	Trichlorofluoromethane	mg/L	5.2	-	-	-	-	-	-	-	-
SW8260C	Vinyl chloride	mg/L	0.00019	-	-	-	-	-	-	-	-
SW8260C	Xylene, Isomers m & p	mg/L	0.193	-	0.00038 [0.0002] J, B	-	0.0006 [0.0002] B	-	0.00055 [0.0002] B	-	ND [0.0002]

Notes:

[1] 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016)

[2] Decision Document (USACE 2009)

[3] Column with Lab Sample ID ending in "F" contains the filtered metals (dissolved) results

[4] In accordance 18 AAC 75 ADEC Table C, samples results reported for total chromium are considered background chromium(III) in the absence of an

bold = Analytical results exceed the 2016 ADEC evaluation criteria.

🟧 Analytical results exceed the SSCL.

Italics Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs

[ ] - limit of detection

- - not provided or not analyzed

ALGK - ALS Environmental, Kelso, WA.

mg/L - milligram per liter

MS/MSD - matrix spike/ matrix spike duplicate

SDG - Sample Delivery Group

SSCL - site-specific cleanup level

WG - Groundwater

For Data Qualifiers, refer to Section 1.1 of the DQA.

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	14MW03	14MW04	14MW04	14MW05	14MW05	14MW06	14MW06
				Sample ID	16NEC-14MW03-WGF	16NEC-14MW04-WG	16NEC-14MW04-WGF	16NEC-14MW05-WG	16NEC-14MW05-WGF	16NEC-14MW06-WG	16NEC-14MW06-WGF
				Lab Sample ID	K160958101F[3]	K160958102	K160958102F[3]	K160958103	K160958103F[3]	K160943404	K160943404F[3]
				SDG	K1609581	K1609581	K1609581	K1609581	K1609581	K1609434	K1609434
				Sample Date	8/15/16	8/15/16	8/15/16	8/15/16	8/15/16	8/13/16	8/13/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
8270SIM	1-Methylnaphthalene	mg/L	0.011	-	-	0.00003 [0.000005]	-	0.00012 [0.000005]	-	ND [0.000005]	-
8270SIM	2-Methylnaphthalene	mg/L	0.036	-	-	ND [0.000005]	-	0.000029 [0.000005] B	-	ND [0.000005]	-
8270SIM	Acenaphthene	mg/L	0.53	-	-	ND [0.000005]	-	0.0002 [0.000005]	-	0.000017 [0.000005] J, QN	-
8270SIM	Acenaphthylene	mg/L	0.26	-	-	0.0000052 [0.000005] J	-	0.00067 [0.000005]	-	0.0000097 [0.000005] J	-
8270SIM	Anthracene	mg/L	0.043	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(a)anthracene	mg/L	0.00012	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(a)pyrene	mg/L	0.000034	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(b)fluoranthene	mg/L	0.00034	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(g,h,i)perylene	mg/L	0.00026	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(k)fluoranthene	mg/L	0.0008	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Chrysene	mg/L	0.002	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Dibenzo(a,h)anthracene	mg/L	0.000034	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Fluoranthene	mg/L	0.26	-	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.00002]	-
8270SIM	Fluorene	mg/L	0.29	-	-	0.000022 [0.000005]	-	0.00024 [0.000005]	-	ND [0.000005]	-
8270SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Naphthalene	mg/L	0.0017	-	-	0.000022 [0.000005] B	-	0.00072 [0.000005]	-	0.00006 [0.000005] B, QN	-
8270SIM	Phenanthrene	mg/L	0.17	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Pyrene	mg/L	0.12	-	-	ND [0.00001]	-	0.000012 [0.00001] J	-	ND [0.00001]	-
A2320B	Alkalinity, Total	mg/L	-	-	-	91 [6]	-	47 [6]	-	140 [6]	-
AK101	Gasoline Range Organics	mg/L	2.2	1.3	-	0.011 [0.025] J	-	0.072 [0.025] J	-	0.011 [0.025] J	-
AK102	Diesel Range Organics	mg/L	1.5	1.5	-	**2.2 [0.021] QL**	-	**3.2 [0.021] QL**	-	1.4 [0.021] QL	-
AK103	Residual Range Organics	mg/L	1.1	1.1	-	0.61 [0.052] B, QL	-	0.61 [0.052] B, QL	-	0.55 [0.051] B, QL	-
E300.0	Sulfate	mg/L	-	-	-	31.2 [0.2]	-	23.1 [0.2]	-	15.3 [0.04]	-
RSK175	Ethane	mg/L	-	-	-	-	-	-	-	ND [0.00024]	-
RSK175	Ethene	mg/L	-	-	-	-	-	-	-	ND [0.00022]	-
RSK175	Methane	mg/L	-	-	-	0.02 [0.00063]	-	0.01 [0.00063]	-	0.0083 [0.00063]	-
SW6020A	Arsenic	mg/L	0.00052	0.01	**0.00186 [0.00025]**	**0.00524 [0.00025]**	**0.00387 [0.00025]**	**0.00207 [0.00025]**	**0.00194 [0.00025]**	**0.00203 [0.00025]**	**0.00203 [0.00025]**
SW6020A	Barium	mg/L	3.8	-	0.0131 [0.000025]	0.884 [0.0005]	0.484 [0.0005]	0.0338 [0.000025]	0.0318 [0.000025]	0.0587 [0.000025]	0.0659 [0.000025]
SW6020A	Cadmium	mg/L	0.0092	-	0.000055 [0.00002]	0.000617 [0.00002]	0.000428 [0.00002]	0.000113 [0.00002]	0.000063 [0.00002]	0.000195 [0.00002]	0.00008 [0.00002] QN
SW6020A	Chromium[4]	mg/L	22	-	0.00065 [0.00005] B	0.0104 [0.00005]	0.00622 [0.00005]	0.001 [0.00005] B	0.00046 [0.00005] B	0.0002 [0.00005] B	0.00034 [0.00005] B, QN
SW6020A	Lead	mg/L	0.015	0.015	0.00126 [0.00001]	**0.0582 [0.00001]**	**0.0349 [0.00001]**	0.00165 [0.00001]	0.000252 [0.00001]	0.000861 [0.00001]	0.000649 [0.00001] QN
SW6020A	Manganese	mg/L	-	-	1.36 [0.000013]	-	1.71 [0.000013]	-	2.71 [0.0013]	-	1.28 [0.000013]
SW6020A	Nickel	mg/L	0.392	-	0.00332 [0.00005] B	0.0119 [0.00005]	0.00919 [0.00005]	0.00662 [0.00005]	0.00696 [0.00005]	0.00175 [0.00005] B	0.00201 [0.00005] B
SW6020A	Selenium	mg/L	0.1	-	ND [0.001]	0.0008 [0.001] J	0.0006 [0.001] J	ND [0.001]	ND [0.001]	0.0005 [0.001] J	ND [0.001] QN
SW6020A	Silver	mg/L	0.094	-	ND [0.00001]	0.000234 [0.00001]	0.000159 [0.00001]	0.000049 [0.00001]	0.00001 [0.00001] J	0.000014 [0.00001] J	0.00001 [0.00001] J, QN
SW6020A	Vanadium	mg/L	0.0864	-	0.00034 [0.00005] B	0.0157 [0.00005]	0.00978 [0.00005]	0.0008 [0.00005]	0.00052 [0.00005]	0.00039 [0.00005] B	0.00054 [0.00005] QN
SW6020A	Zinc	mg/L	6	-	0.00516 [0.0005] B	0.201 [0.0005]	0.141 [0.0005]	0.00989 [0.0005]	0.01 [0.0005]	0.00331 [0.0005] B	0.00734 [0.0005] QN
SW7470A	Mercury	mg/L	0.00052	-	ND [0.00005]	0.00005 [0.00005] J	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]
SW8015C	Ethylene glycol	mg/L	40	-	-	-	-	-	-	ND [2]	-
SW8015C	Propylene glycol	mg/L	-	-	-	-	-	-	-	ND [2]	-
SW8082A	PCB-1016 (Aroclor 1016)	mg/L	0.0005	-	-	ND [0.0002] QL	-	ND [0.000002]	-	ND [0.000002]	-
SW8082A	PCB-1221 (Aroclor 1221)	mg/L	0.0005	-	-	ND [0.0004] QL	-	ND [0.00001]	-	ND [0.00001]	-
SW8082A	PCB-1232 (Aroclor 1232)	mg/L	0.0005	-	-	ND [0.0002] QL	-	ND [0.000002]	-	ND [0.000002]	-
SW8082A	PCB-1242 (Aroclor 1242)	mg/L	0.0005	-	-	ND [0.0002] QL	-	ND [0.000002]	-	ND [0.000002]	-
SW8082A	PCB-1248 (Aroclor 1248)	mg/L	0.0005	-	-	ND [0.0002] QL	-	ND [0.000002]	-	ND [0.000002]	-
SW8082A	PCB-1254 (Aroclor 1254)	mg/L	0.0005	-	-	ND [0.0002] QL	-	0.0000094 [0.000002] J	-	0.0000045 [0.000002] J	-
SW8082A	PCB-1260 (Aroclor 1260)	mg/L	0.0005	-	-	ND [0.0002] QL	-	ND [0.000002]	-	0.0000015 [0.000002] J, QN	-
SW8082A	PCB-1262 (Aroclor 1262)	mg/L	0.0005	-	-	-	-	-	-	-	-
SW8082A	PCB-1268 (Aroclor 1268)	mg/L	0.0005	-	-	-	-	-	-	-	-
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	0.0057	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,1,1-Trichloroethane	mg/L	8	-	-	-	-	-	-	ND [0.0002]	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	14MW03	14MW04	14MW04	14MW05	14MW05	14MW06	14MW06
				Sample ID	16NEC-14MW03-WGF	16NEC-14MW04-WG	16NEC-14MW04-WGF	16NEC-14MW05-WG	16NEC-14MW05-WGF	16NEC-14MW06-WG	16NEC-14MW06-WGF
				Lab Sample ID	K160958101F[3]	K160958102	K160958102F[3]	K160958103	K160958103F[3]	K160943404	K160943404F[3]
				SDG	K1609581	K1609581	K1609581	K1609581	K1609581	K1609434	K1609434
				Sample Date	8/15/16	8/15/16	8/15/16	8/15/16	8/15/16	8/13/16	8/13/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Method	Analyte	Units	2016 ADEC Evaluation Criteria[1]	SSCL[2]							
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.00076	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,1,2-Trichloroethane	mg/L	0.00041	-	-	-	-	-	-	ND [0.0004]	-
SW8260C	1,1-Dichloroethane	mg/L	0.028	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,1-Dichloroethene	mg/L	0.28	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,1-Dichloropropene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,2,3-Trichlorobenzene	mg/L	-	-	-	-	-	-	-	ND [0.0004]	-
SW8260C	1,2,3-Trichloropropane	mg/L	0.0000075	-	-	-	-	-	-	*ND [0.0005]*	-
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.004	-	-	-	-	-	-	ND [0.0003]	-
SW8260C	1,2,4-Trimethylbenzene	mg/L	0.015	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	-	-	-	-	-	-	-	ND [0.0008]	-
SW8260C	1,2-Dibromoethane	mg/L	0.000075	-	-	-	-	-	-	*ND [0.0002]*	-
SW8260C	1,2-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,2-Dichloroethane	mg/L	0.0017	-	-	-	-	-	-	ND [0.00015]	-
SW8260C	1,2-Dichloropropane	mg/L	0.0044	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,3,5-Trimethylbenzene	mg/L	0.12	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,3-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	1,3-Dichloropropane	mg/L	-	-	-	-	-	-	-	ND [0.0003]	-
SW8260C	1,4-Dichlorobenzene	mg/L	0.0048	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	2,2-Dichloropropane	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	2-Butanone	mg/L	5.6	-	-	-	-	-	-	ND [0.004]	-
SW8260C	2-Chlorotoluene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	2-Hexanone	mg/L	0.038	-	-	-	-	-	-	ND [0.01]	-
SW8260C	4-Chlorotoluene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	4-Isopropyltoluene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	4-Methyl-2-pentanone	mg/L	6.3	-	-	-	-	-	-	ND [0.01]	-
SW8260C	Acetone	mg/L	14	-	-	-	-	-	-	ND [0.01]	-
SW8260C	Benzene	mg/L	0.0046	0.005	-	0.00013 [0.0001] J, QH	-	ND [0.0001]	-	ND [0.0001]	-
SW8260C	Bromobenzene	mg/L	0.062	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Bromochloromethane	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Bromodichloromethane	mg/L	0.0013	-	-	-	-	-	-	ND [0.0003]	-
SW8260C	Bromoform	mg/L	0.033	-	-	-	-	-	-	ND [0.0005]	-
SW8260C	Bromomethane	mg/L	0.0075	-	-	-	-	-	-	ND [0.0003]	-
SW8260C	Carbon disulfide	mg/L	0.81	-	-	-	-	-	-	0.00007 [0.0002] J, B, QH, QL	-
SW8260C	Carbon tetrachloride	mg/L	0.0046	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Chlorobenzene	mg/L	0.078	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Chloroethane	mg/L	21	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Chloroform	mg/L	0.0022	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Chloromethane	mg/L	0.19	-	-	-	-	-	-	ND [0.0002] QL	-
SW8260C	cis-1,2-Dichloroethene	mg/L	0.036	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Dibromochloromethane	mg/L	0.0087	-	-	-	-	-	-	ND [0.0005]	-
SW8260C	Dibromomethane	mg/L	0.0083	-	-	-	-	-	-	ND [0.0005]	-
SW8260C	Dichlorodifluoromethane	mg/L	0.2	-	-	-	-	-	-	ND [0.0002] QL	-
SW8260C	Ethylbenzene	mg/L	0.015	0.7	-	ND [0.0001]	-	0.00021 [0.0001] J, B, QH	-	ND [0.0001]	-
SW8260C	Hexachlorobutadiene	mg/L	0.0014	-	-	-	-	-	-	ND [0.0003]	-
SW8260C	Isopropylbenzene	mg/L	0.45	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Methylene chloride	mg/L	0.11	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.14	-	-	-	-	-	-	ND [0.0003]	-
SW8260C	Naphthalene	mg/L	0.0017	-	-	-	-	-	-	0.00034 [0.0003] J, QH, QN	-
SW8260C	n-Butylbenzene	mg/L	1	-	-	-	-	-	-	ND [0.0001]	-
SW8260C	n-Propylbenzene	mg/L	0.66	-	-	-	-	-	-	ND [0.0002]	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	**14MW03**	**14MW04**	**14MW04**	**14MW05**	**14MW05**	**14MW06**	**14MW06**
				Sample ID	**16NEC-14MW03-WGF**	**16NEC-14MW04-WG**	**16NEC-14MW04-WGF**	**16NEC-14MW05-WG**	**16NEC-14MW05-WGF**	**16NEC-14MW06-WG**	**16NEC-14MW06-WGF**
				Lab Sample ID	**K160958101F[3]**	**K160958102**	**K160958102F[3]**	**K160958103**	**K160958103F[3]**	**K160943404**	**K160943404F[3]**
				SDG	**K1609581**	**K1609581**	**K1609581**	**K1609581**	**K1609581**	**K1609434**	**K1609434**
				Sample Date	**8/15/16**	**8/15/16**	**8/15/16**	**8/15/16**	**8/15/16**	**8/13/16**	**8/13/16**
				Matrix	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**	**WG**
				Laboratory	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**
				QA/QC	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
SW8260C	o-Xylene	mg/L	0.193	-	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-
SW8260C	sec-Butylbenzene	mg/L	2	-	-	-	-	-	-	ND [0.0001]	-
SW8260C	Styrene	mg/L	1.2	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	tert-Butylbenzene	mg/L	0.69	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Tetrachloroethene (PCE)	mg/L	0.041	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Toluene	mg/L	1.1	-	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-
SW8260C	trans-1,2-Dichloroethene	mg/L	0.36	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Trichloroethene (TCE)	mg/L	0.0028	-	-	-	-	-	-	ND [0.0001]	-
SW8260C	Trichlorofluoromethane	mg/L	5.2	-	-	-	-	-	-	ND [0.0002]	-
SW8260C	Vinyl chloride	mg/L	0.00019	-	-	-	-	-	-	ND [0.0001]	-
SW8260C	Xylene, Isomers m & p	mg/L	0.193	-	-	ND [0.0002]	-	0.00018 [0.0002] J, B, QH	-	ND [0.0002]	-

Notes:

[1] 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016)

[2] Decision Document (USACE 2009)

[3] Column with Lab Sample ID ending in "F" contains the filtered metals (dissolved) results

[4] In accordance 18 AAC 75 ADEC Table C, samples results reported for total chromium are considered background chromium(III) in the absence of an

bold = Analytical results exceed the 2016 ADEC evaluation criteria.

🟧 Analytical results exceed the SSCL.

Italics Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs

[ ] - limit of detection
- - not provided or not analyzed
ALGK - ALS Environmental, Kelso, WA.
mg/L - milligram per liter
MS/MSD - matrix spike/ matrix spike duplicate
SDG - Sample Delivery Group
SSCL - site-specific cleanup level
WG - Groundwater
For Data Qualifiers, refer to Section 1.1 of the DQA.

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID Sample ID Lab Sample ID SDG Sample Date Matrix Laboratory QA/QC	14MW06 16NEC-14MW06-WG-9 K160943405 K1609434 8/13/16 WG ALGK Duplicate	14MW06 16NEC-14MW06-WG-9F K160943405F[3] K1609434 8/13/16 WG ALGK Duplicate	14MW07 16NEC-14MW07-WG K160943409 K1609434 8/13/16 WG ALGK Primary	14MW07 16NEC-14MW07-WGF K160943409F[3] K1609434 8/13/16 WG ALGK Primary	17MW1 16NEC-17MW1-WG K160943412 K1609434 8/14/16 WG ALGK Primary	17MW1 16NEC-17MW1-WGF K160943412F[3] K1609434 8/14/16 WG ALGK Primary	20MW-1 16NEC-20MW-1-WG K160943413 K1609434 8/14/16 WG ALGK Primary
Method	Analyte	Units	2016 ADEC Evaluation Criteria[1]	SSCL[2]							
8270SIM	1-Methylnaphthalene	mg/L	0.011	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	2-Methylnaphthalene	mg/L	0.036	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Acenaphthene	mg/L	0.53	-	ND [0.000005] QN	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Acenaphthylene	mg/L	0.26	-	0.000013 [0.000005] J	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Anthracene	mg/L	0.043	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(a)anthracene	mg/L	0.00012	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	0.000003 [0.000005] J
8270SIM	Benzo(a)pyrene	mg/L	0.000034	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(b)fluoranthene	mg/L	0.00034	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(g,h,i)perylene	mg/L	0.00026	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(k)fluoranthene	mg/L	0.0008	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Chrysene	mg/L	0.002	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Dibenzo(a,h)anthracene	mg/L	0.000034	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Fluoranthene	mg/L	0.26	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.00002]
8270SIM	Fluorene	mg/L	0.29	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Naphthalene	mg/L	0.0017	-	0.000033 [0.000005] B, QN	-	0.0000061 [0.000005] J, B	-	0.0000076 [0.000005] J, B	-	0.0000054 [0.000005] J, B
8270SIM	Phenanthrene	mg/L	0.17	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Pyrene	mg/L	0.12	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.00001]
A2320B	Alkalinity, Total	mg/L	-	-	138 [6]	-	11.7 [2]	-	10 [2]	-	21 [6] B
AK101	Gasoline Range Organics	mg/L	2.2	1.3	0.011 [0.025] J	-	ND [0.025]	-	ND [0.025]	-	ND [0.025]
AK102	Diesel Range Organics	mg/L	1.5	1.5	1.4 [0.02] QL	-	0.12 [0.021] J, B, QL	-	0.092 [0.021] J, B, QL	-	0.09 [0.021] J, B, QL
AK103	Residual Range Organics	mg/L	1.1	1.1	0.47 [0.05] B, QL	-	0.093 [0.052] J, B, QL	-	0.13 [0.052] J, B, QL	-	0.13 [0.052] J, B, QL
E300.0	Sulfate	mg/L	-	-	15.2 [0.04]	-	12.7 [0.04]	-	16.9 [0.04]	-	19.6 [0.04]
RSK175	Ethane	mg/L	-	-	ND [0.00024]	-	ND [0.00024]	-	ND [0.00024]	-	ND [0.00024]
RSK175	Ethene	mg/L	-	-	ND [0.00022]	-	ND [0.00022]	-	ND [0.00022]	-	ND [0.00022]
RSK175	Methane	mg/L	-	-	0.0093 [0.00063]	-	ND [0.00063]	-	ND [0.00063]	-	ND [0.00063]
SW6020A	Arsenic	mg/L	0.00052	0.01	**0.00197 [0.00025]**	**0.00197 [0.00025]**	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
SW6020A	Barium	mg/L	3.8	-	0.0562 [0.000025]	0.0566 [0.000025]	0.00711 [0.000025]	0.00661 [0.000025]	0.0124 [0.000025]	0.0116 [0.000025]	0.0163 [0.000025]
SW6020A	Cadmium	mg/L	0.0092	-	0.000183 [0.00002]	0.000049 [0.00002] QN	0.000046 [0.00002]	0.00004 [0.00002]	0.000061 [0.00002]	0.000067 [0.00002]	0.000241 [0.00002]
SW6020A	Chromium[4]	mg/L	22	-	0.00016 [0.00005] J, B	0.00017 [0.00005] J, B, QN	0.00045 [0.00005] B	0.00024 [0.00005] B	0.00025 [0.00005] B	0.00021 [0.00005] B	0.00053 [0.00005] B
SW6020A	Lead	mg/L	0.015	0.015	0.000817 [0.00001]	0.000208 [0.00001] B, QN	0.000338 [0.00001]	0.000052 [0.00001] B	0.00025 [0.00001]	0.000045 [0.00001] B	0.000866 [0.00001]
SW6020A	Manganese	mg/L	-	-	-	1.26 [0.000013]	-	0.0359 [0.000013]	-	0.00156 [0.000013] B	-
SW6020A	Nickel	mg/L	0.392	-	0.00166 [0.00005] B	0.0018 [0.00005] B	0.0181 [0.00005]	0.0182 [0.00005]	0.0008 [0.00005] B	0.0023 [0.00005] B	0.00114 [0.00005] B
SW6020A	Selenium	mg/L	0.1	-	0.0005 [0.001] J	0.0005 [0.001] J, QN	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
SW6020A	Silver	mg/L	0.094	-	0.000014 [0.00001] J	0.000004 [0.00001] J, QN	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	0.000003 [0.00001] J
SW6020A	Vanadium	mg/L	0.0864	-	0.00037 [0.00005] B	0.00035 [0.00005] B, QN	0.00016 [0.00005] J, B	0.00003 [0.00005] J, B	0.00017 [0.00005] J, B	0.00005 [0.00005] J, B	0.00037 [0.00005] B
SW6020A	Zinc	mg/L	6	-	0.00301 [0.0005] B	0.00412 [0.0005] B, QN	0.00384 [0.0005] B	0.00394 [0.0005] B	0.0135 [0.0005]	0.014 [0.0005]	0.0187 [0.0005]
SW7470A	Mercury	mg/L	0.00052	-	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]
SW8015C	Ethylene glycol	mg/L	40	-	ND [2]	-	-	-	-	-	-
SW8015C	Propylene glycol	mg/L	-	-	ND [2]	-	-	-	-	-	-
SW8082A	PCB-1016 (Aroclor 1016)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-	ND [0.0000021]
SW8082A	PCB-1221 (Aroclor 1221)	mg/L	0.0005	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.000011]	-	ND [0.000011]
SW8082A	PCB-1232 (Aroclor 1232)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-	ND [0.0000021]
SW8082A	PCB-1242 (Aroclor 1242)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-	ND [0.0000021]
SW8082A	PCB-1248 (Aroclor 1248)	mg/L	0.0005	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-	ND [0.0000021]
SW8082A	PCB-1254 (Aroclor 1254)	mg/L	0.0005	-	0.0000059 [0.000002] J	-	ND [0.000002]	-	ND [0.0000021]	-	ND [0.0000021]
SW8082A	PCB-1260 (Aroclor 1260)	mg/L	0.0005	-	0.0000026 [0.000002] J, QN	-	ND [0.000002]	-	ND [0.0000021]	-	0.0000023 [0.0000021] J, QN
SW8082A	PCB-1262 (Aroclor 1262)	mg/L	0.0005	-	-	-	-	-	-	-	-
SW8082A	PCB-1268 (Aroclor 1268)	mg/L	0.0005	-	-	-	-	-	-	-	-
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	0.0057	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,1,1-Trichloroethane	mg/L	8	-	ND [0.0002]	-	-	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	14MW06	14MW06	14MW07	14MW07	17MW1	17MW1	20MW-1
				Sample ID	16NEC-14MW06-WG-9	16NEC-14MW06-WG-9F	16NEC-14MW07-WG	16NEC-14MW07-WGF	16NEC-17MW1-WG	16NEC-17MW1-WGF	16NEC-20MW-1-WG
				Lab Sample ID	K160943405	K160943405F[3]	K160943409	K160943409F[3]	K160943412	K160943412F[3]	K160943413
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434
				Sample Date	8/13/16	8/13/16	8/13/16	8/13/16	8/14/16	8/14/16	8/14/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Duplicate	Duplicate	Primary	Primary	Primary	Primary	Primary
Method	Analyte	Units	2016 ADEC Evaluation Criteria[1]	SSCL[2]							
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.00076	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,1,2-Trichloroethane	mg/L	0.00041	-	ND [0.0004]	-	-	-	-	-	-
SW8260C	1,1-Dichloroethane	mg/L	0.028	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,1-Dichloroethene	mg/L	0.28	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,1-Dichloropropene	mg/L	-	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,2,3-Trichlorobenzene	mg/L	-	-	ND [0.0004]	-	-	-	-	-	-
SW8260C	1,2,3-Trichloropropane	mg/L	0.0000075	-	*ND [0.0005]*	-	-	-	-	-	-
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.004	-	ND [0.0003]	-	-	-	-	-	-
SW8260C	1,2,4-Trimethylbenzene	mg/L	0.015	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	-	-	ND [0.0008]	-	-	-	-	-	-
SW8260C	1,2-Dibromoethane	mg/L	0.000075	-	*ND [0.0002]*	-	-	-	-	-	-
SW8260C	1,2-Dichlorobenzene	mg/L	0.3	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,2-Dichloroethane	mg/L	0.0017	-	ND [0.00015]	-	-	-	-	-	-
SW8260C	1,2-Dichloropropane	mg/L	0.0044	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,3,5-Trimethylbenzene	mg/L	0.12	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,3-Dichlorobenzene	mg/L	0.3	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	1,3-Dichloropropane	mg/L	-	-	ND [0.0003]	-	-	-	-	-	-
SW8260C	1,4-Dichlorobenzene	mg/L	0.0048	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	2,2-Dichloropropane	mg/L	-	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	2-Butanone	mg/L	5.6	-	ND [0.004]	-	-	-	-	-	-
SW8260C	2-Chlorotoluene	mg/L	-	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	2-Hexanone	mg/L	0.038	-	ND [0.01]	-	-	-	-	-	-
SW8260C	4-Chlorotoluene	mg/L	-	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	4-Isopropyltoluene	mg/L	-	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	4-Methyl-2-pentanone	mg/L	6.3	-	ND [0.01]	-	-	-	-	-	-
SW8260C	Acetone	mg/L	14	-	ND [0.01]	-	-	-	-	-	-
SW8260C	Benzene	mg/L	0.0046	0.005	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Bromobenzene	mg/L	0.062	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Bromochloromethane	mg/L	-	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Bromodichloromethane	mg/L	0.0013	-	ND [0.0003]	-	-	-	-	-	-
SW8260C	Bromoform	mg/L	0.033	-	ND [0.0005]	-	-	-	-	-	-
SW8260C	Bromomethane	mg/L	0.0075	-	ND [0.0003]	-	-	-	-	-	-
SW8260C	Carbon disulfide	mg/L	0.81	-	0.00007 [0.0002] J, B, QL	-	-	-	-	-	-
SW8260C	Carbon tetrachloride	mg/L	0.0046	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Chlorobenzene	mg/L	0.078	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Chloroethane	mg/L	21	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Chloroform	mg/L	0.0022	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Chloromethane	mg/L	0.19	-	ND [0.0002] QL	-	-	-	-	-	-
SW8260C	cis-1,2-Dichloroethene	mg/L	0.036	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0047	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Dibromochloromethane	mg/L	0.0087	-	ND [0.0005]	-	-	-	-	-	-
SW8260C	Dibromomethane	mg/L	0.0083	-	ND [0.0005]	-	-	-	-	-	-
SW8260C	Dichlorodifluoromethane	mg/L	0.2	-	ND [0.0002] QL	-	-	-	-	-	-
SW8260C	Ethylbenzene	mg/L	0.015	0.7	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Hexachlorobutadiene	mg/L	0.0014	-	ND [0.0003]	-	-	-	-	-	-
SW8260C	Isopropylbenzene	mg/L	0.45	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Methylene chloride	mg/L	0.11	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.14	-	ND [0.0003]	-	-	-	-	-	-
SW8260C	Naphthalene	mg/L	0.0017	-	0.00025 [0.0003] J, QN	-	-	-	-	-	-
SW8260C	n-Butylbenzene	mg/L	1	-	ND [0.0001]	-	-	-	-	-	-
SW8260C	n-Propylbenzene	mg/L	0.66	-	ND [0.0002]	-	-	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	14MW06	14MW06	14MW07	14MW07	17MW1	17MW1	20MW-1
				Sample ID	16NEC-14MW06-WG-9	16NEC-14MW06-WG-9F	16NEC-14MW07-WG	16NEC-14MW07-WGF	16NEC-17MW1-WG	16NEC-17MW1-WGF	16NEC-20MW-1-WG
				Lab Sample ID	K160943405	K160943405F[3]	K160943409	K160943409F[3]	K160943412	K160943412F[3]	K160943413
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434
				Sample Date	8/13/16	8/13/16	8/13/16	8/13/16	8/14/16	8/14/16	8/14/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Duplicate	Duplicate	Primary	Primary	Primary	Primary	Primary
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
SW8260C	o-Xylene	mg/L	0.193	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]
SW8260C	sec-Butylbenzene	mg/L	2	-	ND [0.0001]	-	-	-	-	-	-
SW8260C	Styrene	mg/L	1.2	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	tert-Butylbenzene	mg/L	0.69	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Tetrachloroethene (PCE)	mg/L	0.041	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Toluene	mg/L	1.1	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]
SW8260C	trans-1,2-Dichloroethene	mg/L	0.36	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0047	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Trichloroethene (TCE)	mg/L	0.0028	-	ND [0.0001]	-	-	-	-	-	-
SW8260C	Trichlorofluoromethane	mg/L	5.2	-	ND [0.0002]	-	-	-	-	-	-
SW8260C	Vinyl chloride	mg/L	0.00019	-	ND [0.0001]	-	-	-	-	-	-
SW8260C	Xylene, Isomers m & p	mg/L	0.193	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]

Notes:

[1] 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016)

[2] Decision Document (USACE 2009)

[3] Column with Lab Sample ID ending in "F" contains the filtered metals (dissolved) results

[4] In accordance 18 AAC 75 ADEC Table C, samples results reported for total chromium are considered background chromium(III) in the absence of an

bold = Analytical results exceed the 2016 ADEC evaluation criteria.

🟧 Analytical results exceed the SSCL.

Italics Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs

[ ] - limit of detection

- - not provided or not analyzed

ALGK - ALS Environmental, Kelso, WA.

mg/L - milligram per liter

MS/MSD - matrix spike/ matrix spike duplicate

SDG - Sample Delivery Group

SSCL - site-specific cleanup level

WG - Groundwater

For Data Qualifiers, refer to Section 1.1 of the DQA.

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	20MW-1	22MW2	22MW2	26MW1	26MW1	MW10-1	MW10-1	MW10-1-DVW
				Sample ID	16NEC-20MW-1-WGF	16NEC-22MW2-WG	16NEC-22MW2-WGF	16NEC-26MW1-WG	16NEC-26MW1-WGF	16NEC-MW10-1-WG	16NEC-MW10-1-WGF	16NEC-MW10-1-DVW
				Lab Sample ID	K160943413F[3]	K160943414	K160943414F[3]	K160943411	K160943411F[3]	K160943403	K160943403F[3]	K160943406
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434
				Sample Date	8/14/16	8/14/16	8/14/16	8/14/16	8/14/16	8/13/16	8/13/16	8/13/16
				Matrix	WG	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Primary	Primary	Primary	Primary	Primary	MS/MSD	MS/MSD	Equipment Blank
Method	Analyte	Units	2016 ADEC Evaluation Criteria[1]	SSCL[2]								
8270SIM	1-Methylnaphthalene	mg/L	0.011	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.0000048 [0.000005] J	-	ND [0.000005]
8270SIM	2-Methylnaphthalene	mg/L	0.036	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.0000049 [0.000005] J, B	-	0.0000042 [0.000005] J
8270SIM	Acenaphthene	mg/L	0.53	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Acenaphthylene	mg/L	0.26	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.0000084 [0.000005] J	-	ND [0.000005]
8270SIM	Anthracene	mg/L	0.043	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(a)anthracene	mg/L	0.00012	-	-	ND [0.0000051]	-	0.0000028 [0.000005] J	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(a)pyrene	mg/L	0.000034	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(b)fluoranthene	mg/L	0.00034	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Benzo(g,h,i)perylene	mg/L	0.00026	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.0000096 [0.000005] J	-	ND [0.000005]
8270SIM	Benzo(k)fluoranthene	mg/L	0.0008	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Chrysene	mg/L	0.002	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Dibenzo(a,h)anthracene	mg/L	0.000034	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.000006 [0.000005] J	-	ND [0.000005]
8270SIM	Fluoranthene	mg/L	0.26	-	-	ND [0.000021]	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.00002]
8270SIM	Fluorene	mg/L	0.29	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.0000048 [0.000005] J	-	ND [0.000005]
8270SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	-	-	ND [0.0000051]	-	ND [0.000005]	-	0.0000081 [0.000005] J	-	ND [0.000005]
8270SIM	Naphthalene	mg/L	0.0017	-	-	ND [0.0000051]	-	0.0000045 [0.000005] J, B	-	0.0000046 [0.000005] J, B	-	0.000011 [0.000005] J
8270SIM	Phenanthrene	mg/L	0.17	-	-	ND [0.0000051]	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]
8270SIM	Pyrene	mg/L	0.12	-	-	ND [0.000011]	-	ND [0.00001]	-	0.0000085 [0.00001] J	-	ND [0.00001]
A2320B	Alkalinity, Total	mg/L	-	-	-	7 [2]	-	6.3 [2]	-	17 [2]	-	-
AK101	Gasoline Range Organics	mg/L	2.2	1.3	-	ND [0.025]	-	ND [0.025]	-	ND [0.025]	-	ND [0.025]
AK102	Diesel Range Organics	mg/L	1.5	1.5	-	0.1 [0.021] J, B, QL	-	0.11 [0.022] J, B, QL	-	0.49 [0.021] J, B, QL	-	0.08 [0.021] J, B, QL
AK103	Residual Range Organics	mg/L	1.1	1.1	-	0.36 [0.052] J, B, QL	-	0.79 [0.053] B, QL	-	0.32 [0.053] J, B, QL	-	0.11 [0.051] J, B, QL
E300.0	Sulfate	mg/L	-	-	-	15.4 [0.04]	-	13.6 [0.04]	-	7.37 [0.04]	-	-
RSK175	Ethane	mg/L	-	-	-	ND [0.00024]	-	ND [0.00024]	-	ND [0.00024]	-	-
RSK175	Ethene	mg/L	-	-	-	ND [0.00022]	-	ND [0.00022]	-	ND [0.00022]	-	-
RSK175	Methane	mg/L	-	-	-	ND [0.00063]	-	ND [0.00063]	-	ND [0.00063]	-	-
SW6020A	Arsenic	mg/L	0.00052	0.01	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	-
SW6020A	Barium	mg/L	3.8	-	0.0148 [0.000025]	0.00558 [0.000025]	0.00533 [0.000025]	0.00494 [0.000025]	0.00426 [0.000025]	0.0184 [0.000025]	0.0156 [0.000025]	-
SW6020A	Cadmium	mg/L	0.0092	-	0.000231 [0.00002]	0.000032 [0.00002]	0.000033 [0.00002]	0.000033 [0.00002]	0.00003 [0.00002]	0.000085 [0.00002]	0.000079 [0.00002]	-
SW6020A	Chromium[4]	mg/L	22	-	0.00033 [0.00005] B	0.00033 [0.00005] B	0.0003 [0.00005] B	0.00132 [0.00005]	0.00031 [0.00005] B	0.0009 [0.00005] B	0.00026 [0.00005] B	-
SW6020A	Lead	mg/L	0.015	0.015	0.000248 [0.00001]	0.000085 [0.00001] B	0.000026 [0.00001] B	0.000474 [0.00001]	0.000025 [0.00001] B	0.000558 [0.00001]	0.000042 [0.00001] B	-
SW6020A	Manganese	mg/L	-	-	0.00321 [0.000013]	-	0.000535 [0.000013] B	-	0.000754 [0.000013] B	-	0.00344 [0.000013]	-
SW6020A	Nickel	mg/L	0.392	-	0.00167 [0.00005] B	0.00028 [0.00005] B	0.001 [0.00005] B	0.00112 [0.00005] B	0.00126 [0.00005] B	0.00135 [0.00005] B	0.00122 [0.00005] B	-
SW6020A	Selenium	mg/L	0.1	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	-
SW6020A	Silver	mg/L	0.094	-	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	0.000007 [0.00001] J	ND [0.00001]	-
SW6020A	Vanadium	mg/L	0.0864	-	0.00012 [0.00005] J, B	0.00006 [0.00005] J, B	0.00005 [0.00005] J, B	0.00021 [0.00005] B	0.00006 [0.00005] J, B	0.00086 [0.00005]	0.00008 [0.00005] J, B	-
SW6020A	Zinc	mg/L	6	-	0.0188 [0.0005]	0.00196 [0.0005] B	0.00343 [0.0005] B	0.00218 [0.0005] B	0.00273 [0.0005] B	0.0112 [0.0005]	0.0117 [0.0005]	-
SW7470A	Mercury	mg/L	0.00052	-	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	-
SW8015C	Ethylene glycol	mg/L	40	-	-	-	-	-	-	ND [2]	-	ND [2]
SW8015C	Propylene glycol	mg/L	-	-	-	-	-	-	-	ND [2]	-	ND [2]
SW8082A	PCB-1016 (Aroclor 1016)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]
SW8082A	PCB-1221 (Aroclor 1221)	mg/L	0.0005	-	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.00001]
SW8082A	PCB-1232 (Aroclor 1232)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]
SW8082A	PCB-1242 (Aroclor 1242)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]
SW8082A	PCB-1248 (Aroclor 1248)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]
SW8082A	PCB-1254 (Aroclor 1254)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]
SW8082A	PCB-1260 (Aroclor 1260)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.000002]
SW8082A	PCB-1262 (Aroclor 1262)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
SW8082A	PCB-1268 (Aroclor 1268)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	0.0057	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,1,1-Trichloroethane	mg/L	8	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	20MW-1	22MW2	22MW2	26MW1	26MW1	MW10-1	MW10-1	MW10-1-DVW
				Sample ID	16NEC-20MW-1-WGF	16NEC-22MW2-WG	16NEC-22MW2-WGF	16NEC-26MW1-WG	16NEC-26MW1-WGF	16NEC-MW10-1-WG	16NEC-MW10-1-WGF	16NEC-MW10-1-DVW
				Lab Sample ID	K160943413F[3]	K160943414	K160943414F[3]	K160943411	K160943411F[3]	K160943403	K160943403F[3]	K160943406
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434
				Sample Date	8/14/16	8/14/16	8/14/16	8/14/16	8/14/16	8/13/16	8/13/16	8/13/16
				Matrix	WG	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Primary	Primary	Primary	Primary	Primary	MS/MSD	MS/MSD	Equipment Blank
Method	Analyte	Units	2016 ADEC Evaluation Criteria[1]	SSCL[2]								
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.00076	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,1,2-Trichloroethane	mg/L	0.00041	-	-	-	-	-	-	ND [0.0004]	-	ND [0.0004]
SW8260C	1,1-Dichloroethane	mg/L	0.028	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,1-Dichloroethene	mg/L	0.28	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,1-Dichloropropene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,2,3-Trichlorobenzene	mg/L	-	-	-	-	-	-	-	ND [0.0004]	-	ND [0.0004]
SW8260C	1,2,3-Trichloropropane	mg/L	0.0000075	-	-	-	-	-	-	*ND [0.0005]*	-	*ND [0.0005]*
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.004	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	1,2,4-Trimethylbenzene	mg/L	0.015	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	-	-	-	-	-	-	-	ND [0.0008]	-	ND [0.0008]
SW8260C	1,2-Dibromoethane	mg/L	0.000075	-	-	-	-	-	-	*ND [0.0002]*	-	*ND [0.0002]*
SW8260C	1,2-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,2-Dichloroethane	mg/L	0.0017	-	-	-	-	-	-	ND [0.00015]	-	ND [0.00015]
SW8260C	1,2-Dichloropropane	mg/L	0.0044	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,3,5-Trimethylbenzene	mg/L	0.12	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,3-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	1,3-Dichloropropane	mg/L	-	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	1,4-Dichlorobenzene	mg/L	0.0048	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	2,2-Dichloropropane	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	2-Butanone	mg/L	5.6	-	-	-	-	-	-	ND [0.004]	-	ND [0.004]
SW8260C	2-Chlorotoluene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	2-Hexanone	mg/L	0.038	-	-	-	-	-	-	ND [0.01]	-	ND [0.01]
SW8260C	4-Chlorotoluene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	4-Isopropyltoluene	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	4-Methyl-2-pentanone	mg/L	6.3	-	-	-	-	-	-	ND [0.01]	-	ND [0.01]
SW8260C	Acetone	mg/L	14	-	-	-	-	-	-	ND [0.01]	-	ND [0.01]
SW8260C	Benzene	mg/L	0.0046	0.005	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Bromobenzene	mg/L	0.062	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Bromochloromethane	mg/L	-	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Bromodichloromethane	mg/L	0.0013	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	Bromoform	mg/L	0.033	-	-	-	-	-	-	ND [0.0005]	-	ND [0.0005]
SW8260C	Bromomethane	mg/L	0.0075	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	Carbon disulfide	mg/L	0.81	-	-	-	-	-	-	ND [0.0002] QL	-	ND [0.0002] QL
SW8260C	Carbon tetrachloride	mg/L	0.0046	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Chlorobenzene	mg/L	0.078	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Chloroethane	mg/L	21	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Chloroform	mg/L	0.0022	-	-	-	-	-	-	ND [0.0002]	-	0.0001 [0.0002] J, B
SW8260C	Chloromethane	mg/L	0.19	-	-	-	-	-	-	ND [0.0002] QL	-	ND [0.0002] QL
SW8260C	cis-1,2-Dichloroethene	mg/L	0.036	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Dibromochloromethane	mg/L	0.0087	-	-	-	-	-	-	ND [0.0005]	-	ND [0.0005]
SW8260C	Dibromomethane	mg/L	0.0083	-	-	-	-	-	-	ND [0.0005]	-	ND [0.0005]
SW8260C	Dichlorodifluoromethane	mg/L	0.2	-	-	-	-	-	-	ND [0.0002] QL	-	ND [0.0002] QL
SW8260C	Ethylbenzene	mg/L	0.015	0.7	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	0.00006 [0.0001] J
SW8260C	Hexachlorobutadiene	mg/L	0.0014	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	Isopropylbenzene	mg/L	0.45	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Methylene chloride	mg/L	0.11	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.14	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	Naphthalene	mg/L	0.0017	-	-	-	-	-	-	ND [0.0003]	-	ND [0.0003]
SW8260C	n-Butylbenzene	mg/L	1	-	-	-	-	-	-	ND [0.0001]	-	ND [0.0001]
SW8260C	n-Propylbenzene	mg/L	0.66	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	20MW-1	22MW2	22MW2	26MW1	26MW1	MW10-1	MW10-1	MW10-1-DVW
				Sample ID	16NEC-20MW-1-WGF	16NEC-22MW2-WG	16NEC-22MW2-WGF	16NEC-26MW1-WG	16NEC-26MW1-WGF	16NEC-MW10-1-WG	16NEC-MW10-1-WGF	16NEC-MW10-1-DVW
				Lab Sample ID	K160943413F[3]	K160943414	K160943414F[3]	K160943411	K160943411F[3]	K160943403	K160943403F[3]	K160943406
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434	K1609434
				Sample Date	8/14/16	8/14/16	8/14/16	8/14/16	8/14/16	8/13/16	8/13/16	8/13/16
				Matrix	WG	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Primary	Primary	Primary	Primary	Primary	MS/MSD	MS/MSD	Equipment Blank
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**								
SW8260C	o-Xylene	mg/L	0.193	-	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-	0.00013 [0.0002] J
SW8260C	sec-Butylbenzene	mg/L	2	-	-	-	-	-	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Styrene	mg/L	1.2	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	tert-Butylbenzene	mg/L	0.69	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Tetrachloroethene (PCE)	mg/L	0.041	-	-	-	-	-	-	0.0092 [0.0002] B	-	0.0024 [0.0002]
SW8260C	Toluene	mg/L	1.1	-	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-	0.00056 [0.0001]
SW8260C	trans-1,2-Dichloroethene	mg/L	0.36	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Trichloroethene (TCE)	mg/L	0.0028	-	-	-	-	-	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Trichlorofluoromethane	mg/L	5.2	-	-	-	-	-	-	ND [0.0002]	-	ND [0.0002]
SW8260C	Vinyl chloride	mg/L	0.00019	-	-	-	-	-	-	ND [0.0001]	-	ND [0.0001]
SW8260C	Xylene, Isomers m & p	mg/L	0.193	-	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-	0.00028 [0.0002] J

Notes:

[1] 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016)

[2] Decision Document (USACE 2009)

[3] Column with Lab Sample ID ending in "F" contains the filtered metals (dissolved) results

[4] In accordance 18 AAC 75 ADEC Table C, samples results reported for total chromium are considered background chromium(III) in the absence of an

bold = Analytical results exceed the 2016 ADEC evaluation criteria.

🟧	Analytical results exceed the SSCL.
Italics	Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs

[ ] - limit of detection
- - not provided or not analyzed
ALGK - ALS Environmental, Kelso, WA.
mg/L - milligram per liter
MS/MSD - matrix spike/ matrix spike duplicate
SDG - Sample Delivery Group
SSCL - site-specific cleanup level
WG - Groundwater
For Data Qualifiers, refer to Section 1.1 of the DQA.

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	MW10-1-DVW	MW88-1	MW88-1	MW88-10	MW88-10	MW88-3	MW88-3
				Sample ID	16NEC-MW10-1-DVWF	16NEC-MW88-1-WG	16NEC-MW88-1-WGF	16NEC-MW88-10-WG	16NEC-MW88-10-WGF	16NEC-MW88-3-WG	16NEC-MW88-3-WGF
				Lab Sample ID	K160943406F[3]	K160943407	K160943407F[3]	K160943410	K160943410F[3]	K160958104	K160958104F[3]
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609581	K1609581
				Sample Date	8/13/16	8/13/16	8/13/16	8/13/16	8/13/16	8/16/16	8/16/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Equipment Blank	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
8270SIM	1-Methylnaphthalene	mg/L	0.011	-	-	ND [0.000005]	-	ND [0.000005]	-	0.000012 [0.000005] J	-
8270SIM	2-Methylnaphthalene	mg/L	0.036	-	-	ND [0.000005]	-	ND [0.000005]	-	0.0000058 [0.000005] J, B	-
8270SIM	Acenaphthene	mg/L	0.53	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Acenaphthylene	mg/L	0.26	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Anthracene	mg/L	0.043	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(a)anthracene	mg/L	0.00012	-	-	ND [0.000005]	-	0.0000027 [0.000005] J	-	ND [0.000005]	-
8270SIM	Benzo(a)pyrene	mg/L	0.000034	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(b)fluoranthene	mg/L	0.00034	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(g,h,i)perylene	mg/L	0.00026	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Benzo(k)fluoranthene	mg/L	0.0008	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Chrysene	mg/L	0.002	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Dibenzo(a,h)anthracene	mg/L	0.000034	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Fluoranthene	mg/L	0.26	-	-	ND [0.00002]	-	ND [0.00002]	-	ND [0.00002]	-
8270SIM	Fluorene	mg/L	0.29	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Naphthalene	mg/L	0.0017	-	-	0.0000071 [0.000005] J, B	-	0.0000088 [0.000005] J, B	-	0.000035 [0.000005] B	-
8270SIM	Phenanthrene	mg/L	0.17	-	-	ND [0.000005]	-	ND [0.000005]	-	ND [0.000005]	-
8270SIM	Pyrene	mg/L	0.12	-	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.00001]	-
A2320B	Alkalinity, Total	mg/L	-	-	-	13 [2]	-	17.7 [2]	-	16 [2]	-
AK101	Gasoline Range Organics	mg/L	2.2	1.3	-	ND [0.025]	-	ND [0.025]	-	ND [0.025]	-
AK102	Diesel Range Organics	mg/L	1.5	1.5	-	0.52 [0.021] J, B, QL	-	0.3 [0.021] J, B, QL	-	0.49 [0.021] J, B, QL	-
AK103	Residual Range Organics	mg/L	1.1	1.1	-	0.23 [0.053] J, B, QL	-	0.16 [0.051] J, B, QL	-	0.15 [0.053] J, B, QL	-
E300.0	Sulfate	mg/L	-	-	-	14.1 [0.04]	-	17.8 [0.04]	-	14.8 [0.04]	-
RSK175	Ethane	mg/L	-	-	-	ND [0.00024]	-	ND [0.00024]	-	-	-
RSK175	Ethene	mg/L	-	-	-	ND [0.00022]	-	ND [0.00022]	-	-	-
RSK175	Methane	mg/L	-	-	-	0.00043 [0.00063] J	-	0.0036 [0.00063]	-	ND [0.00063]	-
SW6020A	Arsenic	mg/L	0.00052	0.01	ND [0.00025]	ND [0.00025]	ND [0.00025]	0.00022 [0.00025] J	0.00023 [0.00025] J	ND [0.00025]	ND [0.00025]
SW6020A	Barium	mg/L	3.8	-	0.000045 [0.000025] J	0.00557 [0.000025]	0.00569 [0.000025]	0.0161 [0.000025]	0.0141 [0.000025]	0.014 [0.000025]	0.013 [0.000025]
SW6020A	Cadmium	mg/L	0.0092	-	ND [0.00002]	0.000126 [0.00002]	0.000129 [0.00002]	0.000357 [0.00002]	0.000276 [0.00002]	0.000121 [0.00002]	0.000126 [0.00002]
SW6020A	Chromium[4]	mg/L	22	-	0.00012 [0.00005] J	0.00016 [0.00005] J, B	0.00018 [0.00005] J, B	0.00048 [0.00005] B	0.0002 [0.00005] B	0.00042 [0.00005] B	0.00028 [0.00005] B
SW6020A	Lead	mg/L	0.015	0.015	0.000021 [0.00001]	0.000301 [0.00001]	0.000075 [0.00001] B	0.00143 [0.00001]	0.000227 [0.00001]	0.000383 [0.00001]	0.000158 [0.00001] B
SW6020A	Manganese	mg/L	-	-	0.000173 [0.000013]	-	0.291 [0.000013]	-	0.203 [0.000013]	-	0.364 [0.000013]
SW6020A	Nickel	mg/L	0.392	-	0.00034 [0.00005]	0.00091 [0.00005] B	0.00104 [0.00005] B	0.00242 [0.00005] B	0.00312 [0.00005] B	0.00217 [0.00005] B	0.00246 [0.00005] B
SW6020A	Selenium	mg/L	0.1	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
SW6020A	Silver	mg/L	0.094	-	ND [0.00001]	0.000013 [0.00001] J	0.000005 [0.00001] J	0.000012 [0.00001] J	ND [0.00001]	0.000008 [0.00001] J	ND [0.00001]
SW6020A	Vanadium	mg/L	0.0864	-	0.00004 [0.00005] J	0.00006 [0.00005] J, B	0.00005 [0.00005] J, B	0.00035 [0.00005] B	0.00007 [0.00005] J, B	0.00032 [0.00005] B	0.00012 [0.00005] J, B
SW6020A	Zinc	mg/L	6	-	0.00063 [0.0005]	0.00962 [0.0005]	0.0124 [0.0005]	0.0159 [0.0005]	0.0164 [0.0005]	0.0179 [0.0005]	0.0185 [0.0005]
SW7470A	Mercury	mg/L	0.00052	-	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]	ND [0.00005]
SW8015C	Ethylene glycol	mg/L	40	-	-	-	-	-	-	-	-
SW8015C	Propylene glycol	mg/L	-	-	-	-	-	-	-	-	-
SW8082A	PCB-1016 (Aroclor 1016)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-
SW8082A	PCB-1221 (Aroclor 1221)	mg/L	0.0005	-	-	ND [0.00001]	-	ND [0.00001]	-	ND [0.000011]	-
SW8082A	PCB-1232 (Aroclor 1232)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-
SW8082A	PCB-1242 (Aroclor 1242)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-
SW8082A	PCB-1248 (Aroclor 1248)	mg/L	0.0005	-	-	ND [0.000002]	-	ND [0.000002]	-	ND [0.0000021]	-
SW8082A	PCB-1254 (Aroclor 1254)	mg/L	0.0005	-	-	ND [0.000005]	-	ND [0.000002]	-	ND [0.0000027]	-
SW8082A	PCB-1260 (Aroclor 1260)	mg/L	0.0005	-	-	0.0000023 [0.000002] J	-	0.0000027 [0.000002] J, QN	-	ND [0.0000021]	-
SW8082A	PCB-1262 (Aroclor 1262)	mg/L	0.0005	-	-	-	-	-	-	-	-
SW8082A	PCB-1268 (Aroclor 1268)	mg/L	0.0005	-	-	-	-	-	-	-	-
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	0.0057	-	-	-	-	-	-	-	-
SW8260C	1,1,1-Trichloroethane	mg/L	8	-	-	-	-	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	MW10-1-DVW	MW88-1	MW88-1	MW88-10	MW88-10	MW88-3	MW88-3
				Sample ID	16NEC-MW10-1-DVWF	16NEC-MW88-1-WG	16NEC-MW88-1-WGF	16NEC-MW88-10-WG	16NEC-MW88-10-WGF	16NEC-MW88-3-WG	16NEC-MW88-3-WGF
				Lab Sample ID	K160943406F[3]	K160943407	K160943407F[3]	K160943410	K160943410F[3]	K160958104	K160958104F[3]
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609581	K1609581
				Sample Date	8/13/16	8/13/16	8/13/16	8/13/16	8/13/16	8/16/16	8/16/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Equipment Blank	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.00076	-	-	-	-	-	-	-	-
SW8260C	1,1,2-Trichloroethane	mg/L	0.00041	-	-	-	-	-	-	-	-
SW8260C	1,1-Dichloroethane	mg/L	0.028	-	-	-	-	-	-	-	-
SW8260C	1,1-Dichloroethene	mg/L	0.28	-	-	-	-	-	-	-	-
SW8260C	1,1-Dichloropropene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,2,3-Trichlorobenzene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,2,3-Trichloropropane	mg/L	0.0000075	-	-	-	-	-	-	-	-
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.004	-	-	-	-	-	-	-	-
SW8260C	1,2,4-Trimethylbenzene	mg/L	0.015	-	-	-	-	-	-	-	-
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,2-Dibromoethane	mg/L	0.000075	-	-	-	-	-	-	-	-
SW8260C	1,2-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	-	-
SW8260C	1,2-Dichloroethane	mg/L	0.0017	-	-	-	-	-	-	-	-
SW8260C	1,2-Dichloropropane	mg/L	0.0044	-	-	-	-	-	-	-	-
SW8260C	1,3,5-Trimethylbenzene	mg/L	0.12	-	-	-	-	-	-	-	-
SW8260C	1,3-Dichlorobenzene	mg/L	0.3	-	-	-	-	-	-	-	-
SW8260C	1,3-Dichloropropane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	1,4-Dichlorobenzene	mg/L	0.0048	-	-	-	-	-	-	-	-
SW8260C	2,2-Dichloropropane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	2-Butanone	mg/L	5.6	-	-	-	-	-	-	-	-
SW8260C	2-Chlorotoluene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	2-Hexanone	mg/L	0.038	-	-	-	-	-	-	-	-
SW8260C	4-Chlorotoluene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	4-Isopropyltoluene	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	4-Methyl-2-pentanone	mg/L	6.3	-	-	-	-	-	-	-	-
SW8260C	Acetone	mg/L	14	-	-	-	-	-	-	-	-
SW8260C	Benzene	mg/L	0.0046	0.005	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-
SW8260C	Bromobenzene	mg/L	0.062	-	-	-	-	-	-	-	-
SW8260C	Bromochloromethane	mg/L	-	-	-	-	-	-	-	-	-
SW8260C	Bromodichloromethane	mg/L	0.0013	-	-	-	-	-	-	-	-
SW8260C	Bromoform	mg/L	0.033	-	-	-	-	-	-	-	-
SW8260C	Bromomethane	mg/L	0.0075	-	-	-	-	-	-	-	-
SW8260C	Carbon disulfide	mg/L	0.81	-	-	-	-	-	-	-	-
SW8260C	Carbon tetrachloride	mg/L	0.0046	-	-	-	-	-	-	-	-
SW8260C	Chlorobenzene	mg/L	0.078	-	-	-	-	-	-	-	-
SW8260C	Chloroethane	mg/L	21	-	-	-	-	-	-	-	-
SW8260C	Chloroform	mg/L	0.0022	-	-	-	-	-	-	-	-
SW8260C	Chloromethane	mg/L	0.19	-	-	-	-	-	-	-	-
SW8260C	cis-1,2-Dichloroethene	mg/L	0.036	-	-	-	-	-	-	-	-
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	-	-
SW8260C	Dibromochloromethane	mg/L	0.0087	-	-	-	-	-	-	-	-
SW8260C	Dibromomethane	mg/L	0.0083	-	-	-	-	-	-	-	-
SW8260C	Dichlorodifluoromethane	mg/L	0.2	-	-	-	-	-	-	-	-
SW8260C	Ethylbenzene	mg/L	0.015	0.7	-	ND [0.0001]	-	ND [0.0001]	-	0.00005 [0.0001] J, B, QH	-
SW8260C	Hexachlorobutadiene	mg/L	0.0014	-	-	-	-	-	-	-	-
SW8260C	Isopropylbenzene	mg/L	0.45	-	-	-	-	-	-	-	-
SW8260C	Methylene chloride	mg/L	0.11	-	-	-	-	-	-	-	-
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.14	-	-	-	-	-	-	-	-
SW8260C	Naphthalene	mg/L	0.0017	-	-	-	-	-	-	-	-
SW8260C	n-Butylbenzene	mg/L	1	-	-	-	-	-	-	-	-
SW8260C	n-Propylbenzene	mg/L	0.66	-	-	-	-	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	MW10-1-DVW	MW88-1	MW88-1	MW88-10	MW88-10	MW88-3	MW88-3
				Sample ID	16NEC-MW10-1-DVWF	16NEC-MW88-1-WG	16NEC-MW88-1-WGF	16NEC-MW88-10-WG	16NEC-MW88-10-WGF	16NEC-MW88-3-WG	16NEC-MW88-3-WGF
				Lab Sample ID	K160943406F[3]	K160943407	K160943407F[3]	K160943410	K160943410F[3]	K160958104	K160958104F[3]
				SDG	K1609434	K1609434	K1609434	K1609434	K1609434	K1609581	K1609581
				Sample Date	8/13/16	8/13/16	8/13/16	8/13/16	8/13/16	8/16/16	8/16/16
				Matrix	WG	WG	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Equipment Blank	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**							
SW8260C	o-Xylene	mg/L	0.193	-	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-
SW8260C	sec-Butylbenzene	mg/L	2	-	-	-	-	-	-	-	-
SW8260C	Styrene	mg/L	1.2	-	-	-	-	-	-	-	-
SW8260C	tert-Butylbenzene	mg/L	0.69	-	-	-	-	-	-	-	-
SW8260C	Tetrachloroethene (PCE)	mg/L	0.041	-	-	-	-	-	-	-	-
SW8260C	Toluene	mg/L	1.1	-	-	ND [0.0001]	-	ND [0.0001]	-	ND [0.0001]	-
SW8260C	trans-1,2-Dichloroethene	mg/L	0.36	-	-	-	-	-	-	-	-
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0047	-	-	-	-	-	-	-	-
SW8260C	Trichloroethene (TCE)	mg/L	0.0028	-	-	-	-	-	-	-	-
SW8260C	Trichlorofluoromethane	mg/L	5.2	-	-	-	-	-	-	-	-
SW8260C	Vinyl chloride	mg/L	0.00019	-	-	-	-	-	-	-	-
SW8260C	Xylene, Isomers m & p	mg/L	0.193	-	-	ND [0.0002]	-	ND [0.0002]	-	ND [0.0002]	-

Notes:

[1] 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016)

[2] Decision Document (USACE 2009)

[3] Column with Lab Sample ID ending in "F" contains the filtered metals (dissolved) results

[4] In accordance 18 AAC 75 ADEC Table C, samples results reported for total
chromium are considered background chromium(III) in the absence of an

bold = Analytical results exceed the 2016 ADEC evaluation criteria.

🟧 Analytical results exceed the SSCL.

Italics Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs

[ ] - limit of detection
- - not provided or not analyzed
ALGK - ALS Environmental, Kelso, WA.
mg/L - milligram per liter
MS/MSD - matrix spike/ matrix spike duplicate
SDG - Sample Delivery Group
SSCL - site-specific cleanup level
WG - Groundwater
For Data Qualifiers, refer to Section 1.1 of the DQA.

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	TB02	TB03	TB04	TB05	TBW01
				Sample ID	16NEC-TB02	16NEC-TB03	16NEC-TB04	16NEC-TB05	16NEC-TBW01
				Lab Sample ID	K160943401	K160943402	K160958110	K160958111	K160931704
				SDG	K1609434	K1609434	K1609581	K1609581	K1609317
				Sample Date	8/13/16	8/14/16	8/15/16	8/16/16	8/10/16
				Matrix	WG	WG	WG	WG	WG
				Laboratory	ALGK	ALGK	ALGK	ALGK	ALGK
				QA/QC	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**					
8270SIM	1-Methylnaphthalene	mg/L	0.011	-	-	-	-	-	-
8270SIM	2-Methylnaphthalene	mg/L	0.036	-	-	-	-	-	-
8270SIM	Acenaphthene	mg/L	0.53	-	-	-	-	-	-
8270SIM	Acenaphthylene	mg/L	0.26	-	-	-	-	-	-
8270SIM	Anthracene	mg/L	0.043	-	-	-	-	-	-
8270SIM	Benzo(a)anthracene	mg/L	0.00012	-	-	-	-	-	-
8270SIM	Benzo(a)pyrene	mg/L	0.000034	-	-	-	-	-	-
8270SIM	Benzo(b)fluoranthene	mg/L	0.00034	-	-	-	-	-	-
8270SIM	Benzo(g,h,i)perylene	mg/L	0.00026	-	-	-	-	-	-
8270SIM	Benzo(k)fluoranthene	mg/L	0.0008	-	-	-	-	-	-
8270SIM	Chrysene	mg/L	0.002	-	-	-	-	-	-
8270SIM	Dibenzo(a,h)anthracene	mg/L	0.000034	-	-	-	-	-	-
8270SIM	Fluoranthene	mg/L	0.26	-	-	-	-	-	-
8270SIM	Fluorene	mg/L	0.29	-	-	-	-	-	-
8270SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	-	-	-	-	-	-
8270SIM	Naphthalene	mg/L	0.0017	-	-	-	-	-	-
8270SIM	Phenanthrene	mg/L	0.17	-	-	-	-	-	-
8270SIM	Pyrene	mg/L	0.12	-	-	-	-	-	-
A2320B	Alkalinity, Total	mg/L	-	-	-	-	-	-	-
AK101	Gasoline Range Organics	mg/L	2.2	1.3	ND [0.025]	ND [0.025]	ND [0.025]	ND [0.025]	ND [0.025]
AK102	Diesel Range Organics	mg/L	1.5	1.5	-	-	-	-	-
AK103	Residual Range Organics	mg/L	1.1	1.1	-	-	-	-	-
E300.0	Sulfate	mg/L	-	-	-	-	-	-	-
RSK175	Ethane	mg/L	-	-	ND [0.00024]	ND [0.00024]	-	-	-
RSK175	Ethene	mg/L	-	-	ND [0.00022]	ND [0.00022]	-	-	-
RSK175	Methane	mg/L	-	-	ND [0.00063]	ND [0.00063]	ND [0.00063]	ND [0.00063]	ND [0.00063]
SW6020A	Arsenic	mg/L	0.00052	0.01	-	-	-	-	-
SW6020A	Barium	mg/L	3.8	-	-	-	-	-	-
SW6020A	Cadmium	mg/L	0.0092	-	-	-	-	-	-
SW6020A	Chromium[4]	mg/L	22	-	-	-	-	-	-
SW6020A	Lead	mg/L	0.015	0.015	-	-	-	-	-
SW6020A	Manganese	mg/L	-	-	-	-	-	-	-
SW6020A	Nickel	mg/L	0.392	-	-	-	-	-	-
SW6020A	Selenium	mg/L	0.1	-	-	-	-	-	-
SW6020A	Silver	mg/L	0.094	-	-	-	-	-	-
SW6020A	Vanadium	mg/L	0.0864	-	-	-	-	-	-
SW6020A	Zinc	mg/L	6	-	-	-	-	-	-
SW7470A	Mercury	mg/L	0.00052	-	-	-	-	-	-
SW8015C	Ethylene glycol	mg/L	40	-	-	-	-	-	-
SW8015C	Propylene glycol	mg/L	-	-	-	-	-	-	-
SW8082A	PCB-1016 (Aroclor 1016)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1221 (Aroclor 1221)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1232 (Aroclor 1232)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1242 (Aroclor 1242)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1248 (Aroclor 1248)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1254 (Aroclor 1254)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1260 (Aroclor 1260)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1262 (Aroclor 1262)	mg/L	0.0005	-	-	-	-	-	-
SW8082A	PCB-1268 (Aroclor 1268)	mg/L	0.0005	-	-	-	-	-	-
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	0.0057	-	ND [0.0002]	-	-	-	-
SW8260C	1,1,1-Trichloroethane	mg/L	8	-	ND [0.0002]	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	**TB02**	**TB03**	**TB04**	**TB05**	**TBW01**
				Sample ID	**16NEC-TB02**	**16NEC-TB03**	**16NEC-TB04**	**16NEC-TB05**	**16NEC-TBW01**
				Lab Sample ID	**K160943401**	**K160943402**	**K160958110**	**K160958111**	**K160931704**
				SDG	**K1609434**	**K1609434**	**K1609581**	**K1609581**	**K1609317**
				Sample Date	**8/13/16**	**8/14/16**	**8/15/16**	**8/16/16**	**8/10/16**
				Matrix	**WG**	**WG**	**WG**	**WG**	**WG**
				Laboratory	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**
				QA/QC	**Trip Blank**	**Trip Blank**	**Trip Blank**	**Trip Blank**	**Trip Blank**
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**					
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.00076	-	ND [0.0002]	-	-	-	-
SW8260C	1,1,2-Trichloroethane	mg/L	0.00041	-	ND [0.0004]	-	-	-	-
SW8260C	1,1-Dichloroethane	mg/L	0.028	-	ND [0.0002]	-	-	-	-
SW8260C	1,1-Dichloroethene	mg/L	0.28	-	ND [0.0002]	-	-	-	-
SW8260C	1,1-Dichloropropene	mg/L	-	-	ND [0.0002]	-	-	-	-
SW8260C	1,2,3-Trichlorobenzene	mg/L	-	-	ND [0.0004]	-	-	-	-
SW8260C	1,2,3-Trichloropropane	mg/L	0.0000075	-	*ND [0.0005]*	-	-	-	-
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.004	-	ND [0.0003]	-	-	-	-
SW8260C	1,2,4-Trimethylbenzene	mg/L	0.015	-	ND [0.0002]	-	-	-	-
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	-	-	ND [0.0008]	-	-	-	-
SW8260C	1,2-Dibromoethane	mg/L	0.000075	-	*ND [0.0002]*	-	-	-	-
SW8260C	1,2-Dichlorobenzene	mg/L	0.3	-	ND [0.0002]	-	-	-	-
SW8260C	1,2-Dichloroethane	mg/L	0.0017	-	ND [0.00015]	-	-	-	-
SW8260C	1,2-Dichloropropane	mg/L	0.0044	-	ND [0.0002]	-	-	-	-
SW8260C	1,3,5-Trimethylbenzene	mg/L	0.12	-	ND [0.0002]	-	-	-	-
SW8260C	1,3-Dichlorobenzene	mg/L	0.3	-	ND [0.0002]	-	-	-	-
SW8260C	1,3-Dichloropropane	mg/L	-	-	ND [0.0003]	-	-	-	-
SW8260C	1,4-Dichlorobenzene	mg/L	0.0048	-	ND [0.0002]	-	-	-	-
SW8260C	2,2-Dichloropropane	mg/L	-	-	ND [0.0002]	-	-	-	-
SW8260C	2-Butanone	mg/L	5.6	-	ND [0.004]	-	-	-	-
SW8260C	2-Chlorotoluene	mg/L	-	-	ND [0.0002]	-	-	-	-
SW8260C	2-Hexanone	mg/L	0.038	-	ND [0.01]	-	-	-	-
SW8260C	4-Chlorotoluene	mg/L	-	-	ND [0.0002]	-	-	-	-
SW8260C	4-Isopropyltoluene	mg/L	-	-	ND [0.0002]	-	-	-	-
SW8260C	4-Methyl-2-pentanone	mg/L	6.3	-	ND [0.01]	-	-	-	-
SW8260C	Acetone	mg/L	14	-	ND [0.01]	-	-	-	-
SW8260C	Benzene	mg/L	0.0046	0.005	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Bromobenzene	mg/L	0.062	-	ND [0.0002]	-	-	-	-
SW8260C	Bromochloromethane	mg/L	-	-	ND [0.0002]	-	-	-	-
SW8260C	Bromodichloromethane	mg/L	0.0013	-	ND [0.0003]	-	-	-	-
SW8260C	Bromoform	mg/L	0.033	-	ND [0.0005]	-	-	-	-
SW8260C	Bromomethane	mg/L	0.0075	-	ND [0.0003]	-	-	-	-
SW8260C	Carbon disulfide	mg/L	0.81	-	0.00009 [0.0002] J, B, QL	-	-	-	-
SW8260C	Carbon tetrachloride	mg/L	0.0046	-	ND [0.0002]	-	-	-	-
SW8260C	Chlorobenzene	mg/L	0.078	-	ND [0.0002]	-	-	-	-
SW8260C	Chloroethane	mg/L	21	-	ND [0.0002]	-	-	-	-
SW8260C	Chloroform	mg/L	0.0022	-	0.00009 [0.0002] J	-	-	-	-
SW8260C	Chloromethane	mg/L	0.19	-	ND [0.0002] QL	-	-	-	-
SW8260C	cis-1,2-Dichloroethene	mg/L	0.036	-	ND [0.0002]	-	-	-	-
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0047	-	ND [0.0002]	-	-	-	-
SW8260C	Dibromochloromethane	mg/L	0.0087	-	ND [0.0005]	-	-	-	-
SW8260C	Dibromomethane	mg/L	0.0083	-	ND [0.0005]	-	-	-	-
SW8260C	Dichlorodifluoromethane	mg/L	0.2	-	ND [0.0002] QL	-	-	-	-
SW8260C	Ethylbenzene	mg/L	0.015	0.7	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Hexachlorobutadiene	mg/L	0.0014	-	ND [0.0003]	-	-	-	-
SW8260C	Isopropylbenzene	mg/L	0.45	-	ND [0.0002]	-	-	-	-
SW8260C	Methylene chloride	mg/L	0.11	-	0.00014 [0.0002] J, B	-	-	-	-
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.14	-	ND [0.0003]	-	-	-	-
SW8260C	Naphthalene	mg/L	0.0017	-	ND [0.0003]	-	-	-	-
SW8260C	n-Butylbenzene	mg/L	1	-	ND [0.0001]	-	-	-	-
SW8260C	n-Propylbenzene	mg/L	0.66	-	ND [0.0002]	-	-	-	-

Northeast Cape FUDS 2016 Sampling at Main Operations Complex
Table B-1-2 Groundwater Analytical Data Table

				Location ID	**TB02**	**TB03**	**TB04**	**TB05**	**TBW01**
				Sample ID	**16NEC-TB02**	**16NEC-TB03**	**16NEC-TB04**	**16NEC-TB05**	**16NEC-TBW01**
				Lab Sample ID	**K160943401**	**K160943402**	**K160958110**	**K160958111**	**K160931704**
				SDG	**K1609434**	**K1609434**	**K1609581**	**K1609581**	**K1609317**
				Sample Date	**8/13/16**	**8/14/16**	**8/15/16**	**8/16/16**	**8/10/16**
				Matrix	**WG**	**WG**	**WG**	**WG**	**WG**
				Laboratory	**ALGK**	**ALGK**	**ALGK**	**ALGK**	**ALGK**
				QA/QC	**Trip Blank**	**Trip Blank**	**Trip Blank**	**Trip Blank**	**Trip Blank**
Method	**Analyte**	**Units**	**2016 ADEC Evaluation Criteria[1]**	**SSCL[2]**					
SW8260C	o-Xylene	mg/L	0.193	-	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	sec-Butylbenzene	mg/L	2	-	ND [0.0001]	-	-	-	-
SW8260C	Styrene	mg/L	1.2	-	ND [0.0002]	-	-	-	-
SW8260C	tert-Butylbenzene	mg/L	0.69	-	ND [0.0002]	-	-	-	-
SW8260C	Tetrachloroethene (PCE)	mg/L	0.041	-	ND [0.0002]	-	-	-	-
SW8260C	Toluene	mg/L	1.1	-	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	trans-1,2-Dichloroethene	mg/L	0.36	-	ND [0.0002]	-	-	-	-
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0047	-	ND [0.0002]	-	-	-	-
SW8260C	Trichloroethene (TCE)	mg/L	0.0028	-	ND [0.0001]	-	-	-	-
SW8260C	Trichlorofluoromethane	mg/L	5.2	-	ND [0.0002]	-	-	-	-
SW8260C	Vinyl chloride	mg/L	0.00019	-	ND [0.0001]	-	-	-	-
SW8260C	Xylene, Isomers m & p	mg/L	0.193	-	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]

Notes:

[1] 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016)

[2] Decision Document (USACE 2009)

[3] Column with Lab Sample ID ending in "F" contains the filtered metals (dissolved) results

[4] In accordance 18 AAC 75 ADEC Table C, samples results reported for total

bold = Analytical results exceed the 2016 ADEC evaluation criteria.

🟧 Analytical results exceed the SSCL.

Italics Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs

[ ] - limit of detection
- - not provided or not analyzed
ALGK - ALS Environmental, Kelso, WA.
mg/L - milligram per liter
MS/MSD - matrix spike/ matrix spike duplicate
SDG - Sample Delivery Group
SSCL - site-specific cleanup level
WG - Groundwater
For Data Qualifiers, refer to Section 1.1 of the DQA.

ATTACHMENT B-2

Qualified Sample Results Tables

Table B-2-1
Sample Results Qualified QL due to Hold Time Exceedance

Sample ID	Lab Sample ID	Method	Analyte	QC Batch	Result (mg/L)	LOD (mg/L)	Qualifier	Sample Date	Extraction Date	Analyzed Date
16NEC-14MW06-WG	K160943404	AK102	DRO	KWG1607446	1.4	0.021	QL	8/13/2016	8/25/2016	10/6/2016
16NEC-14MW06-WG-9	K160943405	AK102	DRO	KWG1607446	1.4	0.02	QL	8/13/2016	8/25/2016	10/6/2016
16NEC-14MW07-WG	K160943409	AK102	DRO	KWG1607446	0.12	0.021	J, B, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-17MW1-WG	K160943412	AK102	DRO	KWG1607446	0.092	0.021	J, B, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-20MW-1-WG	K160943413	AK102	DRO	KWG1607446	0.09	0.021	J, B, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-22MW2-WG	K160943414	AK102	DRO	KWG1607446	0.1	0.021	J, B, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-26MW1-WG	K160943411	AK102	DRO	KWG1607446	0.11	0.022	J, B, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-MW10-1-WG	K160943403	AK102	DRO	KWG1607446	0.49	0.021	J, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-MW10-1-DVW	K160943406	AK102	DRO	KWG1607446	0.08	0.021	J, B, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-MW88-1-WG	K160943407	AK102	DRO	KWG1607446	0.52	0.021	J, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-MW88-10-WG	K160943410	AK102	DRO	KWG1607446	0.3	0.021	J, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-14MW03-WG	K160958101	AK102	DRO	KWG1607446	0.99	0.021	QL	8/14/2016	8/25/2016	10/6/2016
16NEC-14MW04-WG	K160958102	AK102	DRO	KWG1607446	2.2	0.021	QL	8/14/2016	8/25/2016	10/6/2016
16NEC-14MW05-WG	K160958103	AK102	DRO	KWG1607446	3.2	0.021	QL	8/14/2016	8/25/2016	10/6/2016
16NEC-MW88-3-WG	K160958104	AK102	DRO	KWG1607446	0.49	0.021	J, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-14MW06-WG	K160943404	AK103	RRO	KWG1607446	0.55	0.051	QL	8/13/2016	8/25/2016	10/6/2016
16NEC-14MW06-WG-9	K160943405	AK103	RRO	KWG1607446	0.47	0.05	QL	8/13/2016	8/25/2016	10/6/2016
16NEC-14MW07-WG	K160943409	AK103	RRO	KWG1607446	0.093	0.052	J, B, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-17MW1-WG	K160943412	AK103	RRO	KWG1607446	0.13	0.052	J, B, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-20MW-1-WG	K160943413	AK103	RRO	KWG1607446	0.13	0.052	J, B, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-22MW2-WG	K160943414	AK103	RRO	KWG1607446	0.36	0.052	J, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-26MW1-WG	K160943411	AK103	RRO	KWG1607446	0.79	0.053	QL	8/14/2016	8/25/2016	10/6/2016
16NEC-MW10-1-WG	K160943403	AK103	RRO	KWG1607446	0.32	0.053	J, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-MW10-1-DVW	K160943406	AK103	RRO	KWG1607446	0.11	0.051	J, B, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-MW88-1-WG	K160943407	AK103	RRO	KWG1607446	0.23	0.053	J, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-MW88-10-WG	K160943410	AK103	RRO	KWG1607446	0.16	0.051	J, QL	8/13/2016	8/25/2016	10/6/2016
16NEC-14MW03-WG	K160958101	AK103	RRO	KWG1607446	0.16	0.053	J, QL	8/14/2016	8/25/2016	10/6/2016
16NEC-14MW04-WG	K160958102	AK103	RRO	KWG1607446	0.61	0.052	QL	8/14/2016	8/25/2016	10/6/2016
16NEC-14MW05-WG	K160958103	AK103	RRO	KWG1607446	0.61	0.052	QL	8/14/2016	8/25/2016	10/6/2016
16NEC-MW88-3-WG	K160958104	AK103	RRO	KWG1607446	0.15	0.053	J, QL	8/14/2016	8/25/2016	10/6/2016

Note:

For definitions, refer to the DQA

Table B-2-2
Sample Results Qualified due to Method Blank and Trip Blank Contamination

SDG	QC Batch	Method	Analyte	QC sample	MB/TB Contamination (mg/L)	Associated Sample	Associated Result (mg/L)	Qualifier
K1609581	511210	A2320B	Alkalinity, Total	Method Blank	6	16NEC-14MW03-WG	28	B
K1609434	511209	A2320B	Alkalinity, Total	Method Blank	6	16NEC-20MW-1-WG	21	B
K1609317	510534	A2320B	Alkalinity, Total	Method Blank	6	16NEC-14MW02-WG	40	B
K1609317	510534	A2320B	Alkalinity, Total	Method Blank	6	16NEC-14MW02-WG-9	40	B
K1609581	511210	A2320B	Alkalinity, Total	Method Blank	6	16NEC-14MW05-WG	47	B
K1609434	KWG1607320	SW8260C	Carbon disulfide	Method Blank	0.00011	16NEC-14MW06-WG	0.00007	B
K1609434	KWG1607320	SW8260C	Carbon disulfide	Method Blank	0.00011	16NEC-14MW06-WG-9	0.00007	B
K1609434	KWG1607320	SW8260C	Carbon disulfide	Method Blank	0.00011	16NEC-TB02	0.00009	B
K1609434	KWG1607320	SW8260C	Methylene chloride	Method Blank	0.00011	16NEC-TB02	0.00014	B
K1609317	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-14MW01-WGF	0.00035	B
K1609317	269412	SW6020A	Chromium	Method Blank	0.0001	16NEC-14MW01-WG	0.00078	B
K1609317	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-14MW02-WGF	0.00034	B
K1609317	269412	SW6020A	Chromium	Method Blank	0.0001	16NEC-14MW02-WG	0.00053	B
K1609317	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-14MW02-WG-9F	0.00035	B
K1609317	269412	SW6020A	Chromium	Method Blank	0.0001	16NEC-14MW02-WG-9	0.00051	B
K1609581	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-14MW05-WGF	0.00046	B
K1609434	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-22MW2-WGF	0.0003	B
K1609434	269412	SW6020A	Chromium	Method Blank	0.0001	16NEC-22MW2-WG	0.00033	B
K1609581	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-MW88-3-WGF	0.00028	B
K1609581	269412	SW6020A	Chromium	Method Blank	0.0001	16NEC-MW88-3-WG	0.00042	B
K1609581	269412	SW6020A	Chromium (Dissolved)	Method Blank	0.0001	16NEC-14MW03-WGF	0.00065	B
K1609434	269412	SW6020A	Vanadium (Dissolved)	Method Blank	0.00003	16NEC-22MW2-WGF	0.00005	B
K1609434	269412	SW6020A	Vanadium	Method Blank	0.00003	16NEC-22MW2-WG	0.00006	B
K1609581	269412	SW6020A	Vanadium (Dissolved)	Method Blank	0.00003	16NEC-MW88-3-WGF	0.00012	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-14MW07-WG	0.12	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-17MW1-WG	0.092	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-20MW-1-WG	0.09	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-22MW2-WG	0.1	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-26MW1-WG	0.11	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-MW10-1-DVW	0.08	B
K1609434	KWG1607446	AK102	DRO	Method Blank	0.043	16NEC-MW88-10-WG	0.3	B
K1609581	KWG1607340	SW8082A	PCB-1260 (Aroclor 1260)	Method Blank	0.0000063	16NEC-14MW03-WG	0.0000029	B
K1609317	KWG1607329	AK103	RRO	Method Blank	0.027	16NEC-14MW01-WG	0.12	B
K1609317	KWG1607329	AK103	RRO	Method Blank	0.027	16NEC-14MW02-WG	0.18	B
K1609317	KWG1607329	AK103	RRO	Method Blank	0.027	16NEC-14MW02-WG-9	0.17	B
K1609434	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-14MW07-WG	0.093	B
K1609434	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-17MW1-WG	0.13	B
K1609434	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-20MW-1-WG	0.13	B
K1609434	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-MW10-1-DVW	0.11	B

Table B-2-2
Sample Results Qualified due to Method Blank and Trip Blank Contamination

SDG	QC Batch	Method	Analyte	QC sample	MB/TB Contamination (mg/L)	Associated Sample	Associated Result (mg/L)	Qualifier
K1609434	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-MW88-1-WG	0.23	B
K1609434	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-MW88-10-WG	0.16	B
K1609581	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-14MW03-WG	0.16	B
K1609581	KWG1607446	AK103	RRO	Method Blank	0.027	16NEC-MW88-3-WG	0.15	B
K1609434	KWG1607320	SW8260C	Carbon disulfide	16NEC-TB02	0.00009	16NEC-14MW06-WG-9	0.00007	B
K1609434	KWG1607320	SW8260C	Carbon disulfide	16NEC-TB02	0.00009	16NEC-14MW06-WG	0.00007	B
K1609434	KWG1607320	SW8260C	Chloroform	16NEC-TB02	0.00009	16NEC-MW10-1-DVW	0.0001	B

Note:

For definitions, refer to the DQA

Table B-2-3
Sample Results Qualified due to Surrogate Accuracy

SDG	Sample ID	Lab Sample ID	QC Batch	Method	Analyte	Percent Recovery	Result (mg/L)	LOD (mg/L)	LCL (%)	UCL (%)	Qualifier
K1609434	16NEC-14MW06-WG	K160943404	KWG1607320	SW8260C	1,2-Dichloroethane-d4	119	-	-	81	118	
K1609434	16NEC-14MW06-WG	K160943404	KWG1607320	SW8260C	Naphthalene	-	0.00034	0.0003	-	-	J, QH
K1609434	16NEC-14MW06-WG	K160943404	KWG1607320	SW8260C	Carbon disulfide	-	0.00007	0.0002	-	-	J, B, QH
K1609581	16NEC-14MW03-WG	K160958101	KWG1607370	SW8260C	Toluene-d8	115	-	-	89	112	
K1609581	16NEC-14MW03-WG	K160958101	KWG1607370	SW8260C	Ethylbenzene	-	0.00025	0.0001	-	-	J, QH
K1609581	16NEC-14MW04-WG	K160958102	KWG1607370	SW8260C	Toluene-d8	114	-	-	89	112	
K1609581	16NEC-14MW04-WG	K160958102	KWG1607370	SW8260C	Benzene	-	0.00013	0.0001	-	-	J, QH
K1609581	16NEC-14MW05-WG	K160958103	KWG1607370	SW8260C	Toluene-d8	116	-	-	89	112	
K1609581	16NEC-14MW05-WG	K160958103	KWG1607370	SW8260C	Xylene, Isomers m & p	-	0.00018	0.0002	-	-	J, QH
K1609581	16NEC-14MW05-WG	K160958103	KWG1607370	SW8260C	Ethylbenzene	-	0.00021	0.0001	-	-	J, QH
K1609581	16NEC-MW88-3-WG	K160958104	KWG1607370	SW8260C	Toluene-d8	114	-	-	89	112	
K1609581	16NEC-MW88-3-WG	K160958104	KWG1607370	SW8260C	Ethylbenzene	-	0.00005	0.0001	-	-	J, QH
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	Decachlorobiphenyl	22	-	-	40	135	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1260 (Aroclor 1260)	-	ND	0.0002	-	-	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1254 (Aroclor 1254)	-	ND	0.0002	-	-	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1248 (Aroclor 1248)	-	ND	0.0002	-	-	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1242 (Aroclor 1242)	-	ND	0.0002	-	-	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1232 (Aroclor 1232)	-	ND	0.0002	-	-	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1221 (Aroclor 1221)	-	ND	0.0004	-	-	QL
K1609581	16NEC-14MW04-WG	K160958102	KWG1607648	SW8082A	PCB-1016 (Aroclor 1016)	-	ND	0.0002	-	-	QL

Note:

For definitions, refer to the DQA

Table B-2-4
CCV Recoveries Less than True Value

SDG	Sample ID	Lab Sample ID	QC Batch	Method	Analyte	% Difference	Result (mg/L)	LOD (mg/L)	Qualifier
K1609434	CCV	-	KWG1607320	SW8260C	Dichlorodifluoromethane	-25	-	-	-
K1609434	CCV	-	KWG1607320	SW8260C	Chloromethane	-22	-	-	-
K1609434	CCV	-	KWG1607320	SW8260C	Carbon disulfide	-23	-	-	-
K1609434	16NEC-TB02	K160943401	KWG1607320	SW8260C	Dichlorodifluoromethane	-	ND	0.0002	QL
K1609434	16NEC-TB02	K160943401	KWG1607320	SW8260C	Chloromethane	-	ND	0.0002	QL
K1609434	16NEC-TB02	K160943401	KWG1607320	SW8260C	Carbon disulfide	-	0.00009	0.0002	J, B, QL
K1609434	16NEC-MW10-1-WG	K160943403	KWG1607320	SW8260C	Dichlorodifluoromethane	-	ND	0.0002	QL
K1609434	16NEC-MW10-1-WG	K160943403	KWG1607320	SW8260C	Chloromethane	-	ND	0.0002	QL
K1609434	16NEC-MW10-1-WG	K160943403	KWG1607320	SW8260C	Carbon disulfide	-	ND	0.0002	QL
K1609434	16NEC-14MW06-WG	K160943404	KWG1607320	SW8260C	Dichlorodifluoromethane	-	ND	0.0002	QL
K1609434	16NEC-14MW06-WG	K160943404	KWG1607320	SW8260C	Chloromethane	-	ND	0.0002	QL
K1609434	16NEC-14MW06-WG	K160943404	KWG1607320	SW8260C	Carbon disulfide	-	0.00007	0.0002	J, B, QH, QL
K1609434	16NEC-14MW06-WG-9	K160943405	KWG1607320	SW8260C	Dichlorodifluoromethane	-	ND	0.0002	QL
K1609434	16NEC-14MW06-WG-9	K160943405	KWG1607320	SW8260C	Chloromethane	-	ND	0.0002	QL
K1609434	16NEC-14MW06-WG-9	K160943405	KWG1607320	SW8260C	Carbon disulfide	-	0.00007	0.0002	J, B, QL
K1609434	16NEC-MW10-1-DVW	K160943406	KWG1607320	SW8260C	Dichlorodifluoromethane	-	ND	0.0002	QL
K1609434	16NEC-MW10-1-DVW	K160943406	KWG1607320	SW8260C	Chloromethane	-	ND	0.0002	QL
K1609434	16NEC-MW10-1-DVW	K160943406	KWG1607320	SW8260C	Carbon disulfide	-	ND	0.0002	QL

Note:

For definitions, refer to the DQA

Table B-2-5
Sample Results Qualified due to Field Duplicate Precision

Method	Analyte	Primary Sample ID	Primary Lab Sample ID	Duplicate Sample ID	Duplicate Lab Sample ID	Primary Result (mg/L)	Duplicate Result (mg/L)	RPD (%)	Qualifier
SW6020A	Silver (Total)	16NEC-14MW02-WG	K160931702	16NEC-14MW02-WG-9	K160931703	0.00001	0.000005	67	QN
SW6020A	Cadmium (Dissolved)	16NEC-14MW02-WGF	K160931702F	16NEC-14MW02-WG-9F	K160931703F	0.000018	0.000029	47	QN
SW6020A	Lead (Dissolved)	16NEC-14MW02-WGF	K160931702F	16NEC-14MW02-WG-9F	K160931703F	0.000054	0.000083	42	QN
8270SIM	Acenaphthene	16NEC-14MW06-WG	K160943404	16NEC-14MW06-WG-9	K160943405	0.000017	ND [0.000005]	109	QN
8270SIM	Naphthalene	16NEC-14MW06-WG	K160943404	16NEC-14MW06-WG-9	K160943405	0.00006	0.000033	58	QN
SW8260C	Naphthalene	16NEC-14MW06-WG	K160943404	16NEC-14MW06-WG-9	K160943405	0.00034	0.00025	31	QN
SW8082A	PCB-1260 (Aroclor 1260)	16NEC-14MW06-WG	K160943404	16NEC-14MW06-WG-9	K160943405	0.0000015	0.0000026	54	QN
SW6020A	Cadmium (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	0.00008	0.000049	48	QN
SW6020A	Chromium (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	0.00034	0.00017	67	QN
SW6020A	Lead (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	0.000649	0.000208	103	QN
SW6020A	Selenium (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	ND [0.001]	0.0005	67	QN
SW6020A	Silver (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	0.00001	0.000004	86	QN
SW6020A	Vanadium (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	0.00054	0.00035	43	QN
SW6020A	Zinc (Dissolved)	16NEC-14MW06-WGF	K160943404F	16NEC-14MW06-WG-9F	K160943405F	0.00734	0.00412	56	QN

Notes:

[ ] - limit of detection

For definitions, refer to the DQA

Table B-2-6
Nondetect Sample Results with LODs Greater than ADEC Criteria

SDG	Sample ID	Location ID	Lab Sample ID	Method	Analyte	2016 ADEC Evaluation Criteria[1] (mg/L)	Result (mg/L)	LOD (mg/L)	DF
K1609434	16NEC-TB02	TB02	K160943401	SW8260C	1,2-Dibromoethane	0.000075	ND	0.0002	1
K1609434	16NEC-TB02	TB02	K160943401	SW8260C	1,2,3-Trichloropropane	0.0000075	ND	0.0005	1
K1609434	16NEC-MW10-1-WG	MW10-1	K160943403	SW8260C	1,2-Dibromoethane	0.000075	ND	0.0002	1
K1609434	16NEC-MW10-1-WG	MW10-1	K160943403	SW8260C	1,2,3-Trichloropropane	0.0000075	ND	0.0005	1
K1609434	16NEC-14MW06-WG	14MW06	K160943404	SW8260C	1,2-Dibromoethane	0.000075	ND	0.0002	1
K1609434	16NEC-14MW06-WG	14MW06	K160943404	SW8260C	1,2,3-Trichloropropane	0.0000075	ND	0.0005	1
K1609434	16NEC-14MW06-WG-9	14MW06	K160943405	SW8260C	1,2-Dibromoethane	0.000075	ND	0.0002	1
K1609434	16NEC-14MW06-WG-9	14MW06	K160943405	SW8260C	1,2,3-Trichloropropane	0.0000075	ND	0.0005	1
K1609434	16NEC-MW10-1-DVW	MW10-1-DVW	K160943406	SW8260C	1,2-Dibromoethane	0.000075	ND	0.0002	1
K1609434	16NEC-MW10-1-DVW	MW10-1-DVW	K160943406	SW8260C	1,2,3-Trichloropropane	0.0000075	ND	0.0005	1

Notes:

[1] Groundwater compared to 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016).

For definitions, refer to the DQA

Table B-2-7
Sample Results Qualified due to Dual Column Confirmation

SDG	Sample ID	Lab Sample ID	Method	Analyte	Primary	Confirmation	RPD	Qualifier
K1609434	16NEC-20MW-1-WG	K160943413	8082A	Aroclor 1260	0.0000023	0.0000035	41	QN
K1609434	16NEC-MW88-10-WG	K160943410	8082A	Aroclor 1260	0.0000027	0.0000044	48	QN
K1609581	16NEC-14MW03-WG	K160958101	8082A	Aroclor 1260	0.0000029	0.0000044	41	QN

Note:

For definitions, refer to the DQA

Table B-2-8
Sample Results Qualified due to Equipment Blank Contamination

SDG	Method	Analyte	Equipment Blank Contamination (mg/L)	Associated Sample	Associated Result (mg/L)	LOD (mg/L)	Qualifier
K1609434	8270SIM	2-Methylnaphthalene	0.0000042	16NEC-MW10-1-WG	0.0000049	0.000005	J, B
K1609581	8270SIM	2-Methylnaphthalene	0.0000042	16NEC-14MW03-WG	0.000015	0.0000056	J, B
K1609581	8270SIM	2-Methylnaphthalene	0.0000042	16NEC-14MW05-WG	0.000029	0.000005	B
K1609581	8270SIM	2-Methylnaphthalene	0.0000042	16NEC-MW88-3-WG	0.0000058	0.000005	J, B
K1609434	AK102	DRO	0.08	16NEC-14MW07-WG	0.12	0.021	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-17MW1-WG	0.092	0.021	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-20MW-1-WG	0.09	0.021	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-22MW2-WG	0.1	0.021	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-26MW1-WG	0.11	0.022	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-MW10-1-WG	0.49	0.021	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-MW88-10-WG	0.3	0.021	J, B, QL
K1609434	AK102	DRO	0.08	16NEC-MW88-1-WG	0.52	0.021	J,B, QL
K1609581	AK102	DRO	0.08	16NEC-MW88-3-WG	0.49	0.021	J, B, QL
K1609317	AK103	RRO	0.11	16NEC-14MW01-WG	0.12	0.051	J, B
K1609317	AK103	RRO	0.11	16NEC-14MW02-WG	0.18	0.053	J, B
K1609317	AK103	RRO	0.11	16NEC-14MW02-WG-9	0.17	0.053	J, B
K1609581	AK103	RRO	0.11	16NEC-14MW03-WG	0.16	0.053	J, B, QL
K1609581	AK103	RRO	0.11	16NEC-14MW04-WG	0.61	0.052	B, QL
K1609581	AK103	RRO	0.11	16NEC-14MW05-WG	0.61	0.052	B, QL
K1609434	AK103	RRO	0.11	16NEC-14MW06-WG	0.55	0.051	B, QL
K1609434	AK103	RRO	0.11	16NEC-14MW06-WG-9	0.47	0.05	B, QL
K1609434	AK103	RRO	0.11	16NEC-14MW07-WG	0.093	0.052	J, B, QL
K1609434	AK103	RRO	0.11	16NEC-17MW1-WG	0.13	0.052	J, B, QL
K1609434	AK103	RRO	0.11	16NEC-20MW-1-WG	0.13	0.052	J, B, QL
K1609434	AK103	RRO	0.11	16NEC-22MW2-WG	0.36	0.052	J, B, QL
K1609434	AK103	RRO	0.11	16NEC-26MW1-WG	0.79	0.053	B, QL
K1609434	AK103	RRO	0.11	16NEC-MW10-1-WG	0.32	0.053	J, B, QL
K1609434	AK103	RRO	0.11	16NEC-MW88-10-WG	0.16	0.051	J, B, QL
K1609434	AK103	RRO	0.11	16NEC-MW88-1-WG	0.23	0.053	J, B, QL
K1609581	AK103	RRO	0.11	16NEC-MW88-3-WG	0.15	0.053	J, B, QL
K1609317	SW8260C	Ethylbenzene	0.00006	16NEC-14MW01-WG	0.0005	0.0001	B
K1609581	SW8260C	Ethylbenzene	0.00006	16NEC-14MW03-WG	0.00025	0.0001	J, B, QH
K1609581	SW8260C	Ethylbenzene	0.00006	16NEC-14MW05-WG	0.00021	0.0001	J,B, QH
K1609581	SW8260C	Ethylbenzene	0.00006	16NEC-MW88-3-WG	0.00005	0.0001	J, B, QH
K1609581	8270SIM	Naphthalene	0.000011	16NEC-14MW04-WG	0.000022	0.000005	B
K1609434	8270SIM	Naphthalene	0.000011	16NEC-14MW06-WG	0.00006	0.000005	B, Q
K1609434	8270SIM	Naphthalene	0.000011	16NEC-14MW06-WG-9	0.000033	0.000005	B, Q
K1609434	8270SIM	Naphthalene	0.000011	16NEC-14MW07-WG	0.0000061	0.000005	J, B
K1609434	8270SIM	Naphthalene	0.000011	16NEC-17MW1-WG	0.0000076	0.000005	J, B
K1609434	8270SIM	Naphthalene	0.000011	16NEC-20MW-1-WG	0.0000054	0.000005	J, B
K1609434	8270SIM	Naphthalene	0.000011	16NEC-26MW1-WG	0.0000045	0.000005	J, B
K1609434	8270SIM	Naphthalene	0.000011	16NEC-MW10-1-WG	0.0000046	0.000005	J, B

Table B-2-8
Sample Results Qualified due to Equipment Blank Contamination

SDG	Method	Analyte	Equipment Blank Contamination (mg/L)	Associated Sample	Associated Result (mg/L)	LOD (mg/L)	Qualifier
K1609434	8270SIM	Naphthalene	0.000011	16NEC-MW88-10-WG	0.0000088	0.000005	J, B
K1609434	8270SIM	Naphthalene	0.000011	16NEC-MW88-1-WG	0.0000071	0.000005	J, B
K1609581	8270SIM	Naphthalene	0.000011	16NEC-MW88-3-WG	0.000035	0.000005	B
K1609434	SW8260C	Tetrachloroethene (PCE)	0.0024	16NEC-MW10-1-WG	0.0092	0.0002	B
K1609317	SW8260C	Xylene, Isomers m & p	0.00028	16NEC-14MW01-WG	0.00038	0.0002	J, B
K1609317	SW8260C	Xylene, Isomers m & p	0.00028	16NEC-14MW02-WG	0.0006	0.0002	B
K1609317	SW8260C	Xylene, Isomers m & p	0.00028	16NEC-14MW02-WG-9	0.00055	0.0002	B
K1609581	SW8260C	Xylene, Isomers m & p	0.00028	16NEC-14MW05-WG	0.00018	0.0002	J, B, QH
K1609317	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW01-WGF	0.00035	0.00005	B
K1609317	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW02-WGF	0.00034	0.00005	B
K1609317	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW02-WG-9F	0.00035	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-MW10-1-WGF	0.00026	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW06-WGF	0.00034	0.00005	B, Q
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW06-WG-9	0.00017	0.00005	J, B, Q
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-MW88-1-WGF	0.00018	0.00005	J, B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW07-WGF	0.00024	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-MW88-10-WGF	0.0002	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-26MW1-WGF	0.00031	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-17MW1-WGF	0.00021	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-20MW-1-WGF	0.00033	0.00005	B
K1609434	SW6020A	Chromium (Dissolved)	0.00012	16NEC-22MW2-WGF	0.0003	0.00005	B
K1609581	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW03-WGF	0.00065	0.00005	B
K1609581	SW6020A	Chromium (Dissolved)	0.00012	16NEC-14MW05-WGF	0.00046	0.00005	B
K1609581	SW6020A	Chromium (Dissolved)	0.00012	16NEC-MW88-3-WGF	0.00028	0.00005	B
K1609317	SW6020A	Chromium (Total)	0.00012	16NEC-14MW01-WG	0.00078	0.00005	B
K1609317	SW6020A	Chromium (Total)	0.00012	16NEC-14MW02-WG	0.00053	0.00005	B
K1609317	SW6020A	Chromium (Total)	0.00012	16NEC-14MW02-WG-9	0.00051	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-MW10-1-WG	0.0009	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-14MW06-WG	0.0002	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-14MW06-WG-9	0.00016	0.00005	J, B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-MW88-1-WG	0.00016	0.00005	J, B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-14MW07-WG	0.00045	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-MW88-10-WG	0.00048	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-17MW1-WG	0.00025	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-20MW-1-WG	0.00053	0.00005	B
K1609434	SW6020A	Chromium (Total)	0.00012	16NEC-22MW2-WG	0.00033	0.00005	B
K1609581	SW6020A	Chromium (Total)	0.00012	16NEC-14MW05-WG	0.001	0.00005	B
K1609581	SW6020A	Chromium (Total)	0.00012	16NEC-MW88-3-WG	0.00042	0.00005	B
K1609317	SW6020A	Lead (Dissolved)	0.000021	16NEC-14MW01-WGF	0.000159	0.00001	B
K1609317	SW6020A	Lead (Dissolved)	0.000021	16NEC-14MW02-WGF	0.000054	0.00001	B, Q
K1609317	SW6020A	Lead (Dissolved)	0.000021	16NEC-14MW02-WG-9F	0.000083	0.00001	B, Q
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-14MW06-WG-9	0.000208	0.00001	B, Q

Table B-2-8
Sample Results Qualified due to Equipment Blank Contamination

SDG	Method	Analyte	Equipment Blank Contamination (mg/L)	Associated Sample	Associated Result (mg/L)	LOD (mg/L)	Qualifier
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-14MW07-WGF	0.000052	0.00001	B
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-17MW1-WGF	0.000045	0.00001	B
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-22MW2-WGF	0.000026	0.00001	B
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-26MW1-WGF	0.000025	0.00001	B
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-MW10-1-WGF	0.000042	0.00001	B
K1609434	SW6020A	Lead (Dissolved)	0.000021	16NEC-MW88-1-WGF	0.000075	0.00001	B
K1609581	SW6020A	Lead (Dissolved)	0.000021	16NEC-MW88-3-WGF	0.000158	0.00001	B
K1609434	SW6020A	Lead (Total)	0.000021	16NEC-22MW2-WG	0.000085	0.00001	B
K1609434	SW6020A	Manganese (Dissolved)	0.000173	16NEC-17MW1-WGF	0.00156	0.000013	B
K1609434	SW6020A	Manganese (Dissolved)	0.000173	16NEC-22MW2-WGF	0.000535	0.000013	B
K1609434	SW6020A	Manganese (Dissolved)	0.000173	16NEC-26MW1-WGF	0.000754	0.000013	B
K1609317	SW6020A	Nickel (Dissolved)	0.00034	16NEC-14MW01-WGF	0.00124	0.00005	B
K1609317	SW6020A	Nickel (Total)	0.00034	16NEC-14MW01-WG	0.00105	0.00005	B
K1609317	SW6020A	Nickel (Dissolved)	0.00034	16NEC-14MW02-WGF	0.00094	0.00005	B
K1609317	SW6020A	Nickel (Total)	0.00034	16NEC-14MW02-WG	0.00111	0.00005	B
K1609317	SW6020A	Nickel (Dissolved)	0.00034	16NEC-14MW02-WG-9F	0.00105	0.00005	B
K1609317	SW6020A	Nickel (Total)	0.00034	16NEC-14MW02-WG-9	0.00106	0.00005	B
K1609581	SW6020A	Nickel (Dissolved)	0.00034	16NEC-14MW03-WGF	0.00332	0.00005	B
K1609581	SW6020A	Nickel (Total)	0.00034	16NEC-14MW03-WG	0.00289	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-14MW06-WGF	0.00201	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-14MW06-WG	0.00175	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-14MW06-WG-9	0.0018	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-14MW06-WG-9	0.00166	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-17MW1-WGF	0.0023	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-17MW1-WG	0.0008	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-20MW-1-WGF	0.00167	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-20MW-1-WG	0.00114	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-22MW2-WGF	0.001	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-22MW2-WG	0.00028	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-26MW1-WGF	0.00126	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-26MW1-WG	0.00112	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-MW10-1-WGF	0.00122	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-MW10-1-WG	0.00135	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-MW88-10-WGF	0.00312	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-MW88-10-WG	0.00242	0.00005	B
K1609434	SW6020A	Nickel (Dissolved)	0.00034	16NEC-MW88-1-WGF	0.00104	0.00005	B
K1609434	SW6020A	Nickel (Total)	0.00034	16NEC-MW88-1-WG	0.00091	0.00005	B
K1609581	SW6020A	Nickel (Dissolved)	0.00034	16NEC-MW88-3-WGF	0.00246	0.00005	B
K1609581	SW6020A	Nickel (Total)	0.00034	16NEC-MW88-3-WG	0.00217	0.00005	B
K1609317	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-14MW01-WGF	0.00034	0.00005	B
K1609581	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-14MW03-WGF	0.00034	0.00005	B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-14MW06-WG	0.00039	0.00005	B

Table B-2-8
Sample Results Qualified due to Equipment Blank Contamination

SDG	Method	Analyte	Equipment Blank Contamination (mg/L)	Associated Sample	Associated Result (mg/L)	LOD (mg/L)	Qualifier
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-14MW06-WG-9	0.00035	0.00005	B, Q
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-14MW06-WG-9	0.00037	0.00005	B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-14MW07-WGF	0.00003	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-14MW07-WG	0.00016	0.00005	J, B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-17MW1-WGF	0.00005	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-17MW1-WG	0.00017	0.00005	J, B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-20MW-1-WGF	0.00012	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-20MW-1-WG	0.00037	0.00005	B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-22MW2-WGF	0.00005	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-22MW2-WG	0.00006	0.00005	J, B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-26MW1-WGF	0.00006	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-26MW1-WG	0.00021	0.00005	B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-MW10-1-WGF	0.00008	0.00005	J, B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-MW88-10-WGF	0.00007	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-MW88-10-WG	0.00035	0.00005	B
K1609434	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-MW88-1-WGF	0.00005	0.00005	J, B
K1609434	SW6020A	Vanadium (Total)	0.00004	16NEC-MW88-1-WG	0.00006	0.00005	J, B
K1609581	SW6020A	Vanadium (Dissolved)	0.00004	16NEC-MW88-3-WGF	0.00012	0.00005	J, B
K1609581	SW6020A	Vanadium (Total)	0.00004	16NEC-MW88-3-WG	0.00032	0.00005	B
K1609317	SW6020A	Zinc (Dissolved)	0.00063	16NEC-14MW01-WGF	0.00313	0.0005	B
K1609317	SW6020A	Zinc (Total)	0.00063	16NEC-14MW01-WG	0.00322	0.0005	B
K1609317	SW6020A	Zinc (Dissolved)	0.00063	16NEC-14MW02-WGF	0.00259	0.0005	B
K1609317	SW6020A	Zinc (Total)	0.00063	16NEC-14MW02-WG	0.00254	0.0005	B
K1609317	SW6020A	Zinc (Dissolved)	0.00063	16NEC-14MW02-WG-9F	0.0034	0.0005	B
K1609317	SW6020A	Zinc (Total)	0.00063	16NEC-14MW02-WG-9	0.00237	0.0005	B
K1609581	SW6020A	Zinc (Dissolved)	0.00063	16NEC-14MW03-WGF	0.00516	0.0005	B
K1609581	SW6020A	Zinc (Total)	0.00063	16NEC-14MW03-WG	0.00587	0.0005	B
K1609434	SW6020A	Zinc (Total)	0.00063	16NEC-14MW06-WG	0.00331	0.0005	B
K1609434	SW6020A	Zinc (Dissolved)	0.00063	16NEC-14MW06-WG-9	0.00412	0.0005	B, Q
K1609434	SW6020A	Zinc (Total)	0.00063	16NEC-14MW06-WG-9	0.00301	0.0005	B
K1609434	SW6020A	Zinc (Dissolved)	0.00063	16NEC-14MW07-WGF	0.00394	0.0005	B
K1609434	SW6020A	Zinc (Total)	0.00063	16NEC-14MW07-WG	0.00384	0.0005	B
K1609434	SW6020A	Zinc (Dissolved)	0.00063	16NEC-22MW2-WGF	0.00343	0.0005	B
K1609434	SW6020A	Zinc (Total)	0.00063	16NEC-22MW2-WG	0.00196	0.0005	B
K1609434	SW6020A	Zinc (Dissolved)	0.00063	16NEC-26MW1-WGF	0.00273	0.0005	B
K1609434	SW6020A	Zinc (Total)	0.00063	16NEC-26MW1-WG	0.00218	0.0005	B

Note:

For definitions, refer to the DQA

ATTACHMENT B-3

ADEC Laboratory Data Review Checklists

Included with document PDF on CD

Laboratory Data Review Checklist

Completed by: Angela DiBerardino

Title: Project Chemist **Date:** 12/14/2016

CS Report Name: Northeast Cape Groundwater Report **Report Date:** March 2017

Consultant Firm: Jacobs Engineering Group Inc.

Laboratory Name: ALS, Kelso, WA. **Laboratory Report Number:** K1609317

ADEC File Number: 475.38.013 **ADEC RecKey Number:** Haz ID: 25681

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

   ☑ Yes ☐ No ☐ NA (Please explain.) Comments

   Samples were shipped to ALS in Kelso, WA.

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

   ☑ Yes ☐ No ☐ NA (Please explain.) Comments

   ALS Kelso transferred samples for method RSK175 to ALS Simi Valley.

2. **Chain of Custody (CoC)**
   a. CoC information completed, signed, and dated (including released/received by)?

   ☑ Yes ☐ No ☐ NA (Please explain.) Comments

   b. Correct Analyses requested?

   ☑ 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 ☑ No ☐ NA (Please explain.) Comments

   Cooler Almond Joy
   Temperature blank – 1.5°C
   Cooler Temperature – 1.3°C

   Cooler Mounds
   Temperature blank – 4.0°C
   Cooler Temperature – 2.0°C

   Transferred Cooler to Simi Valley
   Temperature blank – 2.0°C

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments

The dissolved metals container for sample 16NEC-14MW02-WG-9F required an additional 1mL HNO3 preservative to be added at the laboratory. The dissolved metals results were qualified QN due to improper preservation.

All dissolved metals results for this field duplicate sample results were comparable to the results in the primary sample with the exception of cadmium and lead (see section 6.e.iii). All metals results for the primary and duplicate sample were less than the ADEC cleanup criteria with the exception of arsenic and chromium which can be considered naturally occurring and not a contaminant of concern at this site.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All samples were received in good condition.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

A 40 mL VOA was unlabeled for sample 16NEC-14MW02-WG-9.

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

Comments:

Data quality was not impacted by the anomalies listed above. The cooler temperature for Almond Joy was less than 2°C but no samples were received frozen at the lab; therefor there is no impact.

4. Case Narrative

a. Present and understandable?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All discrepancies and anomalies are discussed in the relevant sections below.

c. Were all corrective actions documented?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

No corrective actions were necessary for this SDG

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

Comments:

All data is usable, see the relevant sections for effects on data quality.

5. **Samples Results**

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

b. All applicable holding times met?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

c. All soils reported on a dry weight basis?

☐ Yes ☐ No ☑ NA (Please explain.) Comments

Only water samples were submitted with this sample group.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

The LODs for nondetect sample results were compared to 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016).

e. Data quality or usability affected?

Comments:

Data quality and usability was not affected.

6. **QC Samples**

a. Method Blank

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

ii. All method blank results less than PQL?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

General chemistry – The method blank had detections for total alkalinity.
Dissolved Metals – The method blank had detections for chromium and vanadium.
DRO/RRO – The method blank had detections for DRO and RRO.
PAH – The method blank had a detection for Acenaphthylene

iii. If above PQL, what samples are affected?

Comments:

Samples within 10 times the method blank detection were affected.

SM2320B: The following samples had detections for alkalinity within 10 times: 16NEC-14MW02-WG and 16NEC-14MW02-WG-9.

SW6020: The following samples had detections for chromium (total and dissolved) within 10 times, 16NEC-14MW01-WGF, 16NEC-14MW01-WG, 16NEC-14MW02-WGF, 16NEC-14MW02-WG and 16NEC-14MW02-WG-9 and 16NEC-14MW02-WG-9F.

AK103: The following samples had detections for RRO within 10 times: 16NEC-14MW01-WG, 16NEC-14MW02-WG and 16NEC-14MW02-WG-9.

No samples were affected for the other method blank detections listed.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Sample results were qualified B

v. Data quality or usability affected? (please explain)

Comments:

Data quality is affected since the sample results are biased high and equal the ADEC Cleanup Level.

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

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

A project-specific MS/MSD was not performed in this SDG for organic methods. LCS/LCSDs are available for the organic methods.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

EPA 300.0:
A LCS, MS/MSD and duplicate was performed for sulfate analysis (batch 268950).
SM2320B:
A LCS and duplicate (from a non-client sample) was performed for alkalinity analysis (batch 511167 and 510534). A MS/MSD is not performed for this analysis.
SW6020:
A LCS and MS/MSD were performed for the metals analysis (batch 269412).
SW7470:
A LCS and MS/MSD (from a non-client sample) were performed for mercury analysis (batch 269933).

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments

All LCS and LCSD were within required QC limits

MS/MSD anomalies:
Metals – The manganese was outside criteria; however, the spike amount was less than the parent sample concentration.
DRO/RRO – The MS and MSD for DRO was lower than the LCL and the MSD for RRO was lower than the LCL. The parent sample was a non-project sample.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All LCS/LCSD and MS/MSD are within QC criteria.

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

Comments:

No samples were affected.

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments

No samples required qualification.

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

Comments:

Data quality and usability were not affected.

c. Surrogates – Organics Only

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

☑ 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 ☐ No ☐ NA (Please explain.) Comments

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments

No samples required qualification.

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

Comments:

Data quality and usability were not affected.

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

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

☑ Yes ☐ No ☐ 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)

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Trip blank sample ID 16NEC-TBW01

iii. All results less than PQL?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

iv. If above PQL, what samples are affected?

Comments:

NA

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

Comments:

Data quality and usability were not affected.

e. Field Duplicate

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

ii. Submitted blind to lab?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Primary 16NEC-14MW02-WG and 16NEC-14MW02-WGF
Duplicate 16NEC-14MW02-WG-9 and 16NEC-14MW02-WG-9F

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☑ No ☐ NA (Please explain.) Comments

The following had RPDs greater than 30% and were qualified Q
Total metals – silver
Dissolved metals – cadmium and lead

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

Data quality is minimally affected since all qualified results are less than ADEC criteria

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☐ No ☑ NA (Please explain.) Comments

i. All results less than PQL?

☐ Yes ☐ No ☑ NA (Please explain.) Comments

ii. If above PQL, what samples are affected?
Comments:

NA

iii. Data quality or usability affected? (Please explain.)
Comments:

NA

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab-Specific, etc.)</u>

a. Defined and appropriate?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Qualifiers are defined in the DQA

Laboratory Data Review Checklist

Completed by: Angela DiBerardino

Title: Project Chemist **Date:** 12/14/2016

CS Report Name: Northeast Cape Groundwater Report **Report Date:** March 2017

Consultant Firm: Jacobs Engineering Group Inc.

Laboratory Name: ALS, Kelso, WA. **Laboratory Report Number:** K1609434

ADEC File Number: 475.38.013 **ADEC RecKey Number:** Haz ID: 25681

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

   ☑ Yes ☐ No ☐ NA (Please explain.) Comments

   Samples were shipped to ALS in Kelso, WA.

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

   ☑ Yes ☐ No ☐ NA (Please explain.) Comments

   ALS Kelso transferred samples for method RSK175 to ALS Simi Valley.

2. **Chain of Custody (CoC)**
   a. CoC information completed, signed, and dated (including released/received by)?

   ☑ Yes ☐ No ☐ NA (Please explain.) Comments

   b. Correct Analyses requested?

   ☑ 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 ☐ No ☐ NA (Please explain.) Comments

Cooler Caramello
Temperature blank – 4.4°C
Cooler Temperature – 4.5°C

Cooler Butterfinger
Temperature blank – 2.9°C
Cooler Temperature – 4.6°C

Cooler Snickers
Temperature blank – 3.2°C
Cooler Temperature – 2.8°C

Cooler Twix
Temperature blank – 4.2°C
Cooler Temperature – 1.3°C

Cooler Kit Kat
Temperature blank – 3.7°C
Cooler Temperature – 4.2°C

Cooler Milky Way
Temperature blank – 3.2°C
Cooler Temperature – 2.1°C

Cooler 100 Grand
Temperature blank – 2.0°C
Cooler Temperature – 2.1°C

Transferred Cooler to Simi Valley
Temperature blank – 4.0°C

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All samples were received properly preserved.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All samples were received in good condition.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

No discrepancies were noted. Jacobs cancelled sample 16NEC-14MW03-WG from this sample group and recollected.

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

Comments:

Data quality and usability was not affected.

4. Case Narrative

a. Present and understandable?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

DRO/RRO – The original analysis that was not reported had low LCS/LCSD related to instrument issues. The reanalysis was performed past the analytical hold time. See comment 5.b.

PCB – The ICV for Aroclor 1232 did not meet the primary evaluation criteria. The ICV was reported from the acceptable column. Data was not affected.
The RPD for the confirmation column for results related to Aroclor 1260 were greater than the 40% in samples 16NEC-20MW-1-WG and 16NEC-MW88-10-WG. Results were qualified QN.

VOCs – CCV MS46\0822F027.D was outside control criteria for Dichlorodifluoromethane, Chloromethane, Carbon Disulfide and 2-Butanone (MEK). Associated samples were qualified QL for Dichlorodifluoromethane, Chloromethane, Carbon Disulfide and may be biased low. Associated samples were not qualified for 2-Butanone (MEK) since the CCV was biased high and results were nondetect.

PAH – Acenaphthene result in sample 16NEC-14MW06-WG may contain a slight high bias due to the presence of non-target background. Sample results were not qualified.

All other discrepancies and anomalies are discussed in the relevant sections below.

c. Were all corrective actions documented?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

The lab indicated in the case narrative that the DRO samples needed re-analysis.

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

Comments:

PCB – The effect is minimal since both results were less than ADEC criteria.

VOCs – The affected sample results were qualified QL and are biased low as described above. The data quality is minimally affected since the results and reporting limits are significantly less than the ADEC criteria.

PAH - Results were not affected since the result is significantly less than ADEC criteria.

All data is usable, see the relevant sections for effects on data quality.

5. **Samples Results**
   a. Correct analyses performed/reported as requested on COC?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

   b. All applicable holding times met?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

DRO/RRO – The original analysis that was not reported had low LCS/LCSD related to instrument issues. The reanalysis was performed past the analytical hold time. Sample results were qualified QL and may be biased low.

   c. All soils reported on a dry weight basis?

☐ Yes ☐ No ☑ NA (Please explain.) Comments

Only water samples were submitted with this sample group.

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments

The LODs for nondetect sample results were compared to 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016).

VOC – The LODs for analytes 1,2-Dibromoethane and 1,2,3-Trichloropropane were greater than ADEC criteria in samples 16NEC-TB02, 16NEC-MW10-1-WG, 16NEC-14MW06-WG, 16NEC-14MW06-WG-9, and 16NEC-MW10-1-DVW.

   e. Data quality or usability affected?

Comments:

Data quality and usability is affected since the reporting limits are not low enough. Alternative methods may need to be utilized in the future for these analytes.

The DRO results may be biased low. Majority of results are less than ADEC or significantly greater than ADEC criteria. Sample 14MW06 primary and duplicate result for DRO was 1.4 mg/L which is just slightly less than the 1.5 mg/L criteria.

6. **QC Samples**
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

ii. All method blank results less than PQL?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

General chemistry - The method blank had a detection for alkalinity, total.

Dissolved Metals – The method blank had detections for chromium and vanadium.

DRO/RRO – The method blank had detections for DRO and RRO.

VOC - The method blank had detections for carbon disulfide and methylene chloride.

iii. If above PQL, what samples are affected?

Comments:

Samples within 10 times the method blank detection were qualified.

General chemistry: 16NEC-20MW-1-WG

Total/Dissolved chromium and vanadium –16NEC-22MW2-WG, 16NEC-22MW22-WGF

DRO - 16NEC-14MW07-WG, 16NEC-17MW1-WG, 16NEC-20MW-1-WG, 16NEC-22MW2-WG, 16NEC-26MW1-WG, 16NEC-MW88-10-WG and 16NEC-MW10-1-DVW
RRO - 16NEC-14MW07-WG, 16NEC-17MW1-WG, 16NEC-20MW-1-WG, 16NEC-MW10-1-DVW, 16NEC-MW88-1-WG and 16NEC-MW88-10-WG

VOC - 16NEC-14MW06-WG, 16NEC-14MW06-WG-9, 16NEC-TB02

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Sample results within 10 times the method blank concentration were qualified B.

v. Data quality or usability affected? (please explain)

Comments:

Data quality is minimally affected since the sample results are less than ADEC criteria and biased high.

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

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

A LCS/LCSD and MS/MSD was performed for GRO analysis (batch KWG1607254), DRO/RRO analysis (batch KWG1607446).
A LCS and MS/MSD was performed for PCB analysis (batch KWG1607339), VOC analysis (batch KWG1607320), PAH analysis (batch KWG1607213) and methane analysis (batch FD10082416).
A LCS, MS and duplicate was performed for glycol analysis (batch KWG1607413).

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

EPA 300.0:
A LCS, MS/MSD and duplicate was performed for sulfate analysis (batch 269075).
SM2320B:
A LCS and duplicate was performed for alkalinity analysis (batch 511862) and two LCSs were performed for alkalinity analysis (batch 511209). A MS/MSD is not performed for this analysis.
SW6020:
A LCS and MS/MSD were performed for the metals analysis (batch 269411), and a LCS and MS/MSD (from a non-client sample) were performed for the metals analysis (batch 269412).
SW7470:
A LCS and MS/MSD were performed for mercury analysis (batch 269931) and a LCS and MS/MSD (from a non-client sample) were performed for mercury analysis (batch 269933).

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments

All LCS and LCSD were within required QC limits

MS/MSD anomalies:
Metals – The manganese was outside criteria; however, the spike amount was less than the parent sample concentration.
VOC – The MS and MSD for the following analytes 2-Hexanone, 1,3-Dichloropropane, 2-Butanone, 4-Methyl-2-pentanone, and 1,1,2-Trichloroethane were greater than the UCL. The parent sample was nondetect and the bias is high.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All LCS/LCSD and MS/MSD are within QC criteria.

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

Comments:

No samples were affected.
VOC – Since the parent sample was nondetect and the bias is high the parent sample is not affected.

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments

No samples required qualification.

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

Comments:

Data quality and usability were not affected.

c. Surrogates – Organics Only

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

☑ 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 ☑ No ☐ NA (Please explain.) Comments

VOC – Surrogate 1,2-Dichloroethane-d4 for sample 16NEC-14MW06-WG was greater than QC criteria at 119%.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

VOC – Naphthalene and carbon disulfide had detections in sample 16NEC-14MW06-WG and were qualified QH for the potential high bias. All other analytes were nondetect and no qualification is necessary.

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

Comments:

Data quality and usability were minimally affected since the results were less than ADEC criteria.

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

Water and Soil

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

☑ Yes ☐ No ☐ 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)

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Trip blank sample ID 16NEC-TB02 and 16NEC-TB03

iii. All results less than PQL?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

16NEC-TB02 had detections for carbon disulfide, methylene chloride and chloroform.

iv. If above PQL, what samples are affected?

Comments:

Samples were qualified B when sample results were within 10 times the trip blank contamination.
Samples 16NEC-14MW06-WG-9 and 16NEC-14MW06-WG were qualified for carbon disulfide.
Sample 16NEC-MW10-1-DVW was qualified for Chloroform.
No samples were detected for methylene chloride; therefore no qualifier is required due to trip blank contamination.

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

Comments:

Data quality and usability were minimally affected since the bias is high and results are less than ADEC criteria.

e. Field Duplicate

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

ii. Submitted blind to lab?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Primary 16NEC-14MW06-WG and 16NEC-14MW06-WGF
Duplicate 16NEC-14MW06-WG -9 and 16NEC-14MW06-WG -9F

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☑ No ☐ NA (Please explain.) Comments

The following had RPDs greater than 30% and were qualified QN
PAH – acenaphthene and naphthalene
VOC - naphthalene
Dissolved metals – cadmium, chromium, lead, selenium, silver, vanadium, and zinc
PCB - PCB-1260 (Aroclor 1260)

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

Comments:

Data quality is minimally affected since all qualified results are less than ADEC criteria.

f. Decontamination or Equipment Blank (If not used explain why).

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Equipment blank sample ID: 16NEC-MW10-1-DVW and 16NEC-MW10-1-DVWF

i. All results less than PQL?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

There were detections in for the following analytes in equipment blank, 16NEC-MW10-1-DVW and 16NEC-MW10-1-DVWF (dissolved metals):
2-Methylnaphthalene
Barium
Chloroform
Chromium
DRO
Ethylbenzene
Lead
Manganese
Naphthalene
Nickel
o-Xylene
RRO
Tetrachloroethene (PCE)
Toluene
Vanadium
Xylene, Isomers m & p
Zinc

ii. If above PQL, what samples are affected?

Comments:

All results within ten times the equipment blank contamination were qualified B. There were no detections for toluene, chloroform and o-xylene for the associated samples.

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

Comments:

Result qualified B are estimated and biased high. The data quality is minimally affected since all results are less than the ADEC criteria.

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

a. Defined and appropriate?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Qualifiers are defined in the DQA

Laboratory Data Review Checklist

Completed by: Angela DiBerardino

Title: Project Chemist **Date:** 12/16/2016

CS Report Name: Northeast Cape Groundwater Report **Report Date:** March 2017

Consultant Firm: Jacobs Engineering Group Inc.

Laboratory Name: ALS, Kelso, WA. **Laboratory Report Number:** K1609581

ADEC File Number: 475.38.013 **ADEC RecKey Number:** Haz ID: 25681

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

    ☑ Yes ☐ No ☐ NA (Please explain.) Comments

    Samples were shipped to ALS in Kelso, WA.

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

    ☑ Yes ☐ No ☐ NA (Please explain.) Comments

    ALS Kelso transferred samples for method RSK175 to ALS Simi Valley.

2. **Chain of Custody (CoC)**
    a. CoC information completed, signed, and dated (including released/received by)?

    ☑ Yes ☐ No ☐ NA (Please explain.) Comments

    b. Correct Analyses requested?

    ☑ 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 ☑ No ☐ NA (Please explain.) Comments

Cooler Whatchamacaulit
Temperature blank – 0.9°C
Cooler Temperature – 0.4°C

Cooler 3 Musketeers
Temperature blank – 0.9°C
Cooler Temperature – 0.3°C

Cooler Pay Day
Temperature blank – 3.9°C
Cooler Temperature – 3.0°C

Cooler O'Henry
Temperature blank – 2.9°C
Cooler Temperature – 0.2°C

Transferred Cooler to Simi Valley
Temperature blank – 3.0°C

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All samples were received properly preserved.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All samples were received in good condition with the exception of headspace in 3 of 8 40 mL vials for 16NEC-TB04 and 1 of 8 40 mL vials for 16NEC-TB05.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

No discrepancies were noted.

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

Comments:

Data quality and usability was not affected.

4. **Case Narrative**
   a. Present and understandable?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

DRO/RRO – The original analysis that was not reported had low LCS/LCSD related to instrument issues. The reanalysis was performed past the analytical hold time. See comment 5.b.

All other discrepancies and anomalies are discussed in the relevant sections below.

c. Were all corrective actions documented?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

The lab indicated in the case narrative that the DRO samples needed re-analysis.

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

Comments:

All data is usable, see the relevant sections for effects on data quality.

5. **Samples Results**

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

b. All applicable holding times met?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

DRO/RRO – The original analysis that was not reported had low LCS/LCSD related to instrument issues. The reanalysis was performed past the analytical hold time. Sample results were qualified QL and may be biased low.

c. All soils reported on a dry weight basis?

☐ Yes ☐ No ☑ NA (Please explain.) Comments

Only water samples were submitted with this sample group.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

The LODs for nondetect sample results were compared to 18 AAC 75 ADEC Table C. Groundwater Human Health Cleanup Level (ADEC 2016).

e. Data quality or usability affected?

Comments:

Data quality and usability is minimally affected for the biased low DRO results. All results are below the ADEC or significantly greater than ADEC criteria.

6. **QC Samples**

a. Method Blank

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

ii. All method blank results less than PQL?

☐ Yes ☑ No ☐ NA (Please explain.) Comments

General chemistry - The method blank had a detection for alkalinity, total

Total/Dissolved Metals – The method blank had detections for chromium and vanadium.

DRO/RRO – The method blank had detections for DRO and RRO.

PCB – The method blank had detections for aroclor 1016 and aroclor 1260 (batch KWG1607340)

iii. If above PQL, what samples are affected?

Comments:

Samples within 10 times the method blank detection were qualified

General chemistry: 16NEC-14MW03-WG and 16NEC-14MW05-WG

Total/Dissolved chromium and dissolved vanadium –16NEC-14MW05-WGF, 16NEC-MW88-3-WGF, 16NEC-MW88-3-WG and 16NEC-14MW03-WGF

DRO/RRO – 16NEC-14MW03-WG and 16NEC-MW88-3-WG

PCB - 16NEC-14MW03-WG

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Sample results within 5 times the method blank concentration were qualified B

v. Data quality or usability affected? (please explain)

Comments:

Data quality is minimally affected since the sample results are less than ADEC criteria and biased high.

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

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

A project specific MS/MSD was not performed in this SDG for organic methods. LCS/LCSDs are available for the organic methods.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

EPA 300.0:
A LCS and a MS/MSD and duplicate (from a non-client sample) were performed for sulfate analysis (batch 269075).
SM2320B:
A LCS and duplicate was performed for alkalinity analysis (batch 511862) and a LCS and duplicate (from a non-client sample) was performed for alkalinity analysis (batch 511210). A MS/MSD is not performed for this analysis.
SW6020:
A LCS and MS/MSD (from a non-client sample) was performed for metals analysis (batch 269412).
SW7470:
A LCS and MS/MSD (from a non-client sample) was performed for mercury analysis (batch 269933).

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments

All LCS and LCSD were within required QC limits

MS/MSD anomalies:
Metals – The manganese was outside criteria; however, the spike amount was less than the parent sample concentration.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

All LCS/LCSD and MS/MSD are within QC criteria.

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

Comments:

No samples were affected.

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments

No samples required qualification.

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

Comments:

Data quality and usability were not affected.

c. Surrogates – Organics Only

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

☑ 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 ☑ No ☐ NA (Please explain.) Comments

PCB – surrogate decachlorobiphenyl for sample 16NEC-14MW04-WG was lower than QC criteria at 22%.

VOC – Surrogate Toluene-d8 for samples 16NEC-14MW03-WG, 16NEC-14MW04-WG, 16NEC-14MW05-WG, and 16NEC-MW88-3-WG was greater than QC criteria.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

PCB – 16NEC-14MW04-WG sample results are qualified QL

VOC – Samples listed above with detections were qualified QH

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

Comments:

PCB - Data quality was slightly affected due to matrix interference. The water sample contained significant amount of particulate, which required sample to be extracted by 3520C. The low surrogate suggests there was matrix interference.

VOC – The effect is minimal since the bias was high and results were less than ADEC criteria.

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

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

☑ Yes ☐ No ☐ 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)

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Trip blank sample ID 16NEC-TB04

iii. All results less than PQL?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

iv. If above PQL, what samples are affected?

Comments:

NA

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

Comments:

Data quality and usability were not affected.

e. Field Duplicate

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments

ii. Submitted blind to lab?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Primary 16NEC-S29-WS-001
Duplicate 16NEC-S29-WS-0019

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☑ Yes ☐ No ☐ NA (Please explain.) Comments

The RPDs were all less than 30%.

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

Comments:

Data quality and usability were not affected.

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☐ No ☑ NA (Please explain.) Comments

Not submitted with this SDG

i. All results less than PQL?

☐ Yes ☐ No ☑ NA (Please explain.) Comments

NA

ii. If above PQL, what samples are affected?

Comments:

NA

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

Comments:

Data quality and usability were not affected.

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

a. Defined and appropriate?

☑ Yes ☐ No ☐ NA (Please explain.) Comments

Qualifiers are defined in the DQA

ATTACHMENT B-4

Laboratory Deliverables

Provided electronically on CD

APPENDIX C
Summarized Analytical Results and Trend Plots

Northeast Cape FUDS 2016 Main Operations Complex
Appendix C Summarized Analytical Results and Trend Plots

This appendix provides tables and plots for groundwater at currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) at the Main Operations Complex. These tables and plots depict groundwater elevation, natural attenuation parameter concentrations, contaminant concentrations as a ratio of the site-specific cleanup level (SSCL) (or 2016 Alaska Department of Environmental Conservation [ADEC] evaluation criteria), and predicted diesel-range organics (DRO) attenuation over time.

Groundwater elevation field measurements were collected from currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002 and continuing through 2016. Plot C-1.1 displays these groundwater elevation measurements over time.

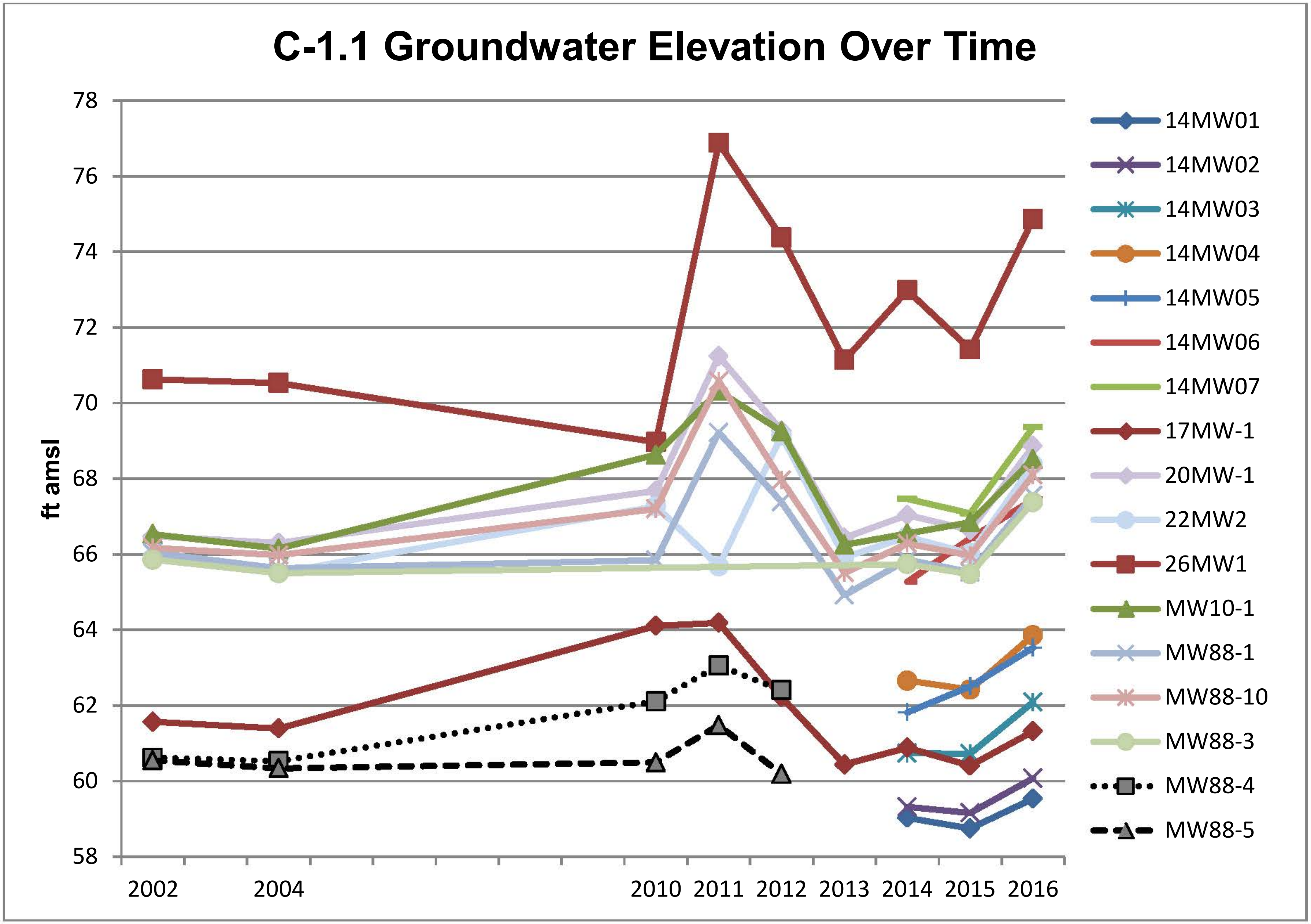
Natural attenuation parameters were collected from currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002 and continuing through 2016. Table C-2.1 presents a table of natural attenuation parameters. Plots C-2.2.1 through C-2.2.11 display natural attenuation parameters over time. Natural attenuation parameters were first collected from currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002, again in 2004, and yearly since 2010. Parameters collected before 2010 are not included.

Contaminant concentrations were collected from currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002 and continuing through 2016. Table C-3.1 presents a table of historical contaminant concentrations exceeding SSCLs and/or 2016 ADEC evaluation criteria. Plots C-3.2.1 through C-3.2.11 display contaminant concentrations over time as a ratio of the SSCL at select wells. Plots C-3.3.1 through C-3.3.9 display naphthalene concentrations over time as a ratio of the 2016 ADEC evaluation criteria (because there is no Decision Document-specified SSCL for naphthalene) at select wells. Trends are presented for in-plume and crossgradient currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) from 2002 through 2016.

Statistical trends for the natural attenuation of DRO are presented in Attachment C-4. Predicted DRO attenuation at currently installed and serviceable monitoring wells 14MW04 and 14MW05 is presented in Plot C-4.1.1 and Tables C-4.1.1 and C-4.1.2 and Plot C-4.2.1 and Tables C-4.2.1 and C-4.2.2. Only the in-plume monitoring wells 14MW04 and 14MW05 were selected for geometric regression because these wells are the only currently installed and serviceable monitoring wells that exceed the DRO SSCL and have a negative geometric regression slope. Tables C-4.3.1 through C-4.3.4 present the output of the Mann-Kendall trend test for currently installed and serviceable monitoring wells 14MW02, 14WM04, and 14MW05.

ATTACHMENT C-1

Groundwater Elevation Over Time



ft amsl = feet above mean sea level

ATTACHMENT C-2

MNA Parameters Over Time

Northeast Cape FUDS

Table C-2.1 MOC Monitoring Well MNA Parameters Over Time

		Ferrous Iron mg/L	Manganese mg/L	Sulfate mg/L	Nitrate mg/L	Alkalinity mg/L	Temperature °C	Conductivity µS/cm	pH	ORP mV	DO mg/L	Methane µg/L
14MW01	**2014**	0.85	0	7	0	80	2.89	--	6.51	-191.9	3.78	83
14MW01	**2015**	0.09	0.2	8	0.02	0	2.06	135	6.32	32.7	0.77	54
14MW01	**2016**	10	0.916	17.7	0	18.7	4.37	94	6.02	0.6	0.53	24
14MW02	**2014**	0.86	0.9	3	0	80	1.38	--	6.39	-103.8	1.17	200
14MW02	**2015**	3.3	1.1	7	0.01	40	2.5	164	6.26	-64	0.15	240
14MW02	**2016**	10	1.86	14.7	0	40	6.84	123	5.88	11.6	0.51	23
14MW03	**2014**	0.89	0.9	8	--	180	3.41	--	6.65	-404.9	8.03	47
14MW03	**2015**	2.17	0.4	6	<0.4	40	3.89	189	6.63	-193.9	0.37	88
14MW03	**2016**	10	1.36	16.9	0	28	4.14	93	5.99	26.7	0.6	8.2
14MW04	**2014**	0.81	0.6	12	0	140	5.9	819	5.92	27.3	0.33	25
14MW04	**2015**	0.51	0.4	27	0.02	40	5.57	294	5.97	-118.1	1.05	110
14MW04	**2016**	3.5	1.71	31.2	0	91	7.66	203	6.05	91.4	0.62	20
14MW05	**2014**	0.95	0.7	6	0	--	3.61	--	6.23	-39.3	3.5	33
14MW05	**2015**	2.8	2.2	10	0.03	40	3.81	138	6.21	31.8	0.32	99
14MW05	**2016**	10	2.71	23.1	0	47	6.82	127	5.87	74.6	0.46	10
14MW06	**2014**	1.75	1.6	3	0	--	2.57	--	6.21	-68.5	0.32	160
14MW06	**2015**	0.09	0.5	6	0.02	80	5.95	222	6.61	24.9	0.18	110
14MW06	**2016**	2	1.28	15.3	0.2	140	9.33	235	6.57	47.2	0.45	8.3
14MW07	**2014**	0.25	0.3	1	<0.01	40	6.49	--	6.9	-385.4	4.52	30
14MW07	**2015**	0.07	0.4	4	0.09	0	3.4	56	6.36	125.9	8.47	1.6 J
14MW07	**2016**	<0.03	0.0359	12.7	0.1	11.7	3.74	52	5.42	187.7	10.09	ND (0.63)
17MW1	**2010**	0.01	<0.2	16	0.2	0	3.09	68	5.76	160.8	7.32	ND (0.19)
17MW1	**2011**	0.06	0.1	15	0.7	40	2.73	67	5.78	237.1	4.47	ND (0.29)
17MW1	**2012**	<0.03	<0.2	16	0.19	40	2.74	108	5.45	205.5	9.22	ND (0.29)
17MW1	**2013**	0.01	0.3	20	0.11	37	3.45	65	5.45	149.2	9.77	ND (0.37)
17MW1	**2014**	--	0	5	0.11	60	2.35	--	5.65	166.6	11.15	ND (0.37)
17MW1	**2015**	0.06	0.2	10	0.08	0	2.47	99	5.83	164	10.52	ND (0.80)
17MW1	**2016**	<0.03	0.00156	16.9	0.2	10	3.94	56	5.45	223.4	10.31	ND (0.63)
20MW1	**2010**	--	--	--	--	--	3.61	63	6.29	101.4	3.96	ND (0.19)
20MW1	**2011**	<0.01	<0.2	24	1.3	80	2.33	82	5.89	125.8	10.78	ND (0.29)
20MW1	**2012**	<0.03	0.3	16	0.23	40	3.39	143	5.76	231.5	9.04	ND (0.29)
20MW1	**2013**	ND	0.2	22	0.26	45	3.58	83	5.65	62.4	10.45	ND (0.37)
20MW1	**2014**	--	0	6	0.2	80	2.37	--	5.68	180	11.85	ND (0.37)
20MW1	**2015**	0.32	0.3	14	0.22	0	2.11	87	5.93	-155.3	11.2	ND (0.80)
20MW1	**2016**	<0.03	0.00321	19.6	0.1	21	4.63	73	5.6	222.5	11.65	ND (0.63)
22MW2	**2010**	<0.01	<0.2	12	0.6	0	3.9	65	6.09	234.2	10.07	0.8
22MW2	**2011**	<0.01	<0.2	7	1	40	6.4	60	5.63	53.7	10.99	ND (0.29)
22MW2	**2012**	<0.03	0.1	12	0.34	40	3.54	108	5.79	204.6	12.45	ND (0.29)
22MW2	**2013**	0.01	0.2	16	0.16	30	5.42	69	5.92	129.5	14.82	ND (0.37)
22MW2	**2014**	0.02	0	6	0.08	60	2.85	--	5.75	165.3	13.14	ND (0.37)
22MW2	**2015**	0.06	0	13	0.06	0	3.29	55	5.89	-73.5	10.78	ND (0.80)
22MW2	**2016**	<0.03	0.000535	15.4	0.1	7	4.5	55	5.52	230.6	12.15	ND (0.63)
26MW1	**2010**	<0.01	<0.2	6	0.3	0	3.01	47	6.77	202.1	11.5	0.44
26MW1	**2011**	0.05	0.2	10	1.3	40	3.47	61	5.74	202.8	12.63	ND (0.29)
26MW1	**2012**	<0.03	0.2	6	0.26	40	3.22	84	5.79	197.2	12.4	ND (0.29)
26MW1	**2013**	0.05	0.5	10	0.12	40	4.19	50	5.49	222.7	13.99	ND (0.37)
26MW1	**2014**	0.02	0.2	6	0.05	80	2.83	--	5.63	230.1	13.47	ND (0.37)
26MW1	**2015**	0.05	0.2	9	0.06	0	2.54	75	6.05	160.9	13.67	ND (0.80)
26MW1	**2016**	<0.03	0.000754	13.6	0	6.3	4.54	50	5.48	231.4	12.98	ND (0.63)
MW10-1	**2010**	<0.01	<0.2	3	0.3	0	6.59	63	5.63	202.5	5.58	0.48
MW10-1	**2011**	0.09	0.1	4	0.4	40	6.03	56	5.45	85.5	4.74	0.29 J

Northeast Cape FUDS

Table C-2.1 MOC Monitoring Well MNA Parameters Over Time

		Ferrous Iron mg/L	Manganese mg/L	Sulfate mg/L	Nitrate mg/L	Alkalinity mg/L	Temperature °C	Conductivity µS/cm	pH	ORP mV	DO mg/L	Methane µg/L
MW10-1	**2012**	<0.03	<0.2	3	<0.01	40	4.42	0.153	5.37	251.6	2.93	0.85
MW10-1	**2013**	0.23	0.2	3	0.11	50	3.79	78	5.43	68.9	1.26	26
MW10-1	**2014**	0	0.1	3	0.07	--	6.62	--	5.35	185.1	2.83	1 J
MW10-1	**2015**	0.09	0.5	5	0.16	0	7.02	99	5.52	-101.1	2.44	ND (0.80)
MW10-1	**2016**	<0.3	0.00344	7.37	0.2	17	10.03	39	5.25	225.1	4.75	ND (0.63)
MW88-1	**2010**	<0.01	0.3	7	0.3	40	2.85	68	5.59	190.1	1.26	0.34
MW88-1	**2011**	0.04	0.3	8	1.5	40	2.3	60	5.75	70.9	2.09	0.44 J
MW88-1	**2012**	<0.03	<0.2	8	bc	40	3.27	111	5.52	225.9	1.58	0.37 J
MW88-1	**2013**	0.03	0.4	9	0.29	40	2.66	68	5.31	114.3	2.23	ND (0.37)
MW88-1	**2014**	0.03	0	3	0.07	40	2.18	--	5.38	231.6	6.43	ND (0.37)
MW88-1	**2015**	0	0	9	0.16	0	2.46	92	5.5	-136	6.49	ND (0.80)
MW88-1	**2016**	0.1	0.291	14.1	0.2	13	6.15	58	5.23	183.7	4.09	ND (0.63)
MW88-10	**2010**	<0.01	1	6	0.1	40	2.89	65	7.58	146	0.81	0.4
MW88-10	**2011**	0.02	0.4	8	0.9	40	4.43	61	5.78	47.7	1.55	1.8
MW88-10	**2012**	0.49	1	16	0.56	40	1.61	124	5.74	146.6	0.66	32
MW88-10	**2013**	1.04	2.9	8	0.03	70	3.64	75	5.82	129.6	0.37	54
MW88-10	**2014**	--	0.2	5	0.02	40	2.86	--	5.55	148.7	1.63	14
MW88-10	**2015**	0.05	0.4	6	0.05	0	3.86	96	5.67	-158.2	1.64	6.2
MW88-10	**2016**	0.2	0.203	17.8	0.1	17.7	4.5	62	5.54	184.6	1.06	3.6
MW88-3	**2014**	0.11	0	4	0.03	70	2.89	--	5.36	175.5	4.73	1.8 J
MW88-3	**2015**	0.06	0.5	8	0.17	0	2.62	53	5.66	155.1	4.43	1.6 J
MW88-3	**2016**	<0.3	0.364	14.8	0	16	3.25	57	5	218.1	4.7	ND (0.63)
MW88-4	**2010**	21.4	0.3	4	2	120	3.28	190	6.93	-72.1	0.68	1900
MW88-4	**2011**	3.3	0.4	1	0.2	180	1.16	173	6.8	-86.2	0.27	2100
MW88-4	**2012**	12.25	1.1	3	<0.01	80	2.01	230	6.41	-51.7	0.35	2300
MW88-5	**2010**	45.5	0.2	6	0.3	80	2.21	221	8.25	-69.3	0.81	99
MW88-5	**2011**	3.3	0.3	46	0.9	180	2.59	241	6.64	-100.3	0.58	630
MW88-5	**2012**	11.45	1.3	18	0.02	80	2.63	262	6.18	-25.4	0.49	360

Notes:

°C = Degrees Celsius

µS/cm = microsiemen per centimeter

DO = dissolved oxygen

mg/L = milligram per liter

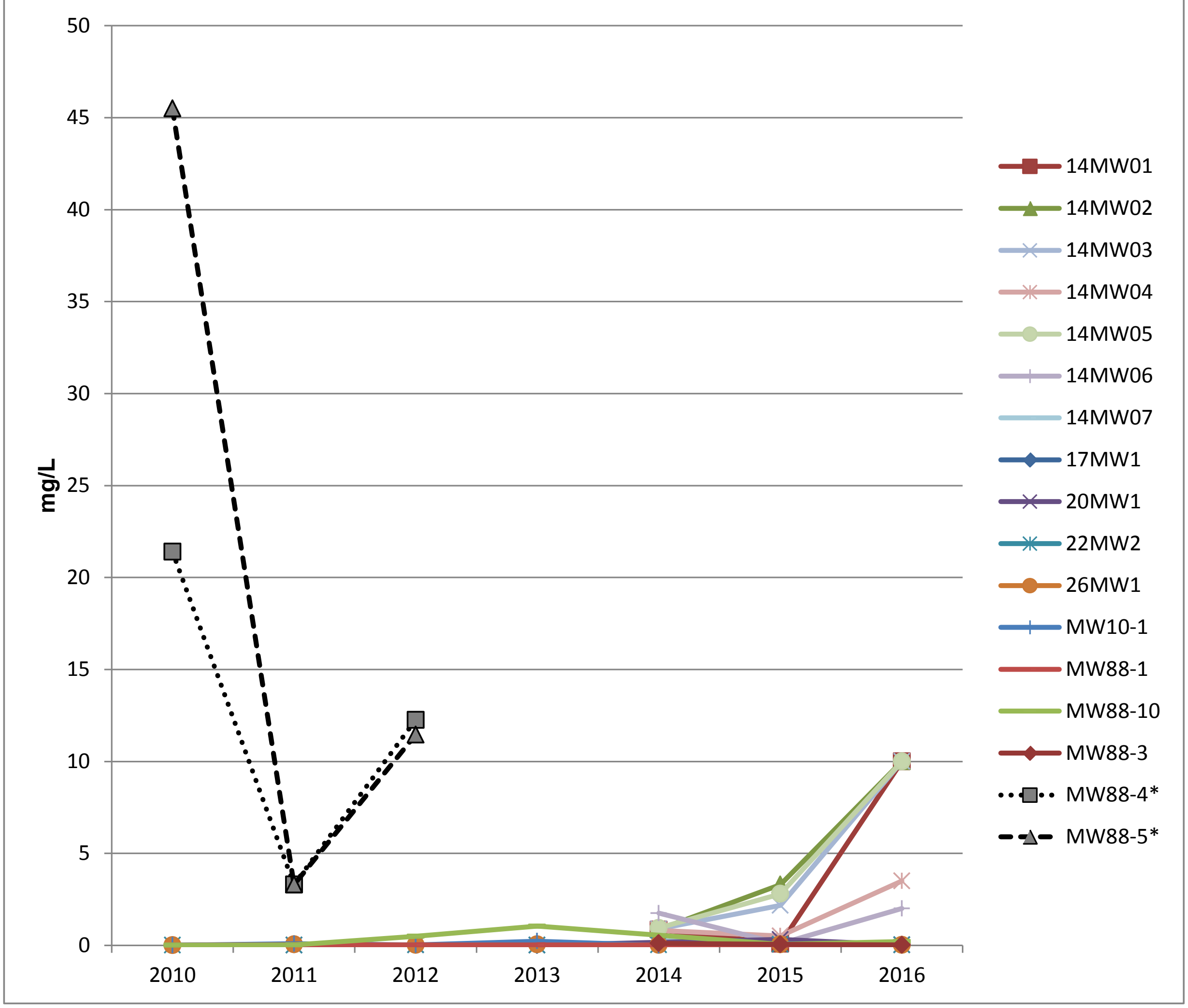
µg/L microgram per liter

ORP = oxidation-reduction potential

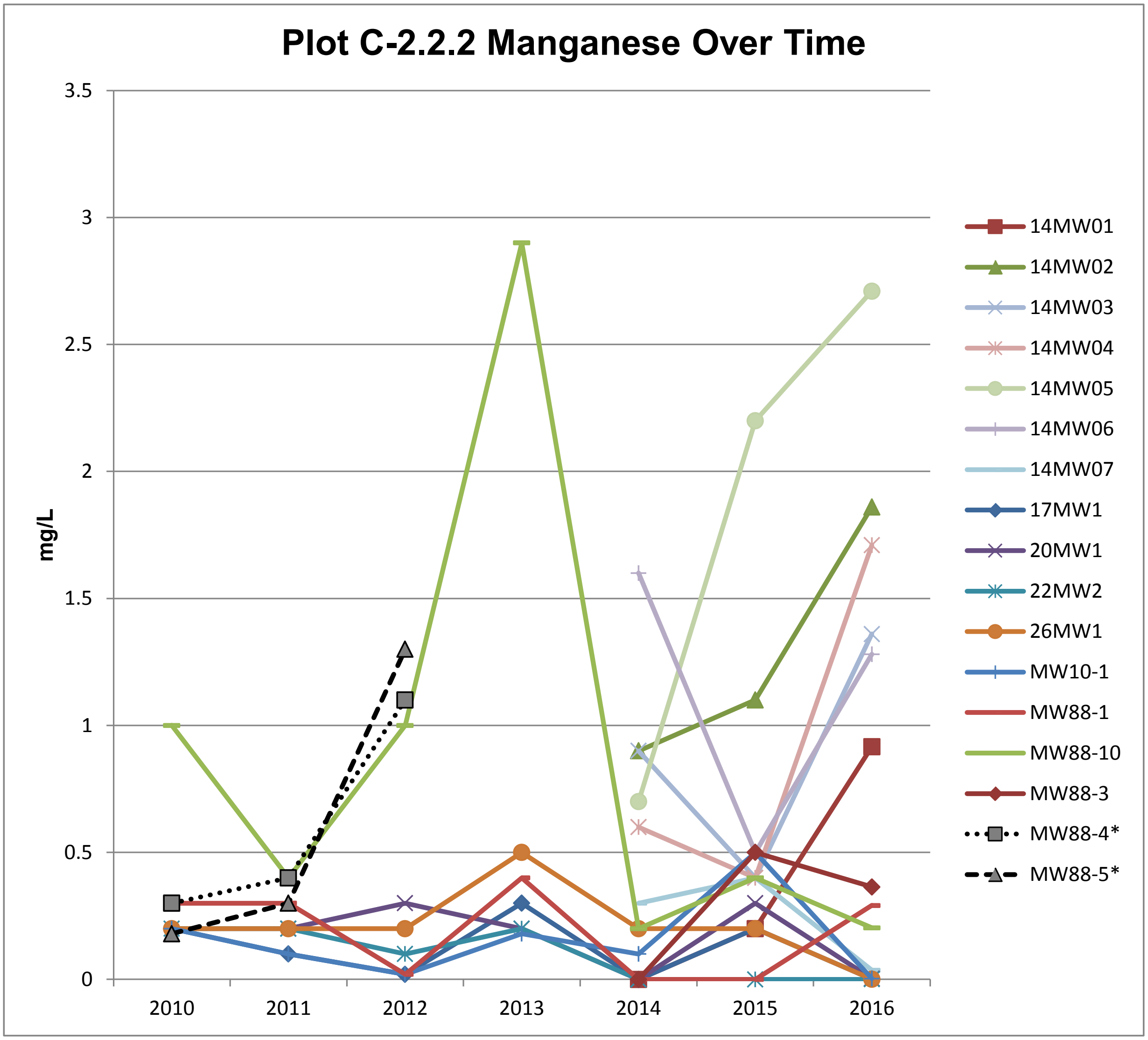
mV = millivolt

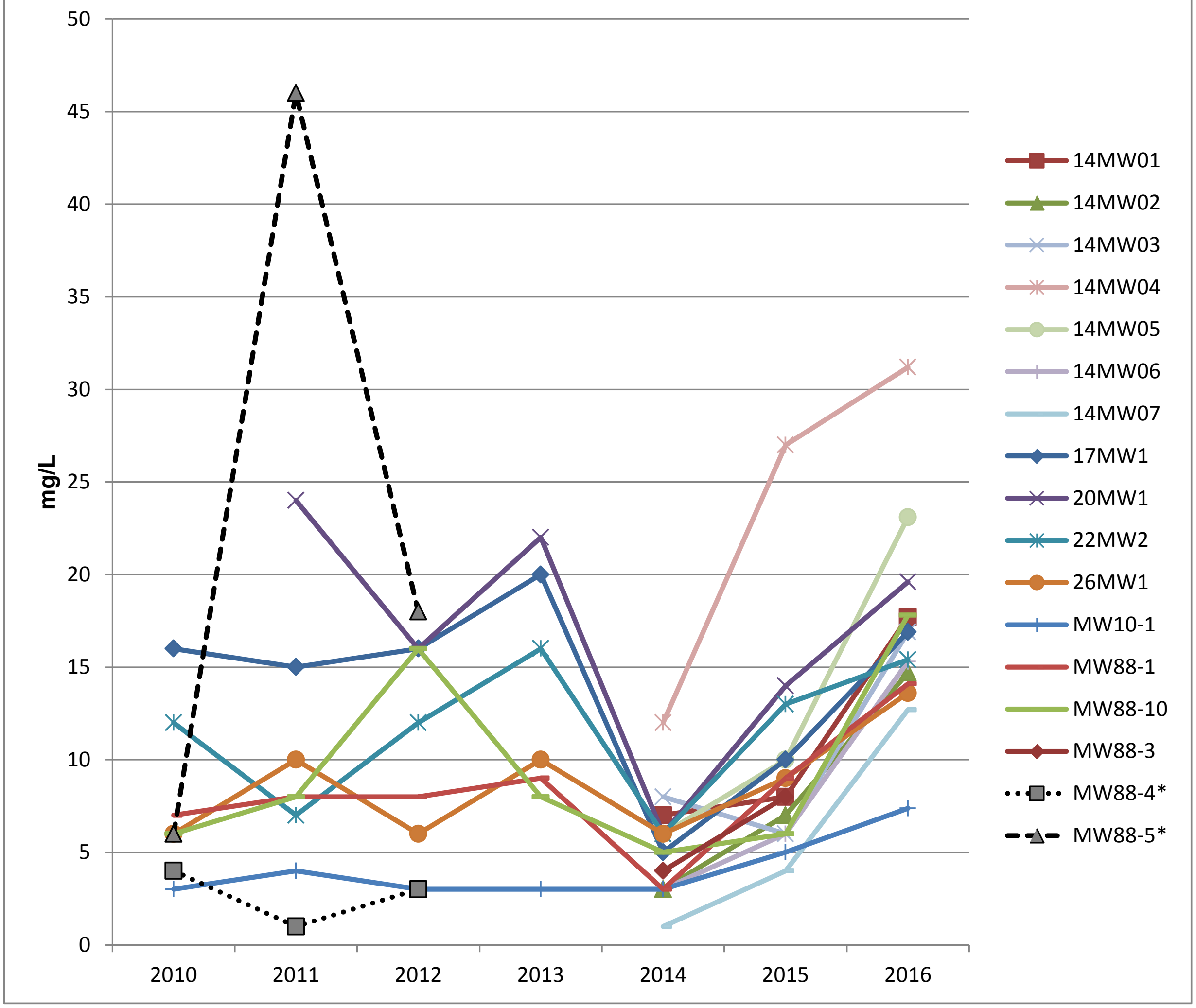
ND = not detected

-- Not reported

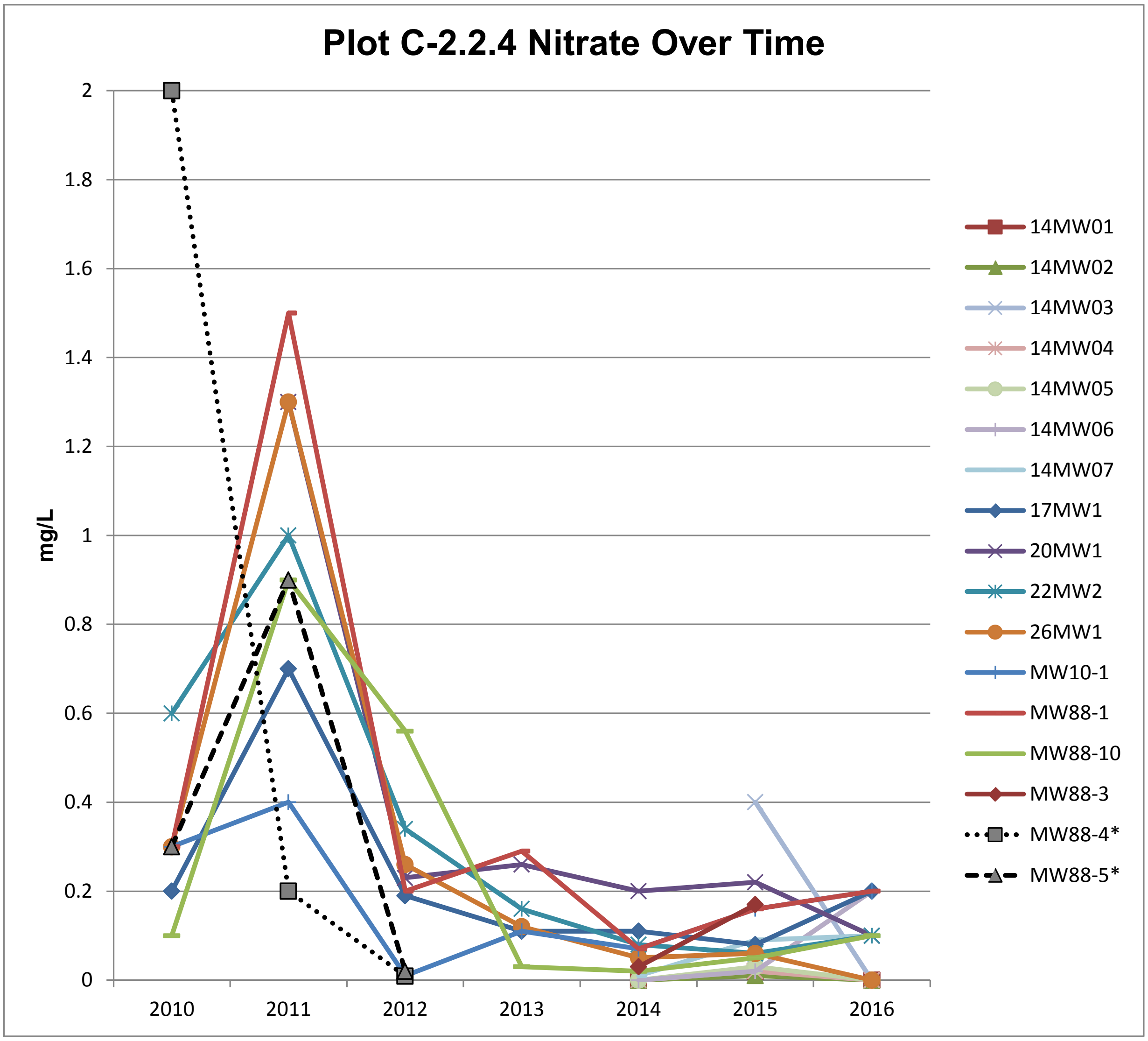


Plot C-2.2.1 Ferrous Iron Over Time

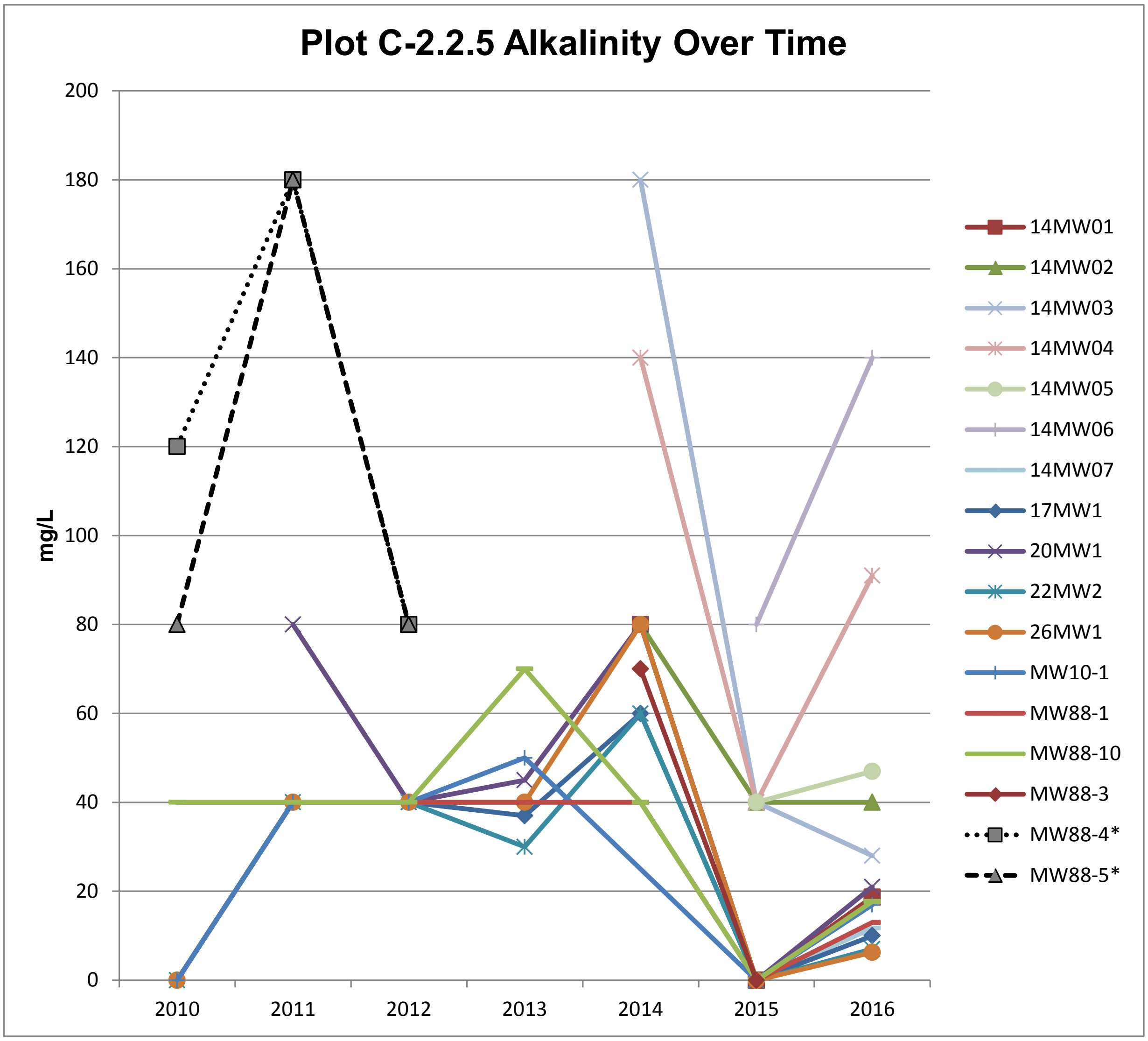

Plot C-2.2.2 Manganese Over Time
mg/L
3.5
3
2.5
2
1.5
1
0.5
0
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3
MW88-4*
MW88-5*

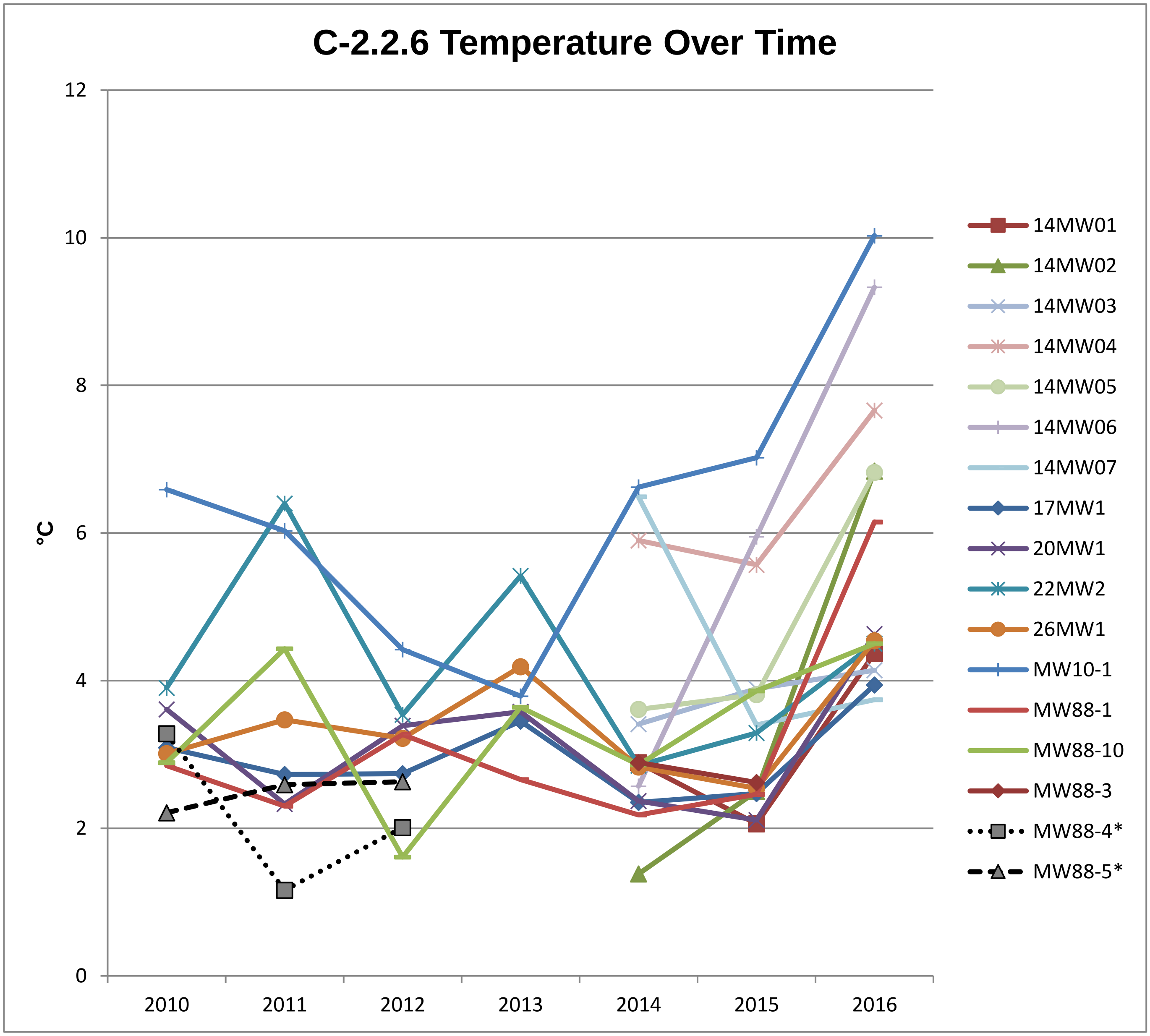


Plot C-2.2.3 Sulfate Over Time

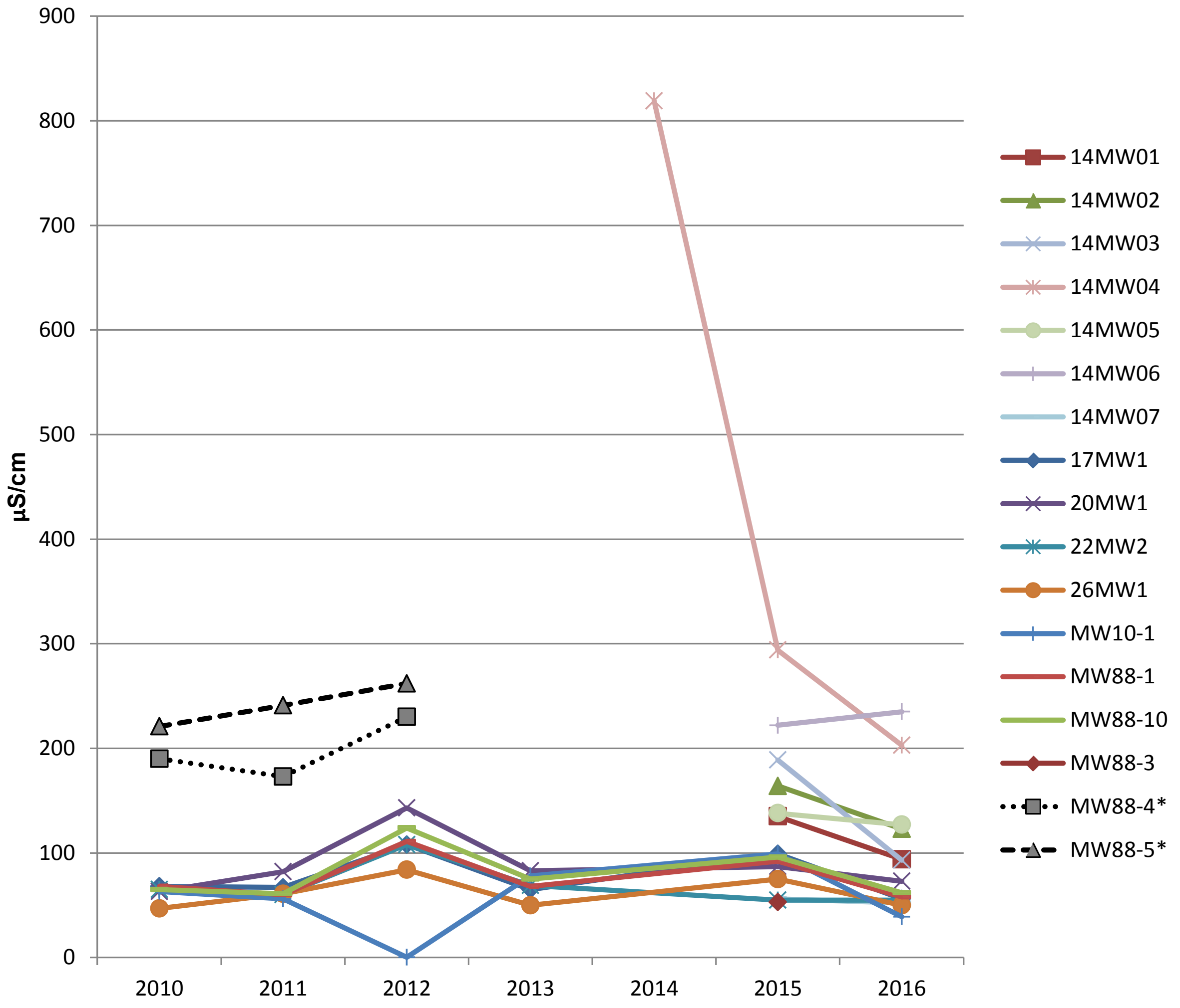


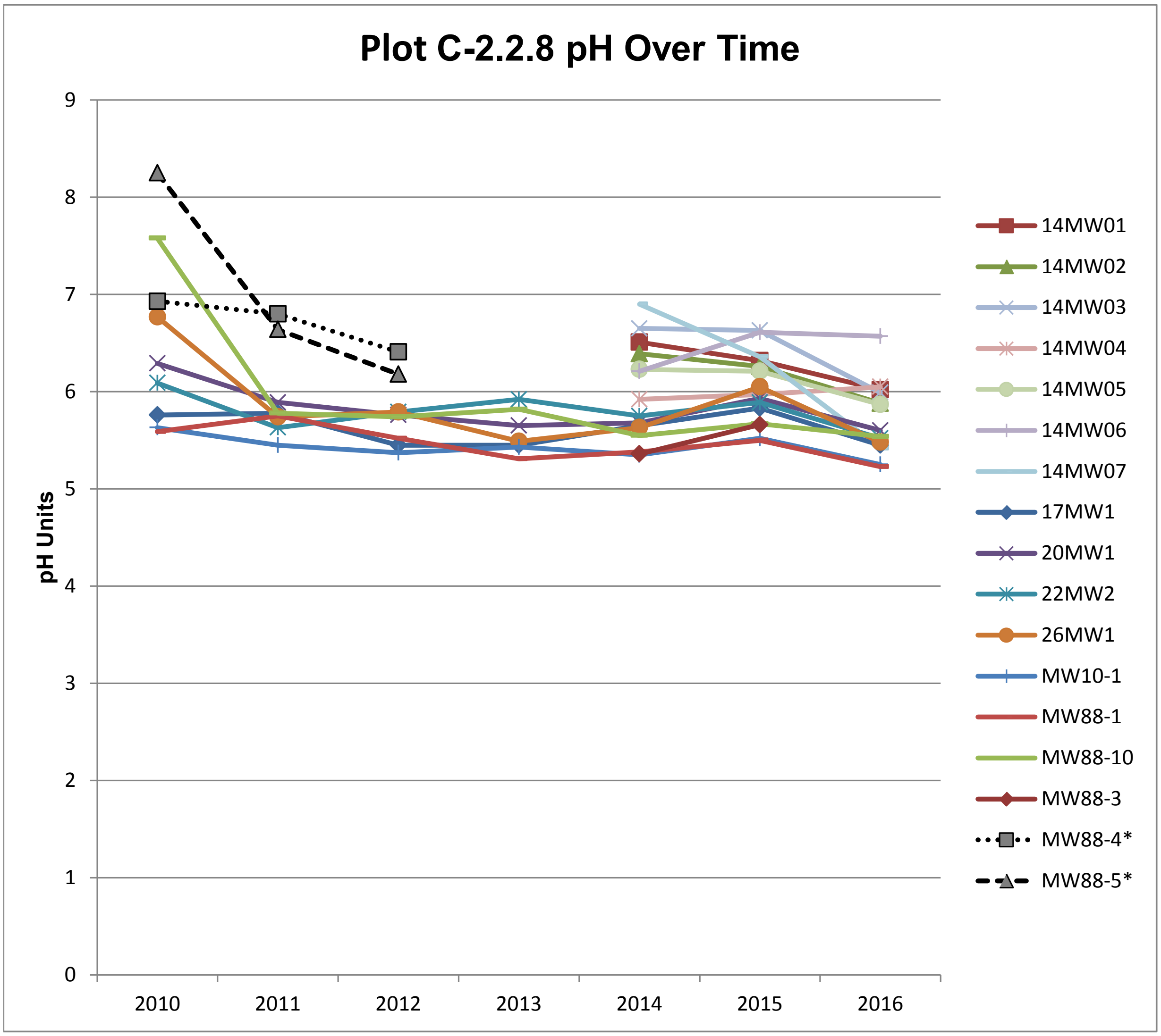
Plot C-2.2.4 Nitrate Over Time
mg/L
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3
MW88-4*
MW88-5*

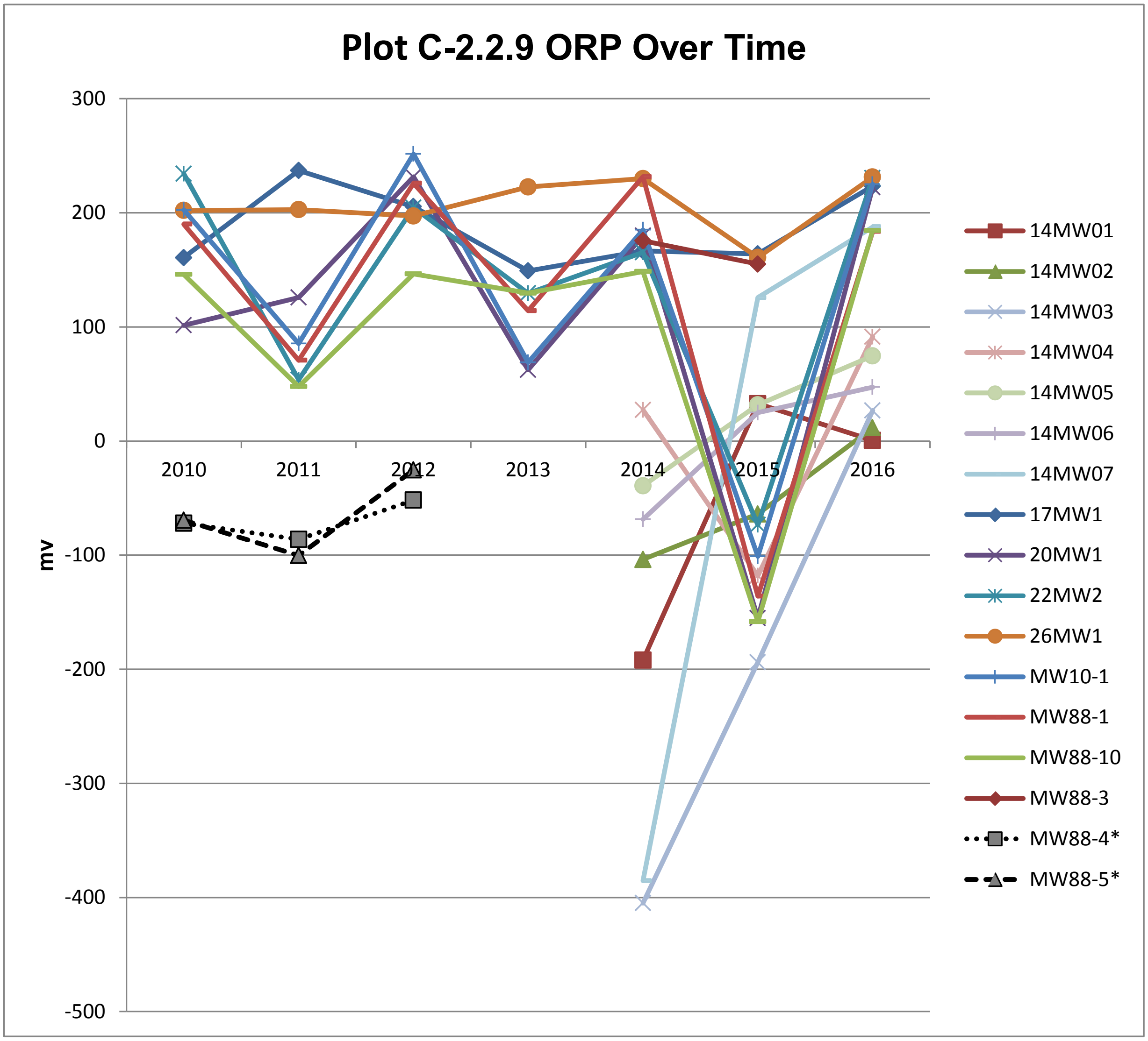

Plot C-2.2.5 Alkalinity Over Time
mg/L
200
180
160
140
120
100
80
60
40
20
0
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3
MW88-4*
MW88-5*


C-2.2.6 Temperature Over Time
°C
0
2
4
6
8
10
12
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3
MW88-4*
MW88-5*

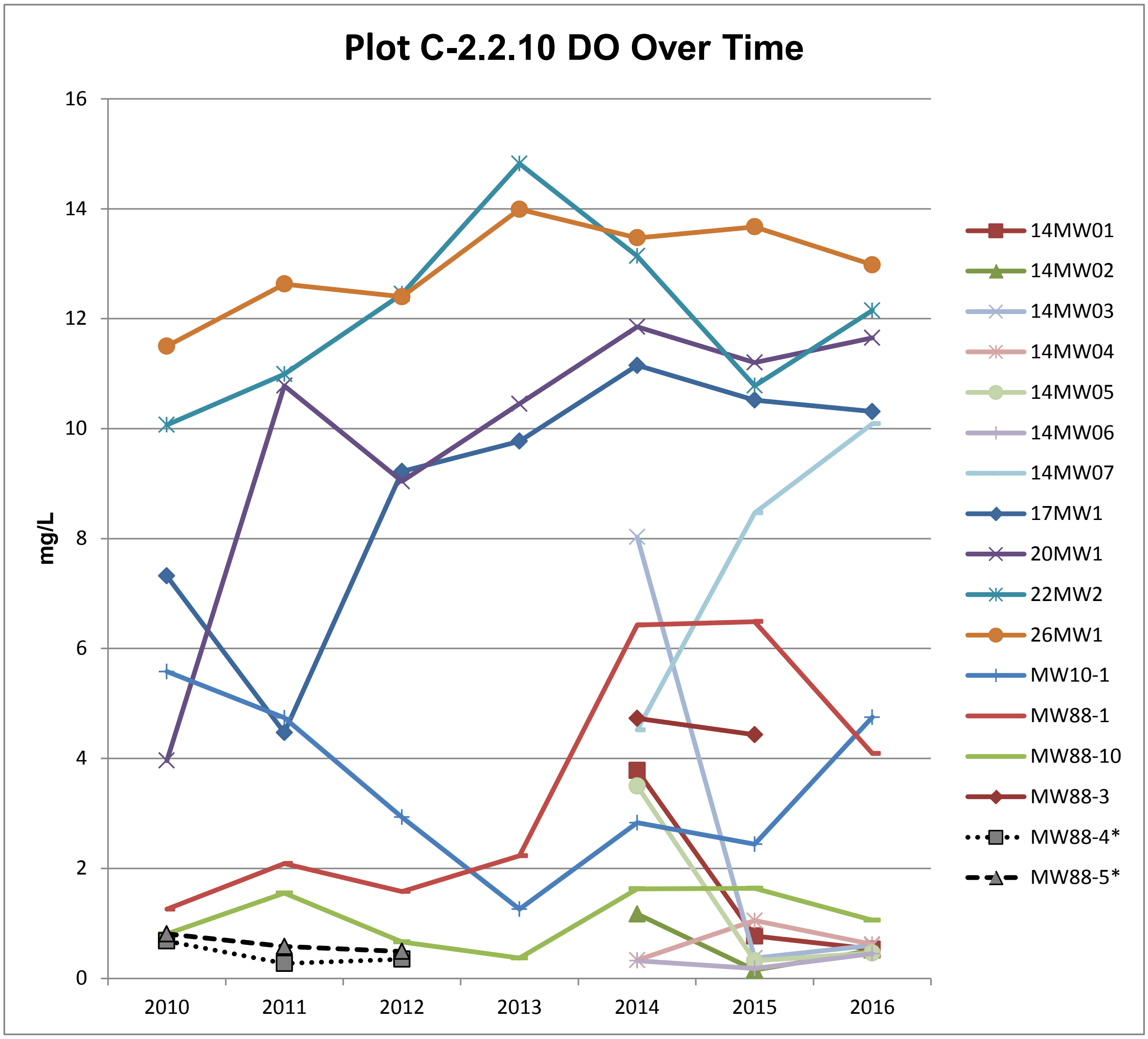
Plot C-2.2.7 Conductivity Over Time



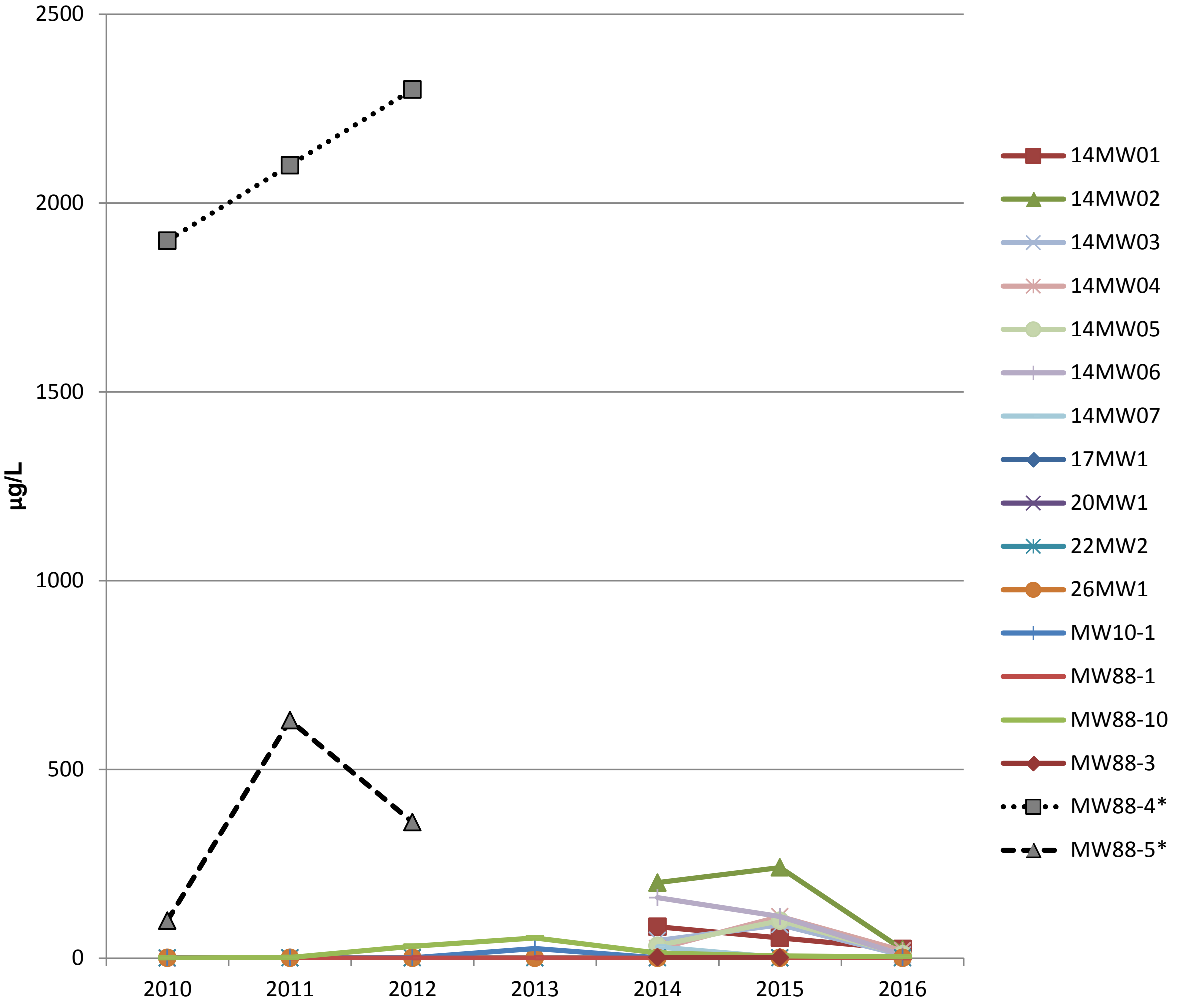

Plot C-2.2.8 pH Over Time
pH Units
0
1
2
3
4
5
6
7
8
9
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3
MW88-4*
MW88-5*

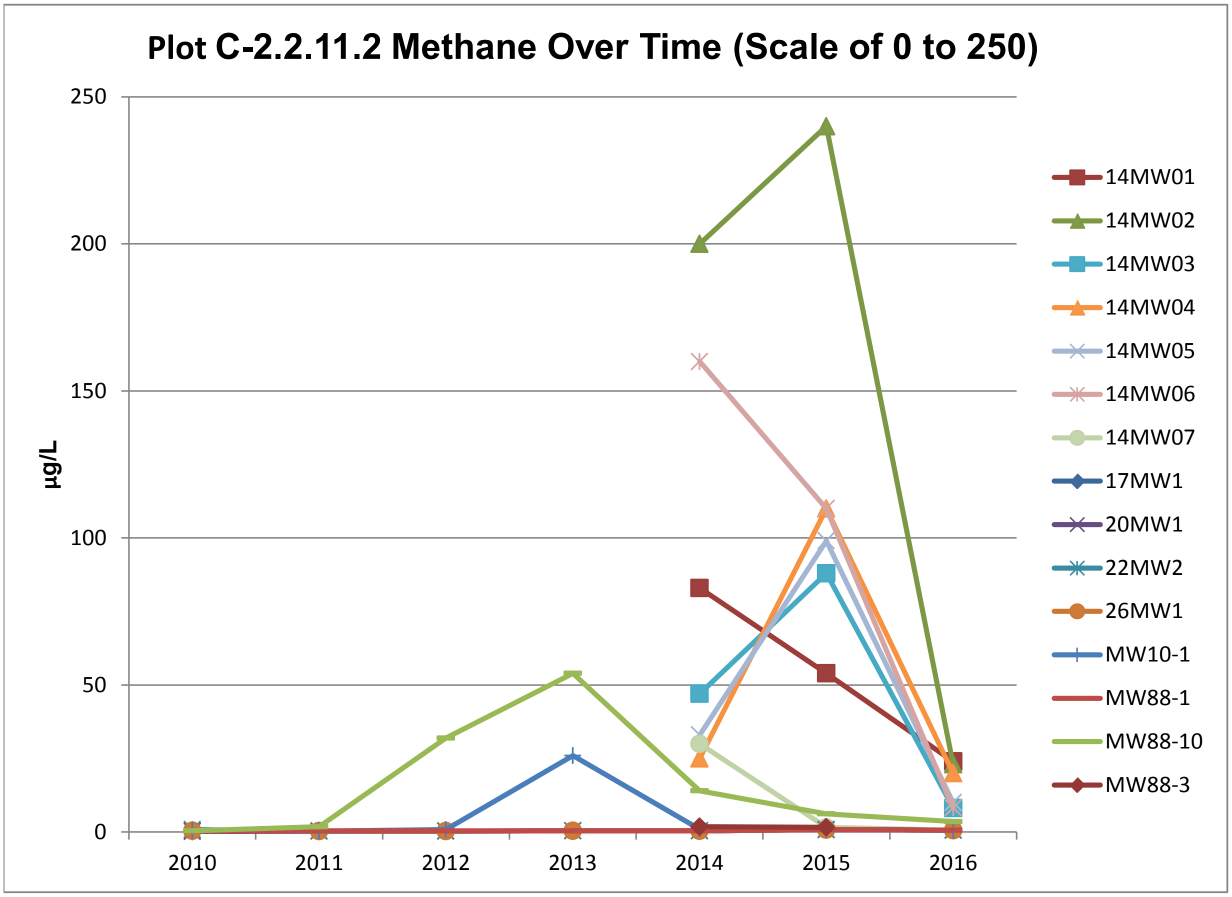


Plot C-2.2.9 ORP Over Time


Plot C-2.2.10 DO Over Time
mg/L
0
2
4
6
8
10
12
14
16
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3
MW88-4*
MW88-5*

Plot C-2.2.11.1 Methane Over Time





Plot C-2.2.11.2 Methane Over Time (Scale of 0 to 250)
µg/L
250
200
150
100
50
0
2010
2011
2012
2013
2014
2015
2016
14MW01
14MW02
14MW03
14MW04
14MW05
14MW06
14MW07
17MW1
20MW1
22MW2
26MW1
MW10-1
MW88-1
MW88-10
MW88-3

ATTACHMENT C-3

Results Above SSCLs and 2016 ADEC Criteria

Northeast Cape FUDS

Table C-3.1 COCs and Analytes in Groundwater Above SSCLs and 2016 ADEC Criteria

		GRO	**DRO**	**RRO**	**Benzene**	**Naphthalene**	**Arsenic-Total**	**Arsenic-Dissolved**	**Lead-Total**	**Lead-Dissolved**
	SSCL	**1.3 mg/L**	**1.5 mg/L**	**1.1 mg/L**	**0.005 mg/L**		**0.01 mg/L**	**0.01 mg/L**	**0.015 mg/L**	**0.015 mg/L**
	2016 ADEC	***2.2 mg/L***	***1.5 mg/L***	***1.1 mg/L***	***0.0046 mg/L***	***0.0017 mg/L***	***0.00052 mg/L***	***0.00052 mg/L***	***0.015 mg/L***	***0.015 mg/L***
14MW01	**2014**	0.046 J,B	0.51 B	0.067 J	ND (0.0004)	***0.0025***	***0.0061***	***0.0041 J***	0.011	0.00056 J
14MW01	**2015**	0.026 J	0.51	ND (0.071)	ND (0.001)	0.0018	0.0042 J	0.0040 J	0.00021 J	ND (0.0005)
14MW01	**2016**	0.065 J	0.92	0.12 J,B	ND (0.0001)	***0.0075***	***0.0046***	***0.00439***	0.00153	0.000159
14MW02	**2014**	0.28	1.2	0.092 J	0.00014 J	0.000007	***0.0058***	***0.0043 J***	0.0054	ND (0.00025)
14MW02	**2014**	0.27	1.3	0.094 J	ND (0.0004)	***0.007***	***0.0056***	***0.0046 J***	0.006	ND (0.00025)
14MW02	**2015**	0.18	***1.6***	0.13	ND (0.001)	***0.005***	***0.0056***	***0.0056***	0.0010 J	ND (0.00050)
14MW02	**2016**	0.14	***1.6***	0.18 J	ND (0.0001)	***0.0037***	***0.00244***	***0.00241***	0.000496	0.000054 QN
14MW02	**2016**	0.14	1.5	0.17 J	ND (0.0001)	***0.0038***	***0.00235***	***0.00237***	0.00045	0.000083 QN
14MW03	**2014**	0.19	***2.4***	0.21	0.001	***0.029***	***0.0055***	*ND (0.004)*	***0.062***	ND (0.00025)
14MW03	**2015**	0.12	1.3	0.41 J	ND (0.001)	0.00062	***0.0034 J***	***0.0024 J***	0.015	0.00049 J
14MW03	**2016**	0.075 J	0.99 QL	0.16 J,QL	ND (0.0001)	0.00072	***0.00194***	***0.00186***	0.00318	0.00126
14MW04	**2014**	0.051 B	***2.5***	0.54	ND (0.0004)	0.0014	*ND (0.004)*	*ND (0.004)*	0.0064	0.0014 J
14MW04	**2015**	ND (0.044)	***1.6 QLQN***	0.18 QLQN	ND (0.001)	ND (0.00001)	***0.0024 J***	***0.0014 J***	0.0063	0.00050 J
14MW04	**2015**	ND (0.044)	***2.8 QN***	0.37 QN	ND (0.001)	ND (0.00001)	***0.0022 J***	***0.0014 J***	0.0064	0.00033 J
14MW04	**2016**	0.011 J	***2.2 QL***	0.61 QL	0.00013 J,QH	0.000022	***0.00524***	***0.00387***	***0.0582***	***0.0349***
14MW05	**2014**	0.36	***4.9***	0.55	ND (0.0004)	***0.093***	***0.0042 J***	*ND (0.004)*	0.01	0.00029 J
14MW05	**2015**	0.13	***12***	0.48	ND (0.001)	0.013 QN	***0.0031 J***	***0.0028 J***	0.012	0.003
14MW05	**2015**	0.11	***11***	0.51	ND (0.001)	0.0059 QN	***0.0032 J***	***0.0026 J***	0.013	0.0023
14MW05	**2016**	0.072 J	***3.2 QL***	0.61 QL	ND (0.0001)	0.00072	***0.00207***	***0.00194***	0.00165	0.000252
14MW06	**2014**	0.22	***5.2 QL***	0.28	0.00070 J	***0.033***	***0.0068***	***0.0062***	0.0027	ND (0.00025)
14MW06	**2015**	0.040 J	***2.3***	0.27	ND (0.001)	ND (0.00001)	***0.0026 J***	***0.0024 J***	0.00064 J	ND (0.00050)
14MW06	**2016**	0.011 J	1.4 QL	0.55 QL	ND (0.0001)	0.00006 QN	***0.00203***	***0.00203***	0.000861	0.000649 QN
14MW06	**2016**	0.011 J	1.4 QL	0.47 QL	ND (0.0001)	0.000033 QN	***0.00197***	***0.00197***	0.000817	0.000208 QN
14MW07	**2014**	0.026 J,B	0.15 B	0.043 J	0.00072 J	0.000011 J	***0.0092***	*ND (0.004)*	ND (0.00025)	0.0015 J
14MW07	**2015**	ND (0.044)	ND (0.10 QN)	ND (0.073)	ND (0.001)	ND (0.000011)	*ND (0.0040)*	*ND (0.0040)*	0.00069 J	0.00069 J
14MW07	**2016**	ND (0.025)	0.12 J,B,QL	0.093 J,B,QL	ND (0.0001)	0.0000061 J	ND (0.00025)	ND (0.00025)	0.000338	0.000052
17MW1	**2004**	ND (0.090)	ND (0.337 B)	ND (0.562 B)	ND (0.0004)	--	--	--	0.00708	--
17MW1	**2010**	0.05 U,B	0.057 U	0.057 U	0.00015 U	--	--	--	--	--
17MW1	**2011**	0.015 J,B	0.037 J	0.056 J	ND (0.00045)	ND (0.000072)	*ND (0.0038)*	*ND (0.0038)*	0.00019 J	0.0003 J
17MW1	**2012**	ND (0.044)	0.036 J	0.039 J	ND (0.00045)	ND (0.000072)	*ND (0.004)*	*ND (0.004)*	0.00028 J	ND (0.00025)
17MW1	**2013**	0.018 J	0.038 J	0.045 J	ND (0.00045)	ND (0.00003)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
17MW1	**2014**	ND (0.044)	0.021 J	ND (0.049)	ND (0.0004)	ND (0.000016)	*ND (0.004)*	*ND (0.004)*	***0.13***	ND (0.00025)
17MW1	**2015**	ND (0.044)	ND (0.10 QN)	ND (0.071)	ND (0.001)	ND (0.00001)	*ND (0.0040)*	*ND (0.0040)*	0.00021 J	ND (0.00050)
17MW1	**2016**	ND (0.025)	0.092 J,B,QL	0.13 J,B,QL	ND (0.0001)	0.0000076 J	ND (0.00025)	ND (0.00025)	0.00025	0.000045
20MW1	**2004**	0.0194 J	ND (0.333 B)	ND (0.568 B)	ND (0.0004)	--	--	--	***0.0517***	--
20MW1	**2010**	0.05 U,B	0.024 J	0.03 JM	0.00015 U	--	--	--	--	--
20MW1	**2011**	0.017 J,B	0.036 J	0.081 J	ND (0.00045)	ND (0.000072)	*ND (0.0038)*	*ND (0.0038)*	0.00045 J	ND (0.00035)
20MW1	**2012**	ND (0.044)	0.040 J	0.046 J	ND (0.00045)	ND (0.000072)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
20MW1	**2013**	ND (0.044)	0.032 J	ND (0.048)	ND (0.00045)	ND (0.00003)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
20MW1	**2014**	ND (0.044)	0.023 J	ND (0.052)	ND (0.0004)	ND (0.000016)	*ND (0.004)*	*ND (0.004)*	0.00045 J	ND (0.00025)
20MW1	**2015**	ND (0.044)	ND (0.10 QN)	ND (0.071)	ND (0.001)	ND (0.00001)	***0.0014 J***	*ND (0.0040)*	0.0057	ND (0.00050)

Northeast Cape FUDS
Table C-3.1 COCs and Analytes in Groundwater Above SSCLs and 2016 ADEC Criteria

		GRO	DRO	RRO	Benzene	Naphthalene	Arsenic-Total	Arsenic-Dissolved	Lead-Total	Lead-Dissolved
	SSCL	**1.3 mg/L**	**1.5 mg/L**	**1.1 mg/L**	**0.005 mg/L**		**0.01 mg/L**	**0.01 mg/L**	**0.015 mg/L**	**0.015 mg/L**
	2016 ADEC	***2.2 mg/L***	***1.5 mg/L***	***1.1 mg/L***	***0.0046 mg/L***	***0.0017 mg/L***	***0.00052 mg/L***	***0.00052 mg/L***	***0.015 mg/L***	***0.015 mg/L***
20MW1	**2016**	ND (0.025)	0.09 J,B,QL	0.13 J,B,QL	ND (0.0001)	0.0000054 J	ND (0.00025)	ND (0.00025)	0.000866	0.000248
22MW2	**2010**	0.044 U	ND (0.094)	0.027 J	0.00015 U	--	--	--	--	--
22MW2	**2011**	0.021	0.023	0.052 J	ND (0.00045)	ND (0.000073)	*ND (0.0038)*	*ND (0.0038)*	0.0003 J	0.00017 J
22MW2	**2012**	ND (0.044)	0.047 J	0.042 J	ND (0.00045)	ND (0.000072)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
22MW2	**2013**	ND (0.044)	0.025 J	ND (0.047)	ND (0.00045)	ND (0.00003)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
22MW2	**2014**	0.017 J,B	ND (0.049)	ND (0.049)	ND (0.0004)	ND (0.000016)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
22MW2	**2015**	ND (0.044)	ND (0.10 QN)	ND (0.074)	ND (0.001)	ND (0.000012)	*ND (0.0040)*	*ND (0.0040)*	0.00066 J	ND (0.00050)
22MW2	**2016**	ND (0.025)	0.1 J,B,QL	0.36 J,QL	ND (0.0001)	ND (0.0000051)	ND (0.00025)	ND (0.00025)	0.000085	0.000026
26MW1	**2004**	0.0166 J	0.078 J	0.249 J	ND (0.0004)	ND (0.0000562)	--	--	--	--
26MW1	**2004**	--	--	--	--	ND (0.0000543)	--	--	--	--
26MW1	**2004**	--	--	--	--	ND (0.000111)	--	--	--	--
26MW1	**2010**	0.044 U	0.057 U	0.057 U	0.00015 U	--	--	--	--	--
26MW1	**2011**	ND (0.044)	0.083	0.073 J	ND (0.00045)	ND (0.000073)	*ND (0.0038)*	*ND (0.0038)*	0.0006 J	ND (0.00035)
26MW1	**2012**	ND (0.044)	0.029 J	0.030 J	ND (0.00045)	ND (0.000071)	*ND (0.004)*	*ND (0.004)*	0.00019 J	ND (0.00025)
26MW1	**2013**	ND (0.044)	0.029 J	ND (0.047)	ND (0.00045)	ND (0.00003)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	*ND (0.015 B)*
26MW1	**2014**	ND (0.044)	ND (0.050)	ND (0.050)	ND (0.0004)	ND (0.000016)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
26MW1	**2015**	ND (0.044)	ND (0.10 QN)	ND (0.072)	ND (0.001)	ND (0.00001)	*ND (0.0040)*	*ND (0.0040)*	ND (0.00050)	ND (0.00050)
26MW1	**2016**	ND (0.025)	0.11 J,B,QL	0.79 QL	ND (0.0001)	0.0000045 J	ND (0.00025)	ND (0.00025)	0.000474	0.000025
MW10-1	**2004**	ND (0.090)	ND (0.333 B)	ND (0.556 B)	ND (0.0004)	--	--	--	0.00457	--
MW10-1	**2010**	0.044 U	0.68	0.43	0.00015 U	--	--	--	--	--
MW10-1	**2011**	0.017 J	0.46	0.59	ND (0.00045)	ND (0.000071)	*ND (0.0038)*	*ND (0.0038)*	0.00086 J	0.00038 J
MW10-1	**2012**	ND (0.044)	0.64	0.28	ND (0.00045)	ND (0.000071)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
MW10-1	**2013**	ND (0.044)	0.4	0.17	ND (0.00045)	ND (0.00003)	*ND (0.004)*	*ND (0.004)*	*ND (0.015 B)*	*ND (0.015 B)*
MW10-1	**2014**	ND (0.044)	0.8	0.37	ND (0.0004)	0.000016 J	*ND (0.004)*	*ND (0.004)*	0.0011 J	ND (0.00025)
MW10-1	**2015**	ND (0.044)	0.39	0.14	ND (0.001)	ND (0.00001)	***0.0014 J***	*ND (0.0040)*	0.004	0.00028 J
MW10-1	**2016**	ND (0.025)	0.49 J, QL	0.32 J, QL	ND (0.0001)	0.0000046 J	ND (0.00025)	ND (0.00025)	0.000558	0.000042
MW88-1	**2002**	0.024 V,J	1.2	0.43	0.00058	--	--	--	--	--
MW88-1	**2004**	0.0141 J	ND (0.345 B)	0.168 J	ND (0.0004)	--	--	--	ND (0.004)	--
MW88-1	**2010**	0.02 U,B	0.75	0.037 J,M	0.00015 U	--	--	--	--	--
MW88-1	**2011**	ND (0.044)	0.74	0.54	ND (0.00045)	ND (0.000072)	*ND (0.0038)*	***ND (0.0038)***	0.0016 J	0.00035 J
MW88-1	**2012**	ND (0.044)	***1.9***	0.15	ND (0.00045)	ND (0.000071)	*ND (0.004)*	*ND (0.004)*	0.00041 J	ND (0.00025)
MW88-1	**2013**	ND (0.044)	0.22	0.05 J	ND (0.00045)	0.000019 J	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)
MW88-1	**2014**	ND (0.044)	0.26	0.049 J	ND (0.0004)	ND (0.000016)	*ND (0.004)*	*ND (0.004)*	0.0027	0.00025 J
MW88-1	**2014**	ND (0.044)	0.21	0.043 J	ND (0.0004)	ND (0.000016)	*ND (0.004)*	*ND (0.004)*	0.003	0.00023 J
MW88-1	**2015**	ND (0.044)	0.1 B	ND (0.071)	ND (0.001)	ND (0.000011)	*ND (0.0040)*	*ND (0.0040)*	ND (0.00050)	ND (0.00050)
MW88-1	**2016**	ND (0.025)	0.52 J, QL	0.23 J, QL	ND (0.0001)	0.0000071 J	ND (0.00025)	ND (0.00025)	0.000301	0.000075
MW88-10	**2002**	0.12	***55***	***1.3***	0.0027	--	--	--	--	--
MW88-10	**2004**	0.0357 J	1.38	ND (0.549 B)	ND (0.0004)	--	--	--	***0.0376***	--
MW88-10	**2010**	0.044 U	***1.6***	0.036 J	0.00015 U	--	--	--	0.00222 J	--
MW88-10	**2011**	ND (0.044)	0.54	0.15	ND (0.00045)	ND (0.000074)	*ND (0.0038)*	*ND (0.0038)*	0.00083 J	0.00021 J
MW88-10	**2012**	ND (0.044)	0.5	0.064 J	ND (0.00045)	0.00033	*ND (0.004)*	*ND (0.004)*	0.00076 J	0.00022 J

Northeast Cape FUDS
Table C-3.1 COCs and Analytes in Groundwater Above SSCLs and 2016 ADEC Criteria

		GRO	DRO	RRO	Benzene	Naphthalene	Arsenic-Total	Arsenic-Dissolved	Lead-Total	Lead-Dissolved
	SSCL	**1.3 mg/L**	**1.5 mg/L**	**1.1 mg/L**	**0.005 mg/L**		**0.01 mg/L**	**0.01 mg/L**	**0.015 mg/L**	**0.015 mg/L**
	2016 ADEC	***2.2 mg/L***	***1.5 mg/L***	***1.1 mg/L***	***0.0046 mg/L***	***0.0017 mg/L***	***0.00052 mg/L***	***0.00052 mg/L***	***0.015 mg/L***	***0.015 mg/L***
MW88-10	**2013**	ND (0.05 B)	0.97	0.042 J	ND (0.00045)	0.00074	*ND (0.004)*	*ND (0.004)*	*ND (0.015 B)*	*ND (0.015 B)*
MW88-10	**2013**	ND (0.05 B)	0.94	0.043 J	ND (0.00045)	0.00084	*ND (0.004)*	*ND (0.004)*	*ND (0.015 B)*	ND (0.00025)
MW88-10	**2014**	0.021 J,B	0.66	0.041 J	ND (0.0004)	0.000044	*ND (0.004)*	*ND (0.004)*	0.0011 J	0.0020 J
MW88-10	**2015**	ND (0.044)	0.43	ND (0.071)	ND (0.001)	ND (0.00001)	*ND (0.0040)*	*ND (0.0040)*	0.00069 J	0.00026 J
MW88-10	**2016**	ND (0.025)	0.3 J, QL	0.16 J, QL	ND (0.0001)	0.0000088 J	0.00022 J	0.00023 J	0.00143	0.000227
MW88-3	**2002**	0.42	***34***	0.22	0.00057	--	--	--	--	--
MW88-3	**2004**	0.104	0.768	ND (0.549 B)	ND (0.0004)	--	--	--	ND (0.004)	--
MW88-3	**2014**	0.018 J,B	0.46	0.030 J	ND (0.0004)	0.000019 J	*ND (0.004)*	*ND (0.004)*	0.0010 J	ND (0.00025)
MW88-3	**2015**	ND (0.044)	0.38	ND (0.073)	ND (0.001)	ND (0.00001)	ND (0.0040)	ND (0.0040)	0.00019 J	0.0031
MW88-3	**2016**	ND (0.025)	0.49 J, QL	0.15 J, QL	ND (0.0001)	0.000035	ND (0.00025)	ND (0.00025)	0.000383	0.000158
MW88-4*	**2002**	1.2	***72***	***1.9***	***0.03***	--	--	--	--	--
MW88-4*	**2002**	1.2	***56***	***1.3***	***0.03***	--	--	--	--	--
MW88-4*	**2004**	0.917	***3.82 J***	***1.46 B***	***0.0276***	--	--	--	0.00502	--
MW88-4*	**2004**	1.09 J	***3.49***	***1.11 B***	***0.0337***	--	--	--	0.00409 B	--
MW88-4*	**2004**	1.25	***3.89***	ND (0.750 B)	***0.03***	--	--	--	0.00423 B	--
MW88-4*	**2010**	0.23	***3.2***	0.38 M	0.0022	--	--	--	0.0025 J	--
MW88-4*	**2010**	0.24	***3.3***	0.43 M	0.0024	--	--	--	0.00266	--
MW88-4*	**2011**	0.4	***2.3***	0.55	***0.0094***	***0.075***	***0.01***	***0.011***	0.0013 J	0.00032 J
MW88-4*	**2012**	0.31	***2***	0.24	***0.0048***	***0.089 D***	***0.011***	***0.0038 J***	0.0019 J	ND (0.00025)
MW88-4*	**2012**	0.3	***1.8***	0.21	0.0042	***0.085 D***	***0.011***	***0.011***	ND (0.00025)	0.0019 J
MW88-5*	**2002**	1.3	***9.8***	***2.3***	***0.019***	--	--	--	--	--
MW88-5*	**2004**	**1.5 J**	***11.3***	***2.28 B***	***0.0297***	--	--	--	0.012	--
MW88-5*	**2010**	0.19	***12***	***1.6***	***0.0093***	--	--	--	0.004 J	--
MW88-5*	**2011**	0.23	***7.5***	***2***	***0.016***	0.00084	***0.0058***	***0.0049 J***	0.0019 J	0000046 J
MW88-5*	**2011**	0.25	***7.2***	***1.8***	***0.02***	0.00078	***0.0057***	***0.0052***	0.0019 J	0.00049 J
MW88-5*	**2012**	0.16	***4.6***	0.58	***0.0064***	***0.029***	***0.007***	***0.0055***	0.0021	0.00023 J

Notes:

mg/L = milligram per liter

COC = contaminant of concern

SSCL = site-specific cleanup level

ADEC = Alaska Department of Environmental Conservation

* = Monitoring well not currently installed and sampled.

-- = Not Sampled

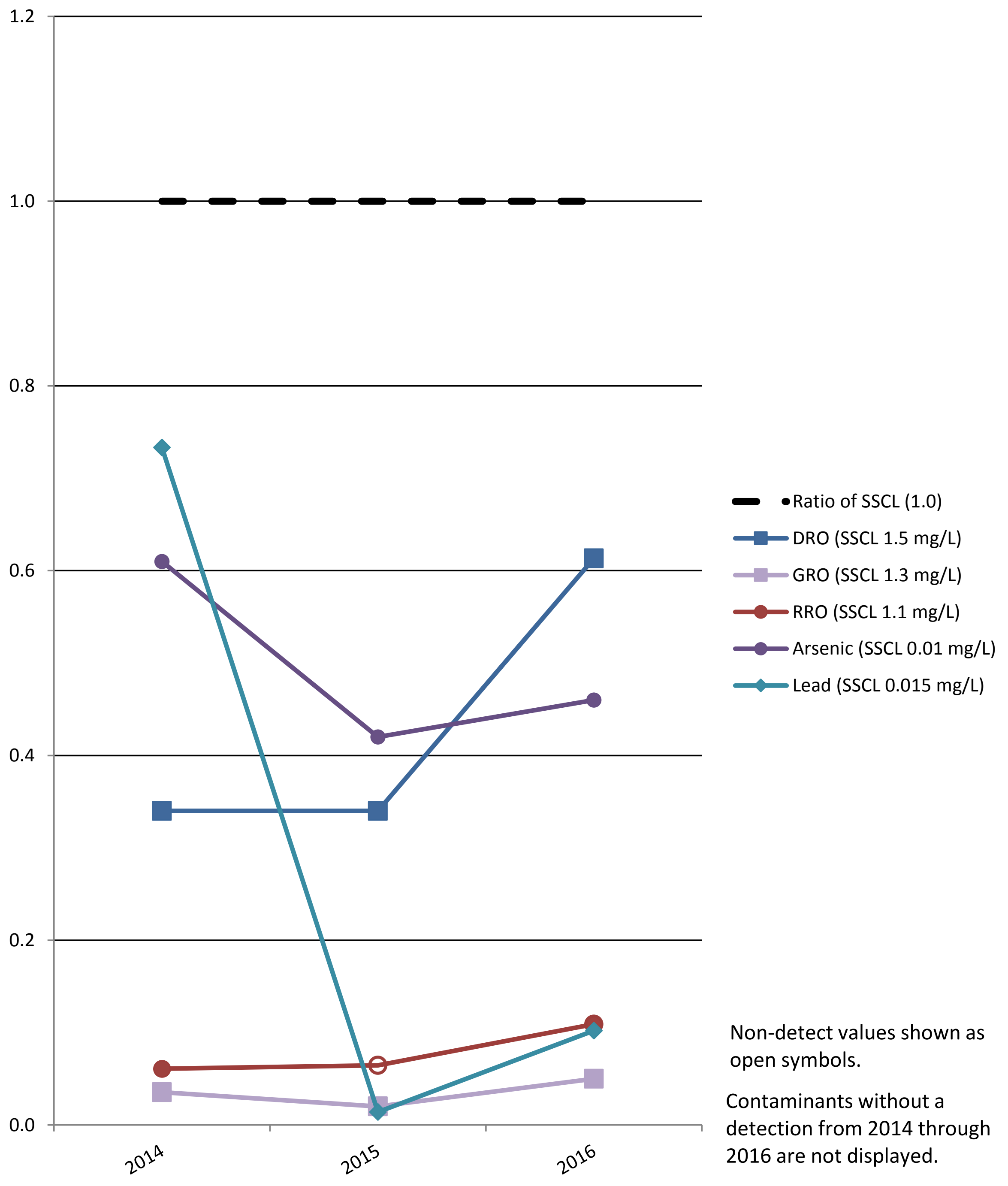
Bold and highlighted text indicates result exceeding the SSCL.

Bold and italicized text indicates resu exceeding 2016 ADEC evaluation criteria.

For additional definitions, refer to the Acronyms and Abbreviations section.

For data qualifiers, refer to the DQA in Appendix B.

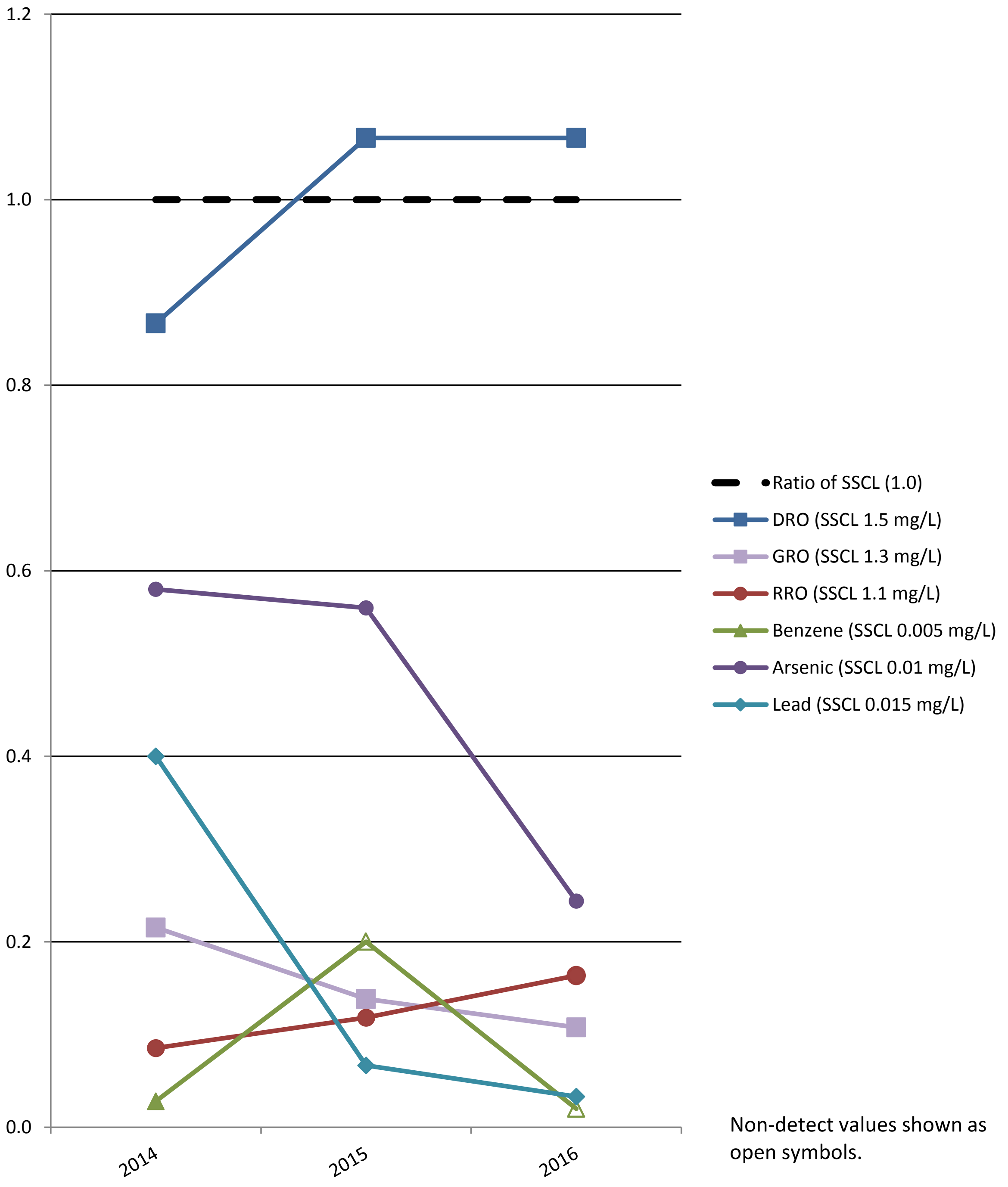
Plot C-3.2.1 Ratio of Contaminant Concentration to the SSCL in In-Plume Monitoring Well 14MW01 Over Time



Non-detect values shown as open symbols.

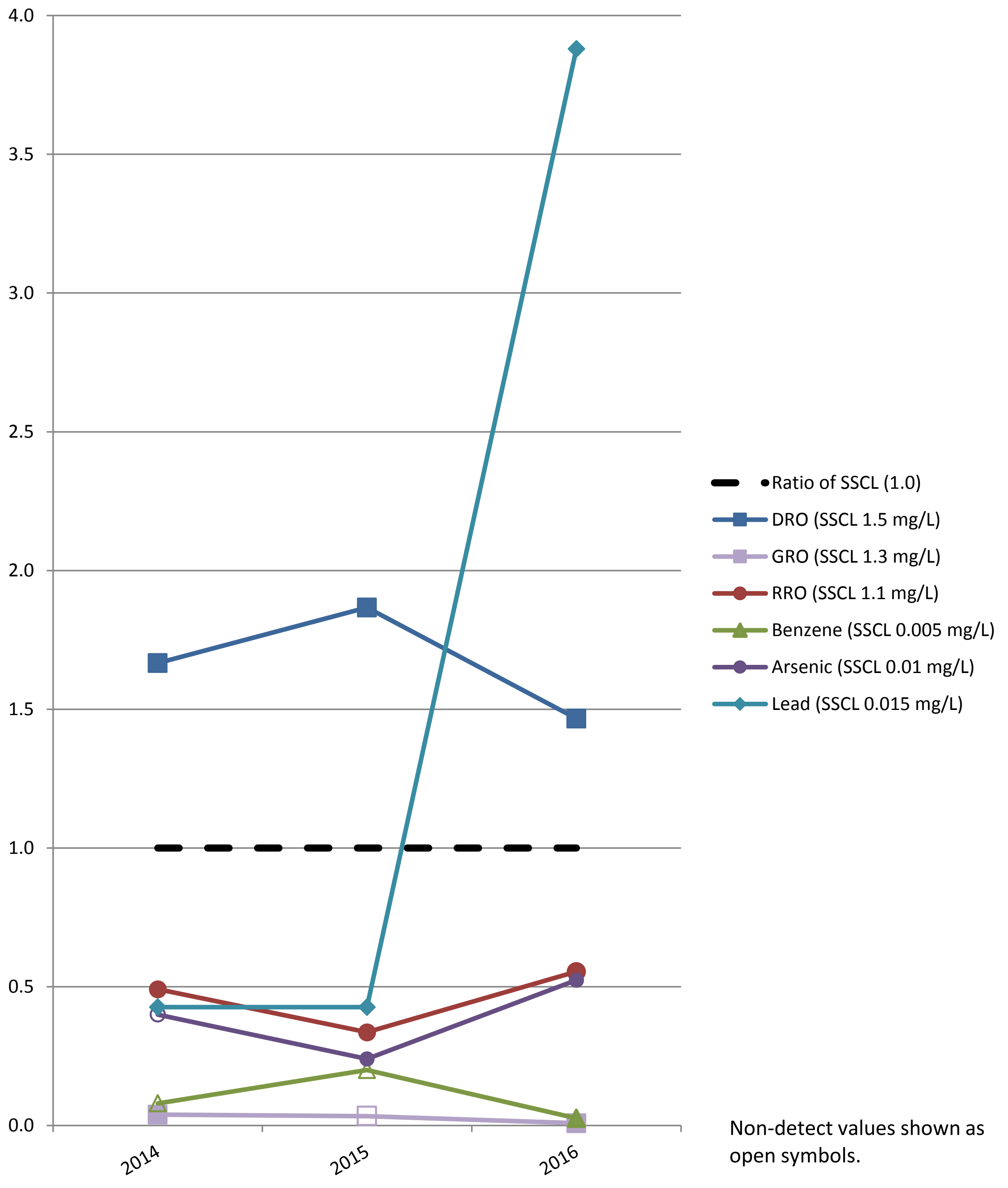
Contaminants without a detection from 2014 through 2016 are not displayed.

Plot C-3.2.2 Ratio of Contaminant Concentration to the SSCL in In-Plume Monitoring Well 14MW02 Over Time

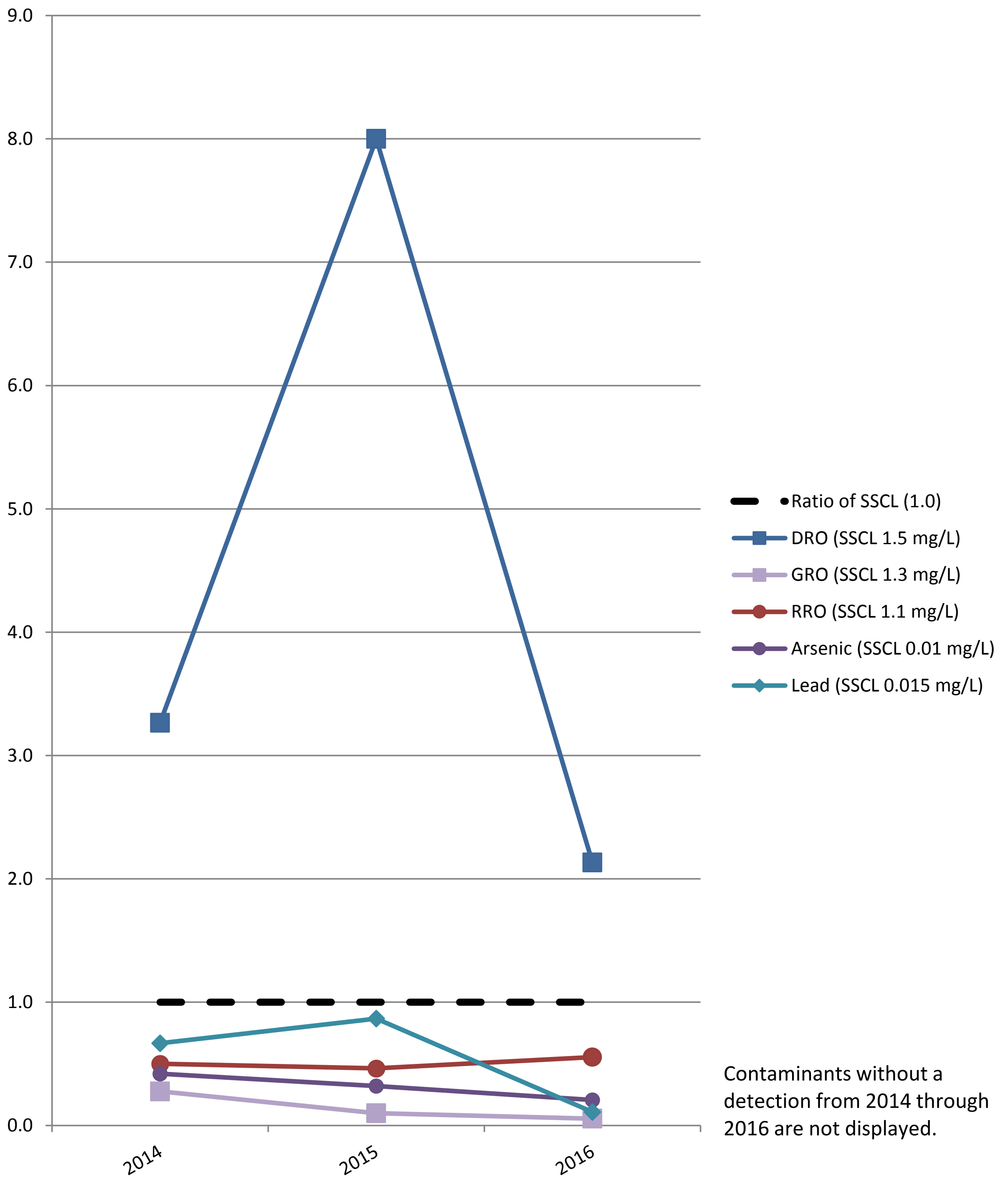


Non-detect values shown as open symbols.

Plot C-3.2.3 Ratio of Contaminant Concentration to the SSCL in In-Plume Monitoring Well 14MW04 Over Time

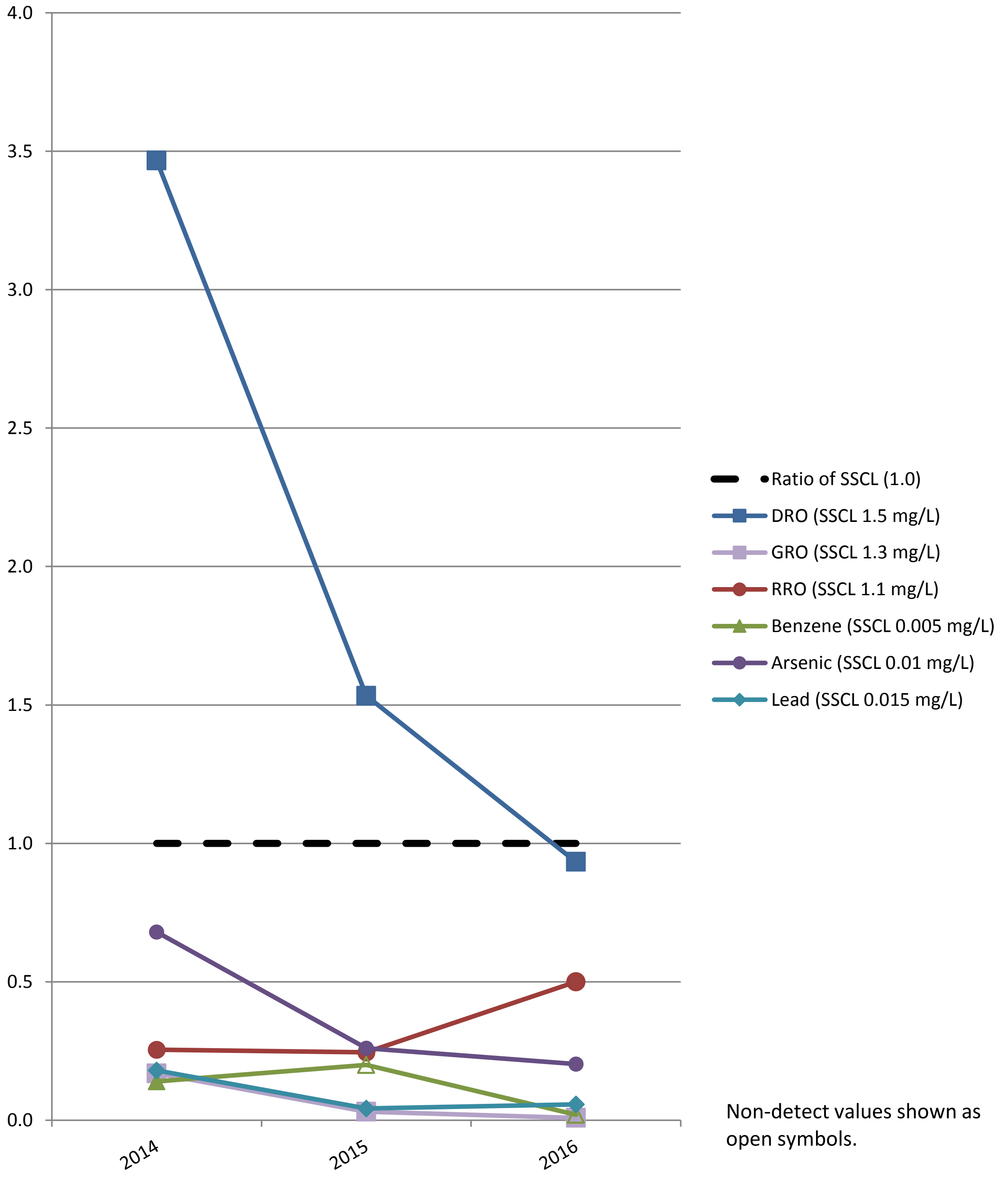


Plot C-3.2.4 Ratio of Contaminant Concentration to the SSCL in In-Plume Monitoring Well 14MW05 Over Time

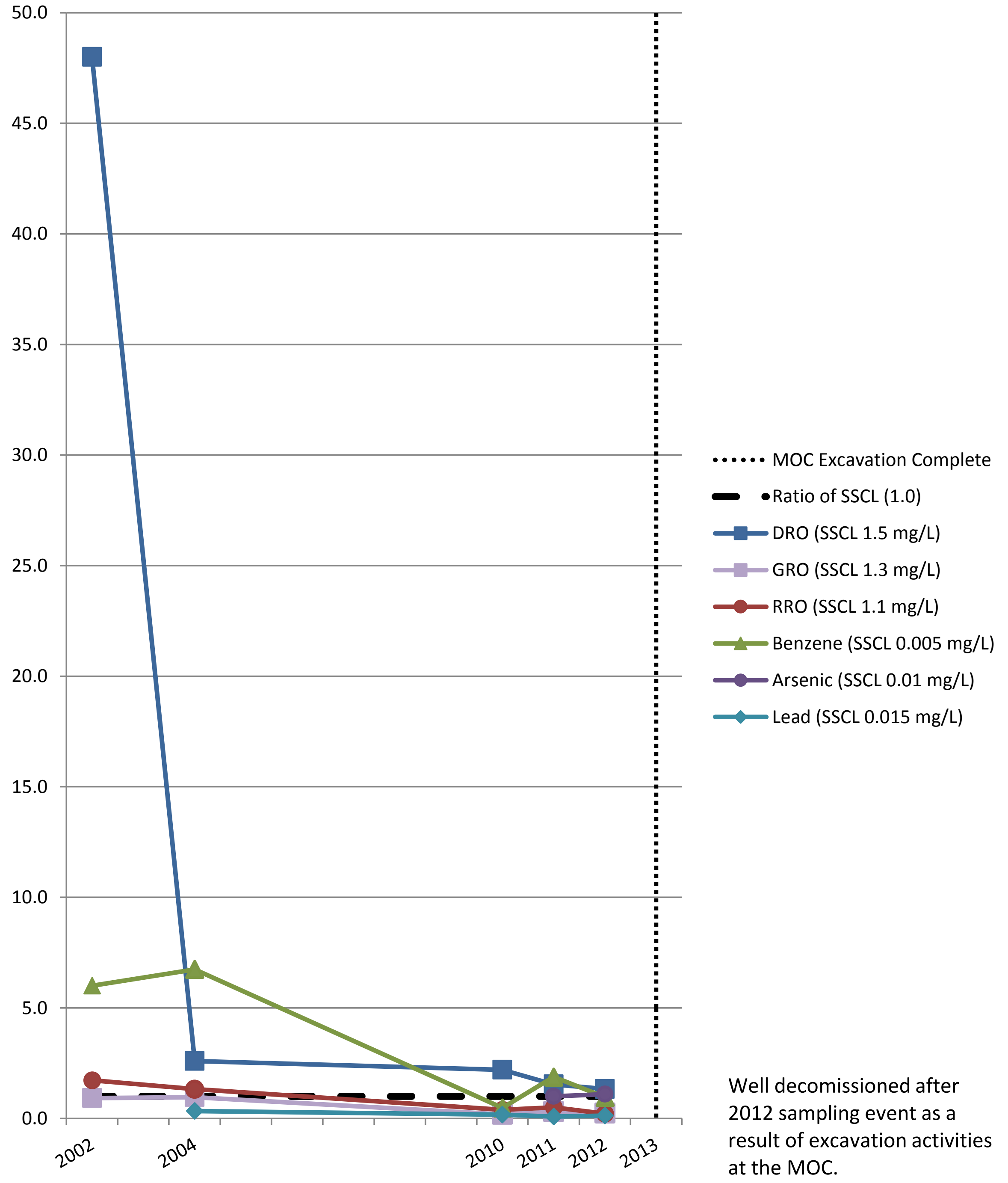


Contaminants without a detection from 2014 through 2016 are not displayed.

Plot C-3.2.5 Ratio of Contaminant Concentration to the SSCL in In-Plume Monitoring Well 14MW06 Over Time

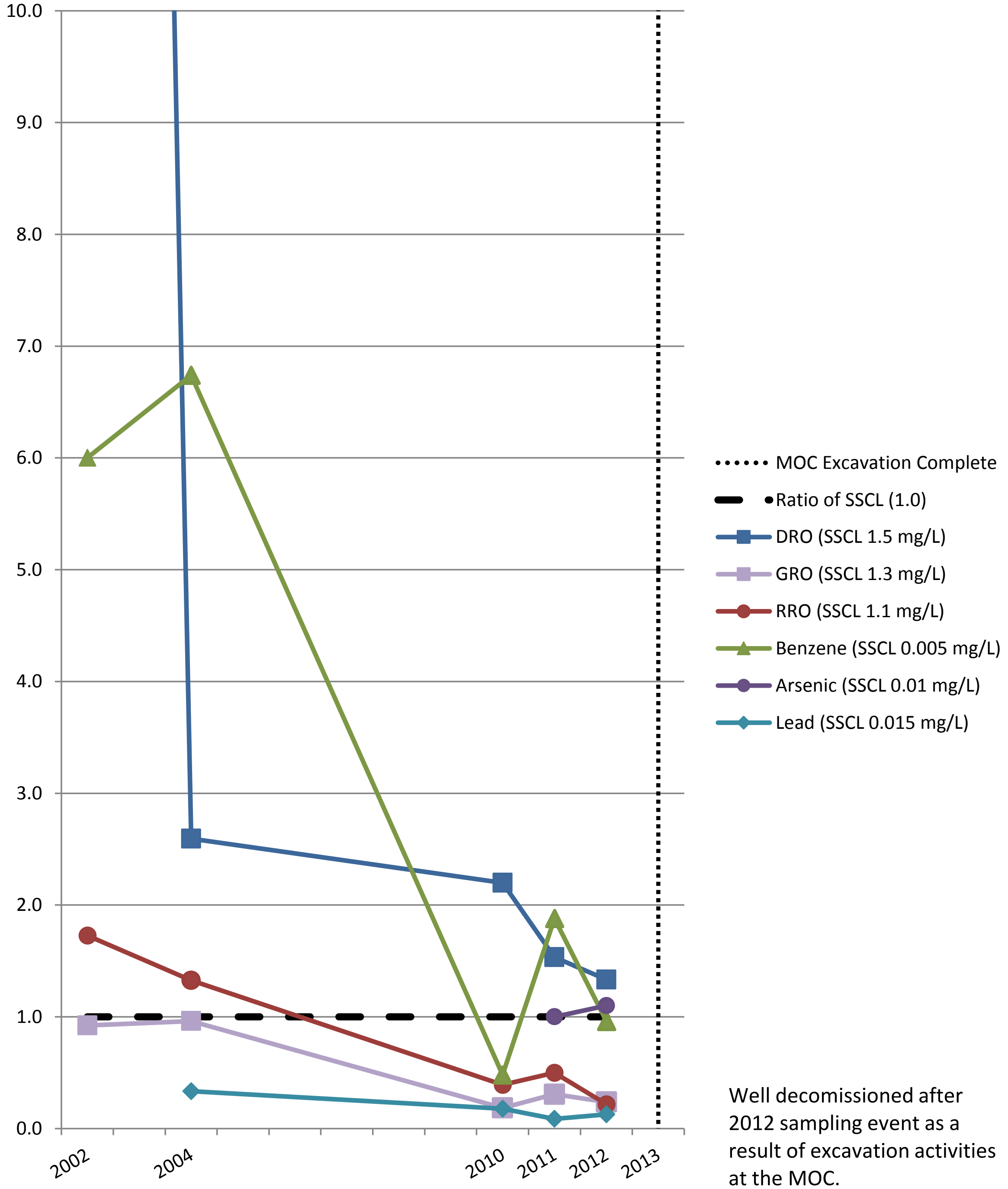


Plot C-3.2.6.1 Ratio of Contaminant Concentration to the SSCL in Historical In-Plume Monitoring Well MW88-4 Over Time



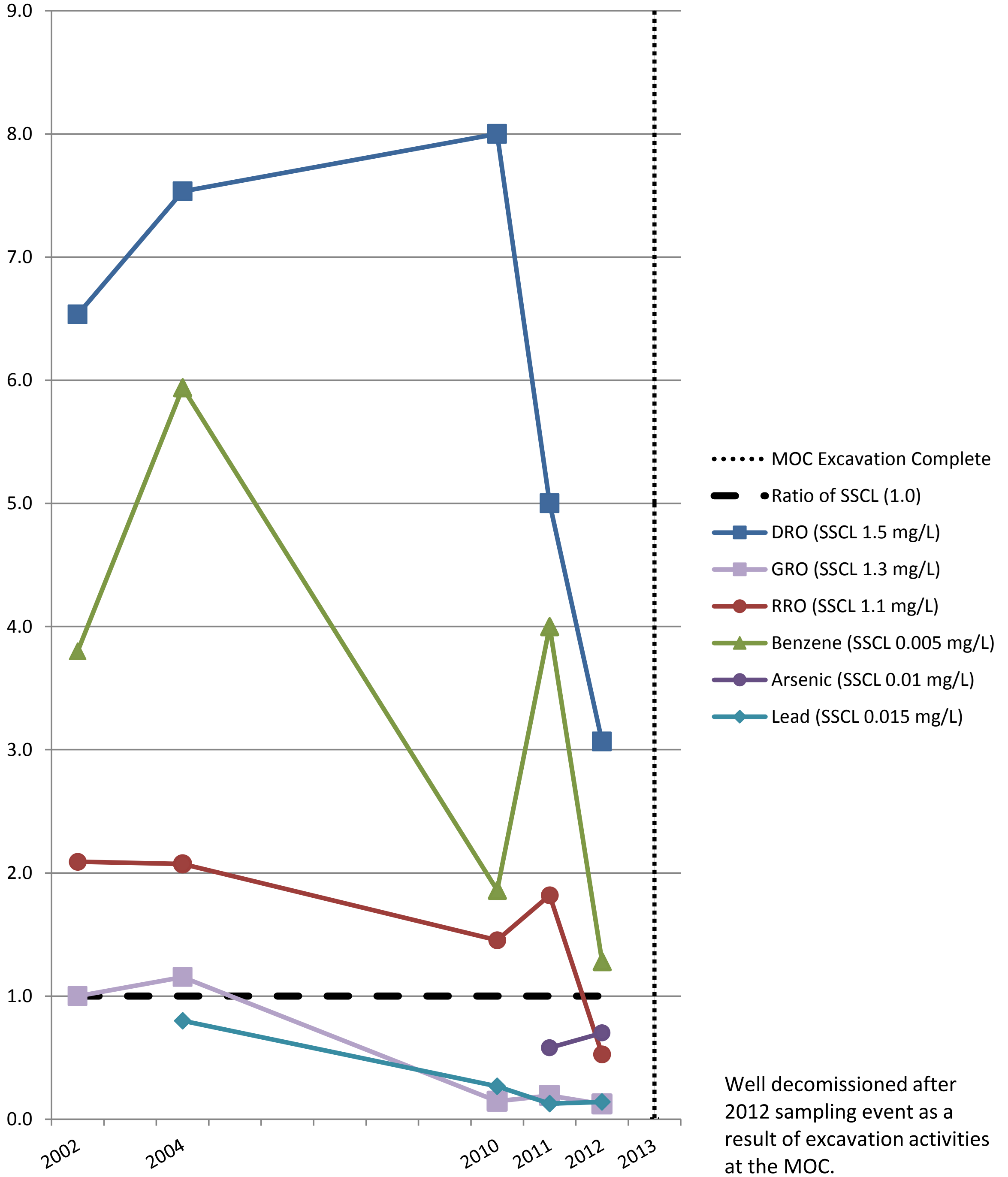
Well decomissioned after 2012 sampling event as a result of excavation activities at the MOC.

Plot C-3.2.6.2 Ratio of Contaminant Concentration to the SSCL in Historical In-Plume Monitoring Well MW88-4 Over Time (Scale of 0 to 10)



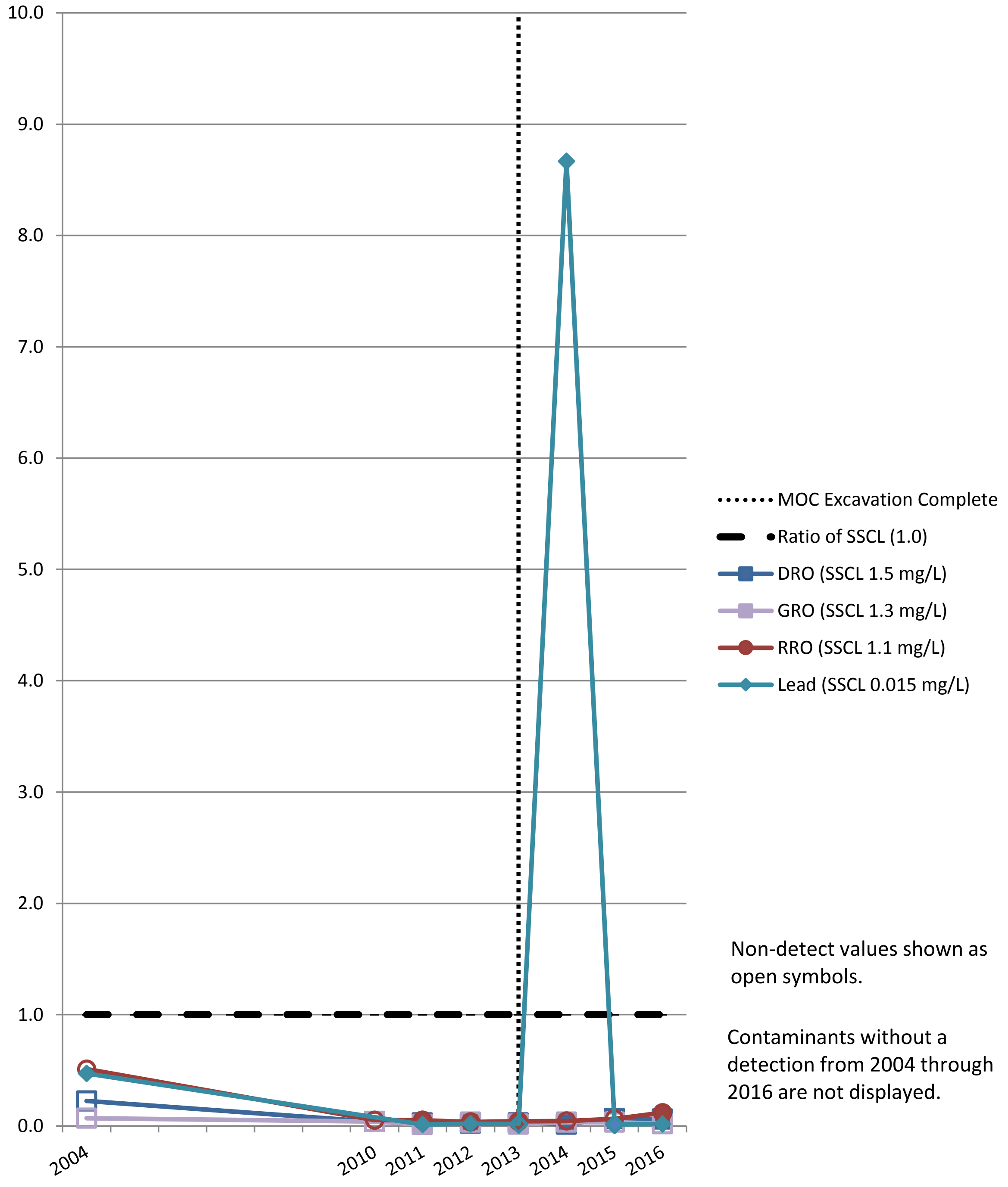
Well decomissioned after 2012 sampling event as a result of excavation activities at the MOC.

Plot C-3.2.7 Ratio of Contaminant Concentration to the SSCL in Historical In-Plume Monitoring Well MW88-5 Over Time



Well decomissioned after 2012 sampling event as a result of excavation activities at the MOC.

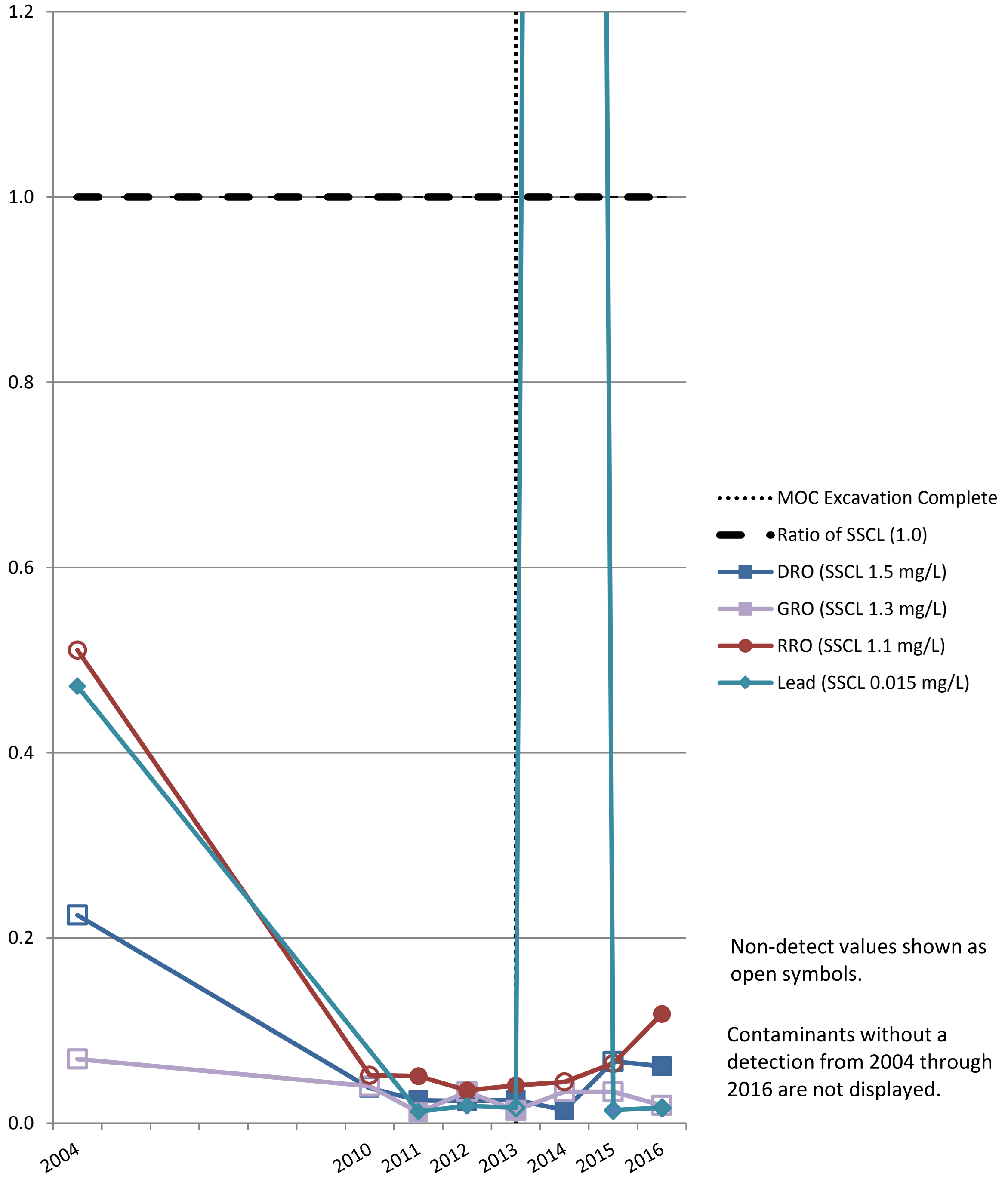
Plot C-3.2.8.1 Ratio of Contaminant Concentration to the SSCL in Crossgradient Monitoring Well 17MW1 Over Time



Non-detect values shown as open symbols.

Contaminants without a detection from 2004 through 2016 are not displayed.

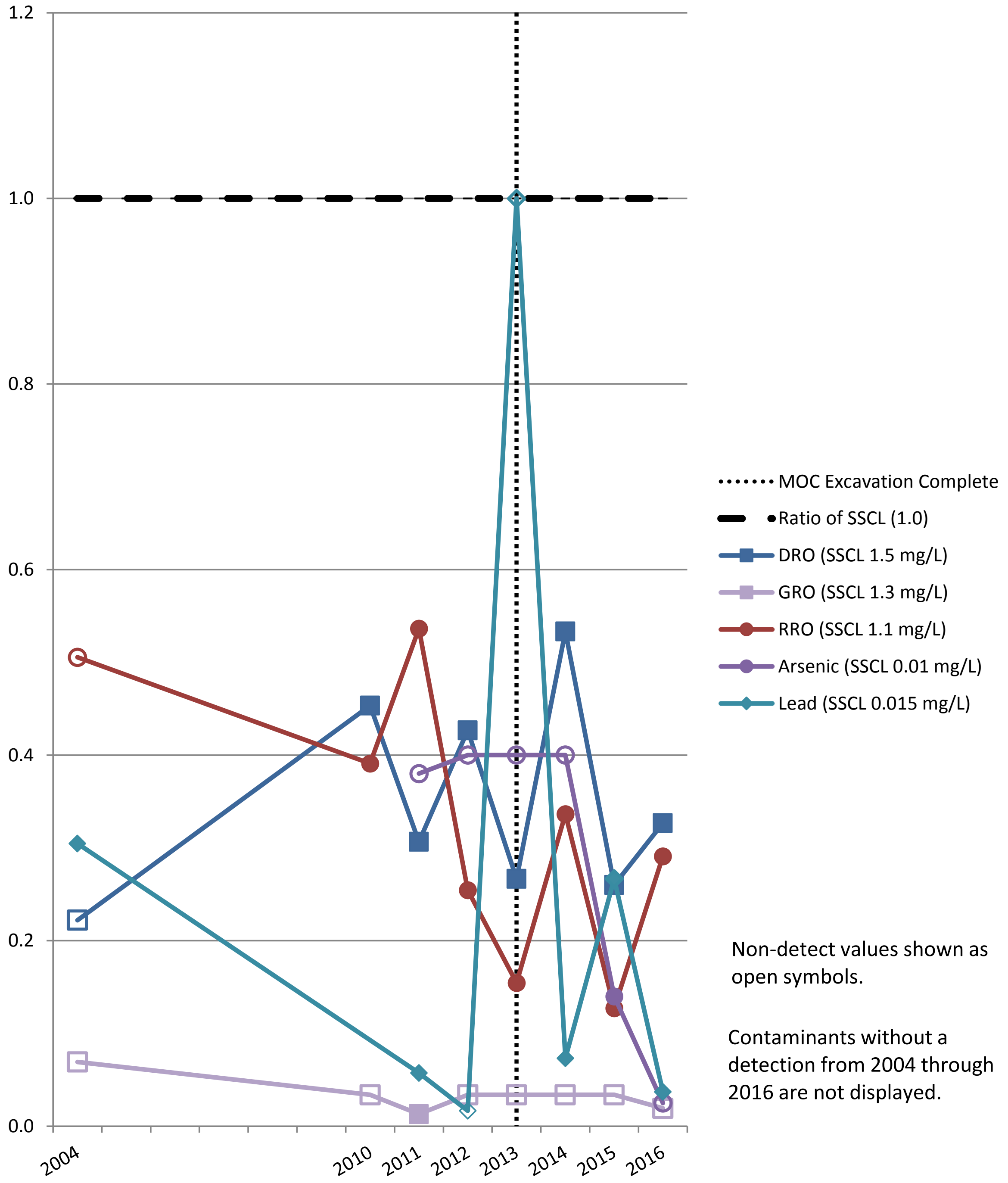
Plot C-3.2.8.2 Ratio of Contaminant Concentration to the SSCL in Crossgradient Monitoring Well 17MW1 Over Time (Scale of 0 to 1.2)



Non-detect values shown as open symbols.

Contaminants without a detection from 2004 through 2016 are not displayed.

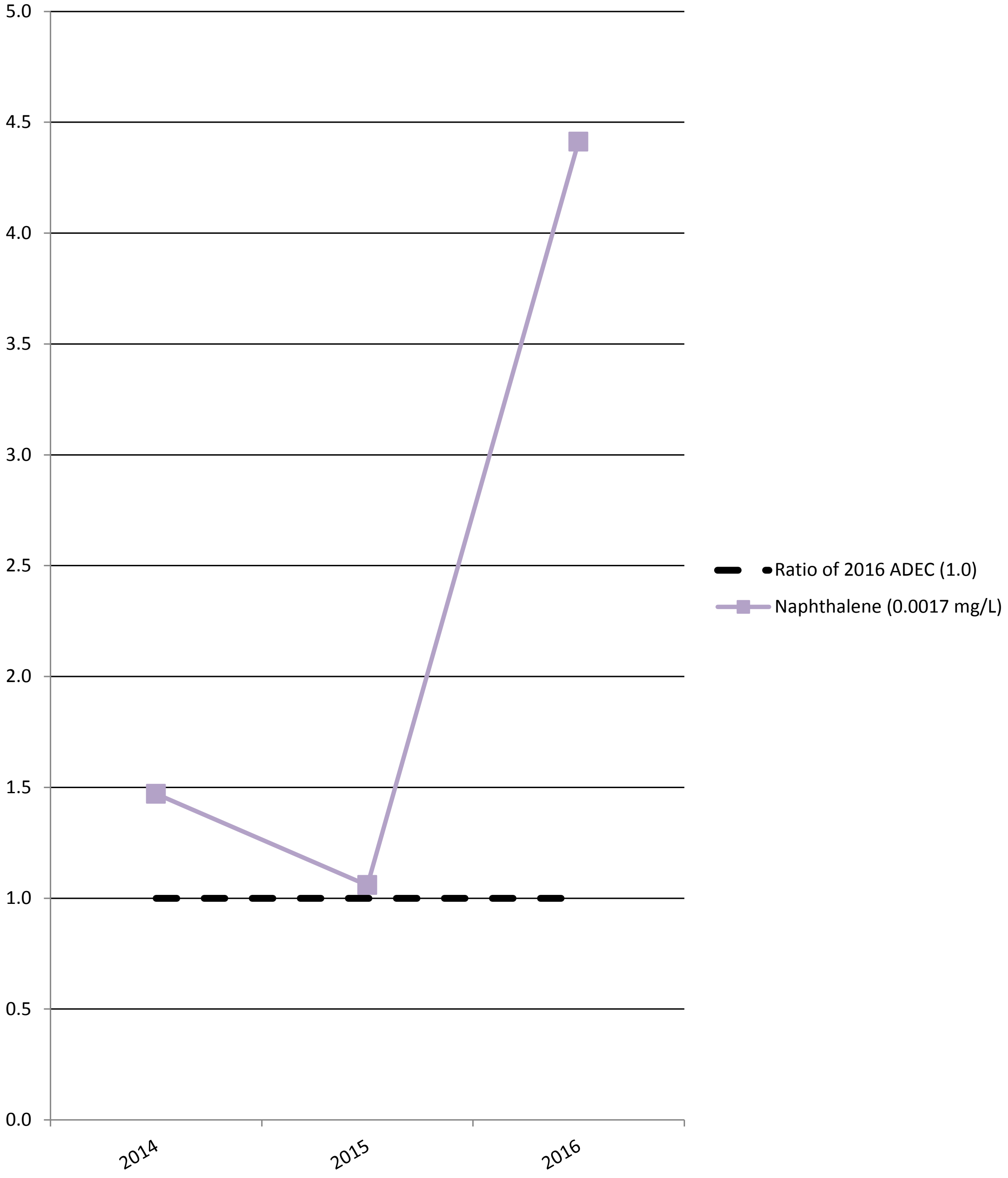
Plot C-3.2.9 Ratio of Contaminant Concentration to the SSCL in Crossgradient Monitoring Well MW10-1 Over Time



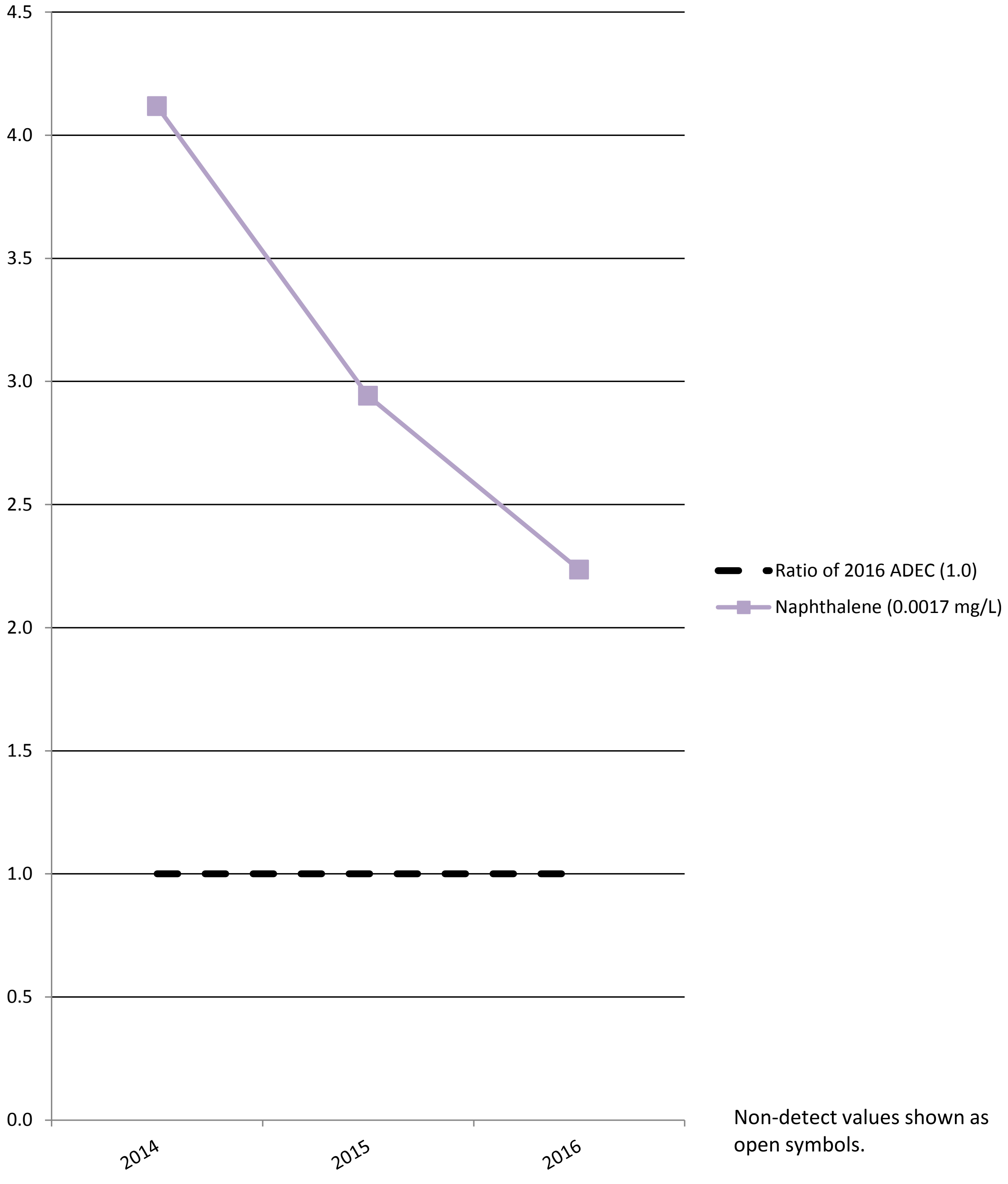
Non-detect values shown as open symbols.

Contaminants without a detection from 2004 through 2016 are not displayed.

Plot C-3.3.1 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in In-Plume Monitoring Well 14MW01 Over Time

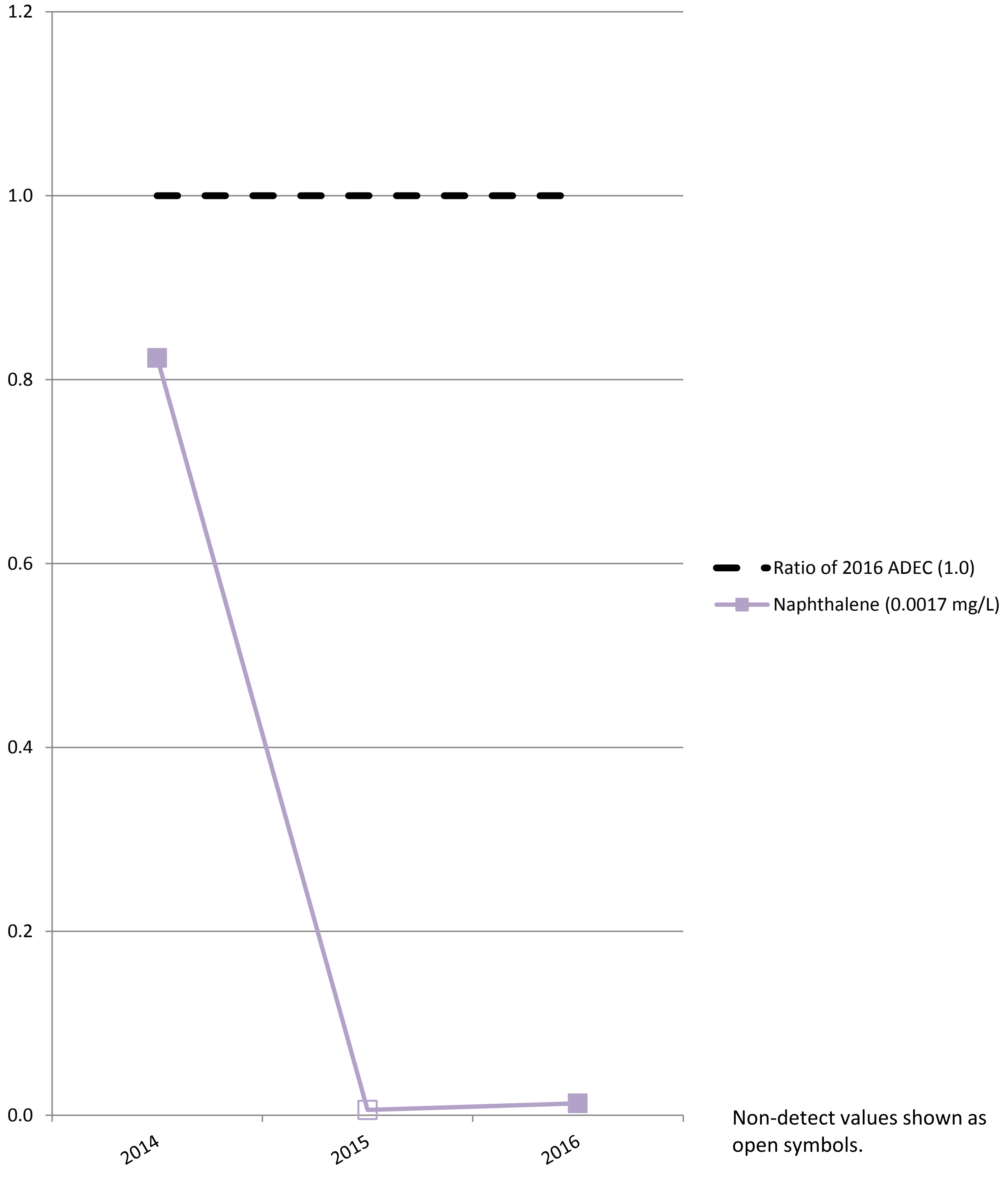


Plot C-3.3.2 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in In-Plume Monitoring Well 14MW02 Over Time



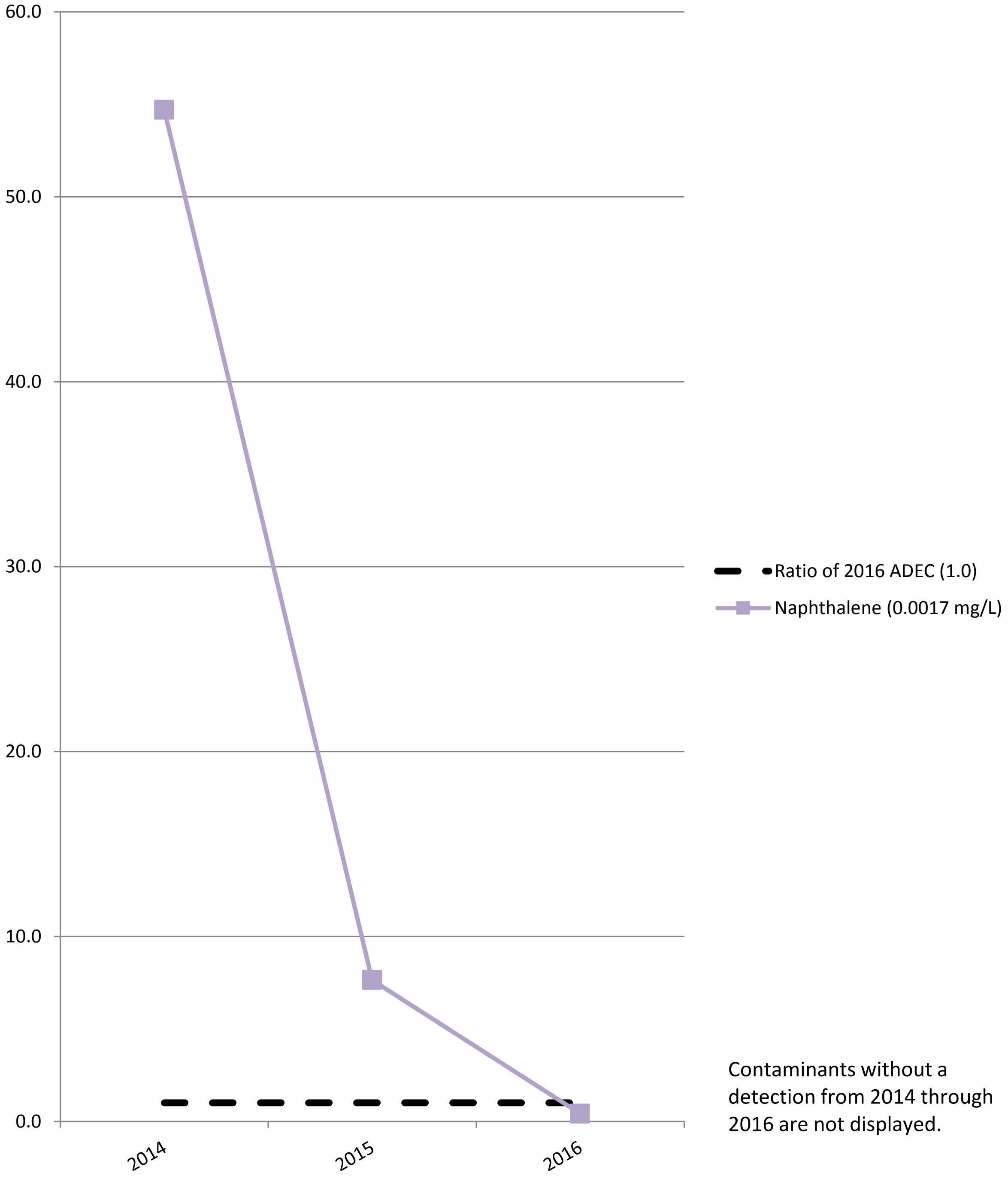
Non-detect values shown as open symbols.

Plot C-3.3.3 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in In-Plume Monitoring Well 14MW04 Over Time



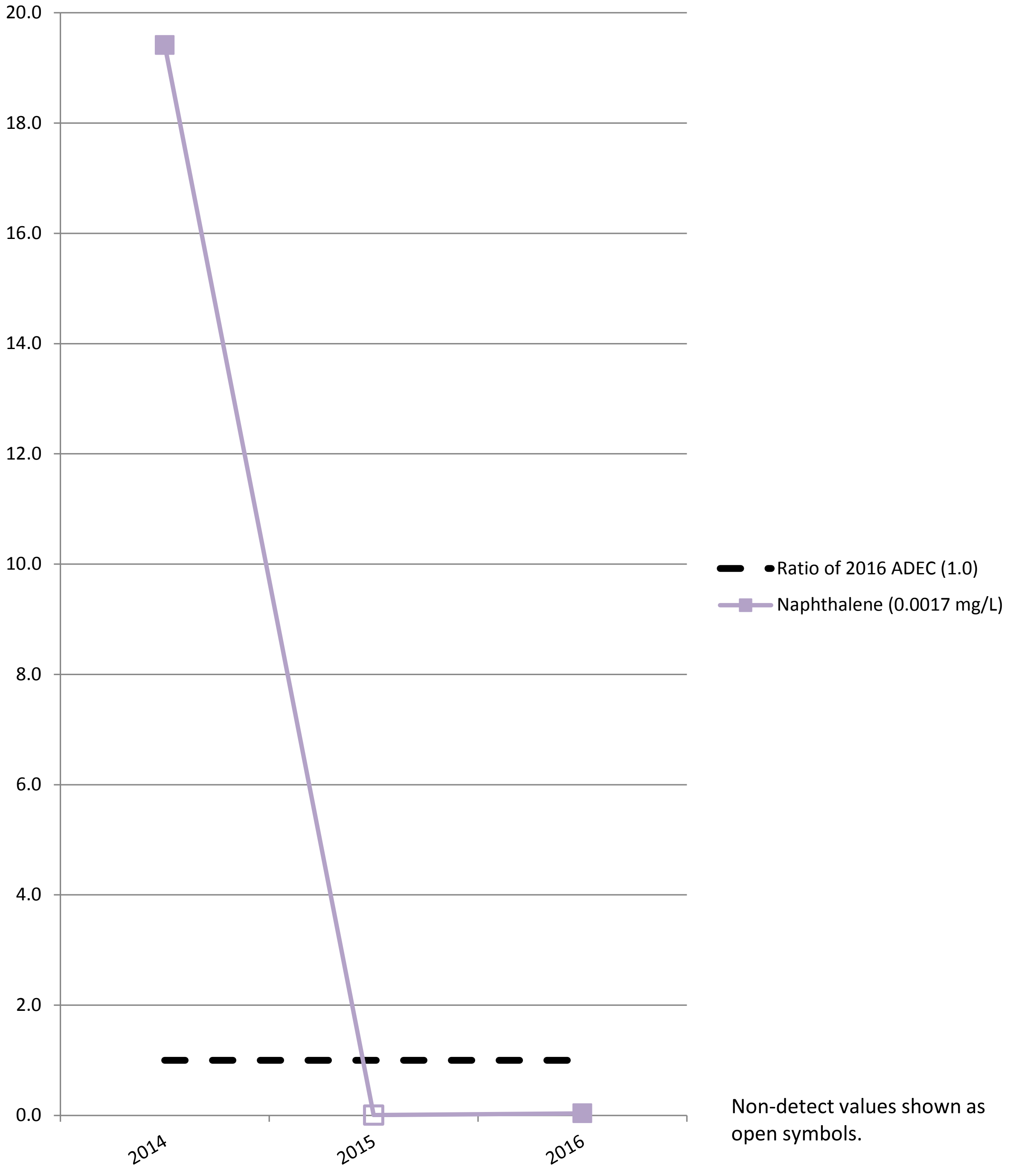
Non-detect values shown as open symbols.

Plot C-3.3.4 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in In-Plume Monitoring Well 14MW05 Over Time



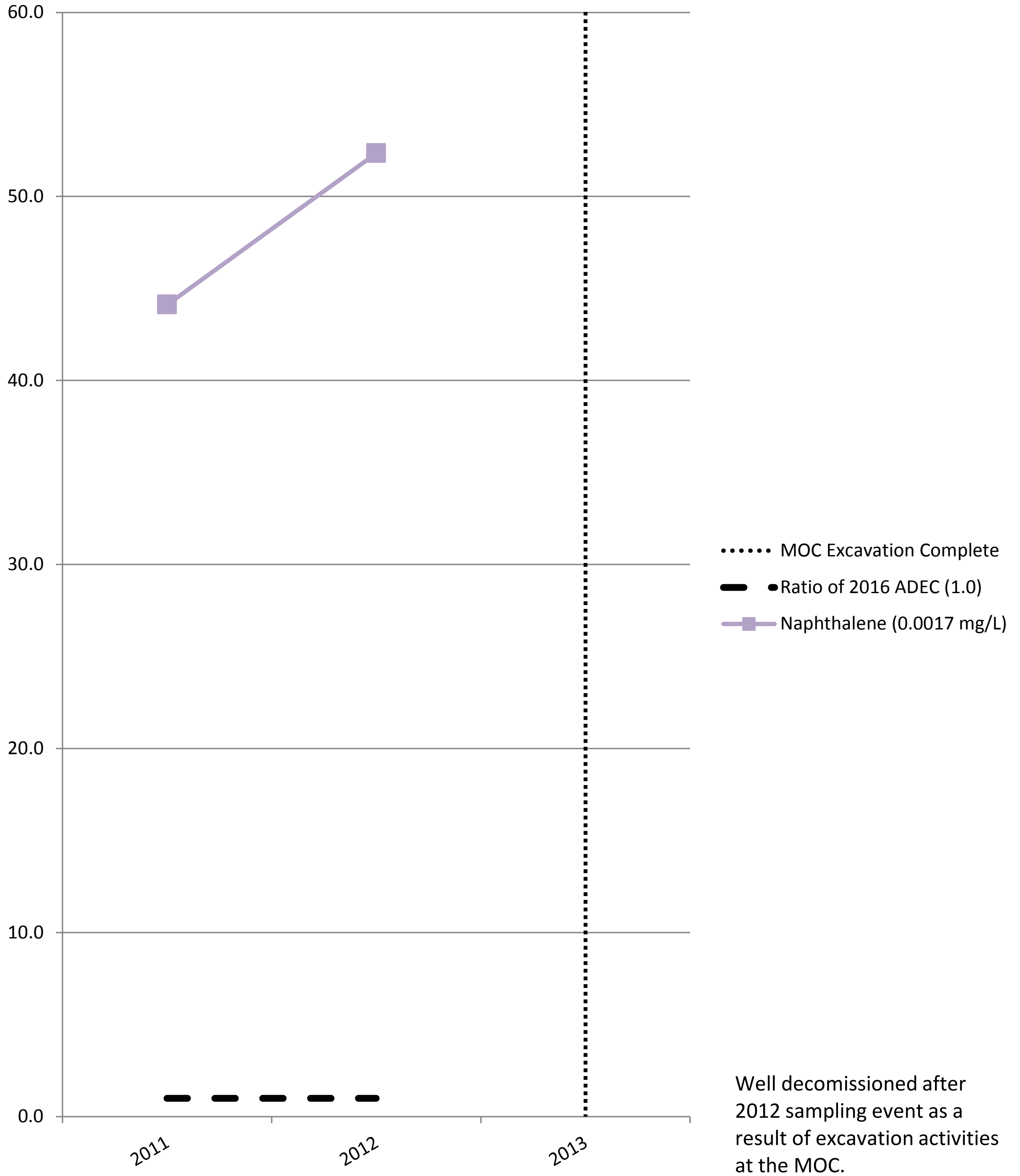
Contaminants without a detection from 2014 through 2016 are not displayed.

Plot C-3.3.5 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in In-Plume Monitoring Well 14MW06 Over Time



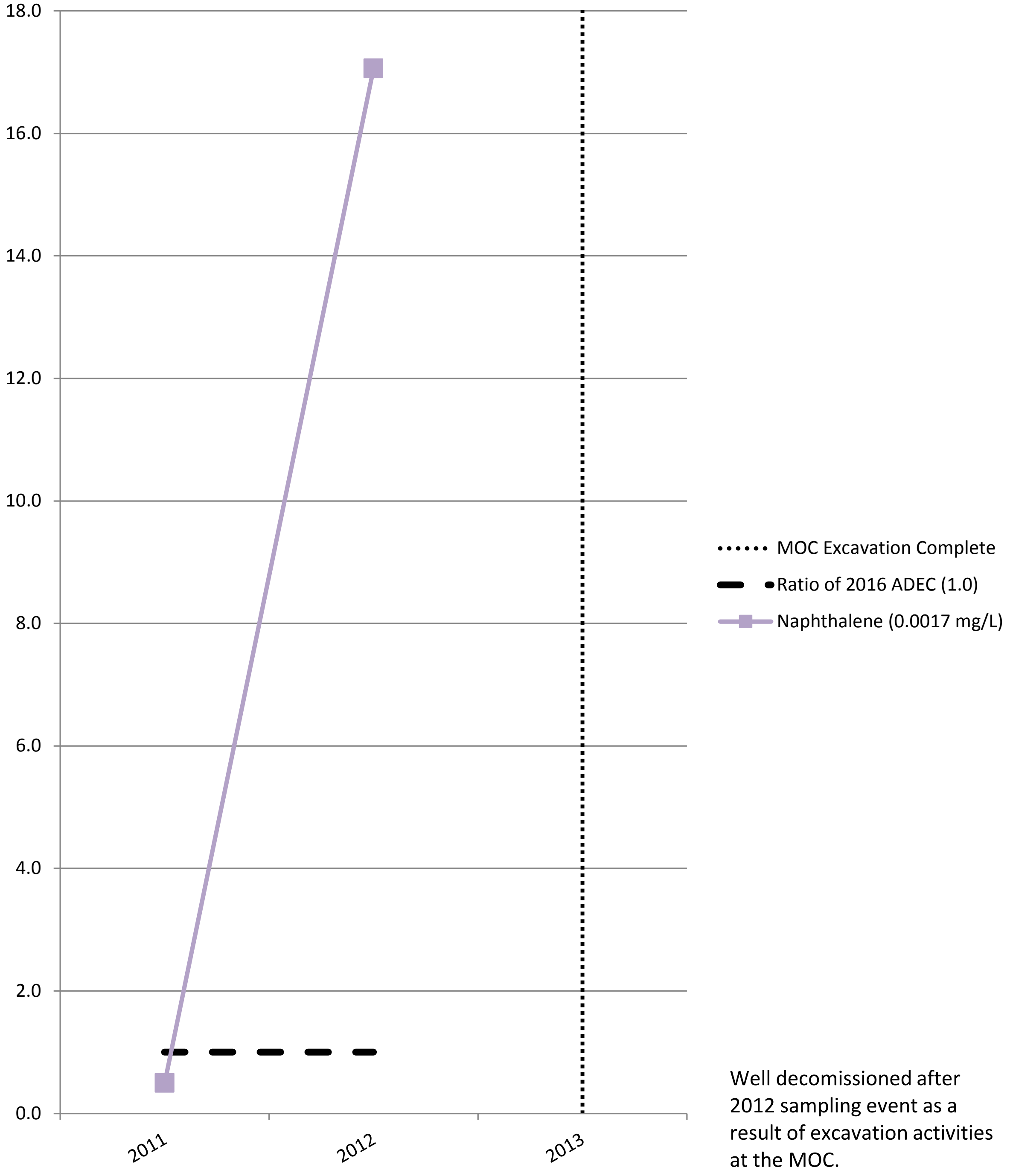
Non-detect values shown as open symbols.

Plot C-3.3.6 Ratio of Naphthalene to the 2016 Evaluation Criteria in Historical In-Plume Monitoring Well MW88-4 Over Time



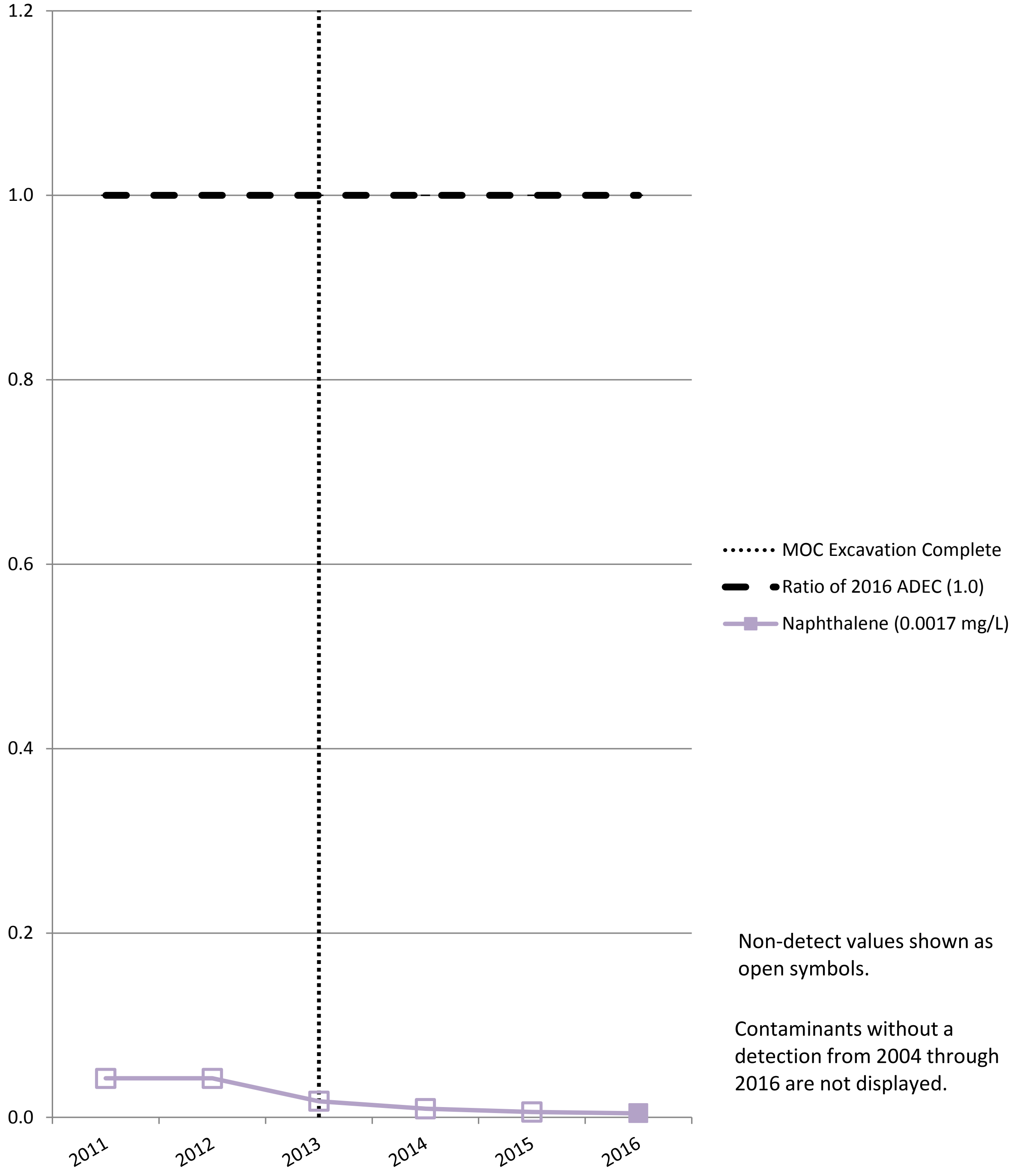
Well decomissioned after 2012 sampling event as a result of excavation activities at the MOC.

Plot C-3.3.7 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in Historical In-Plume Monitoring Well MW88-5 Over Time



Well decomissioned after 2012 sampling event as a result of excavation activities at the MOC.

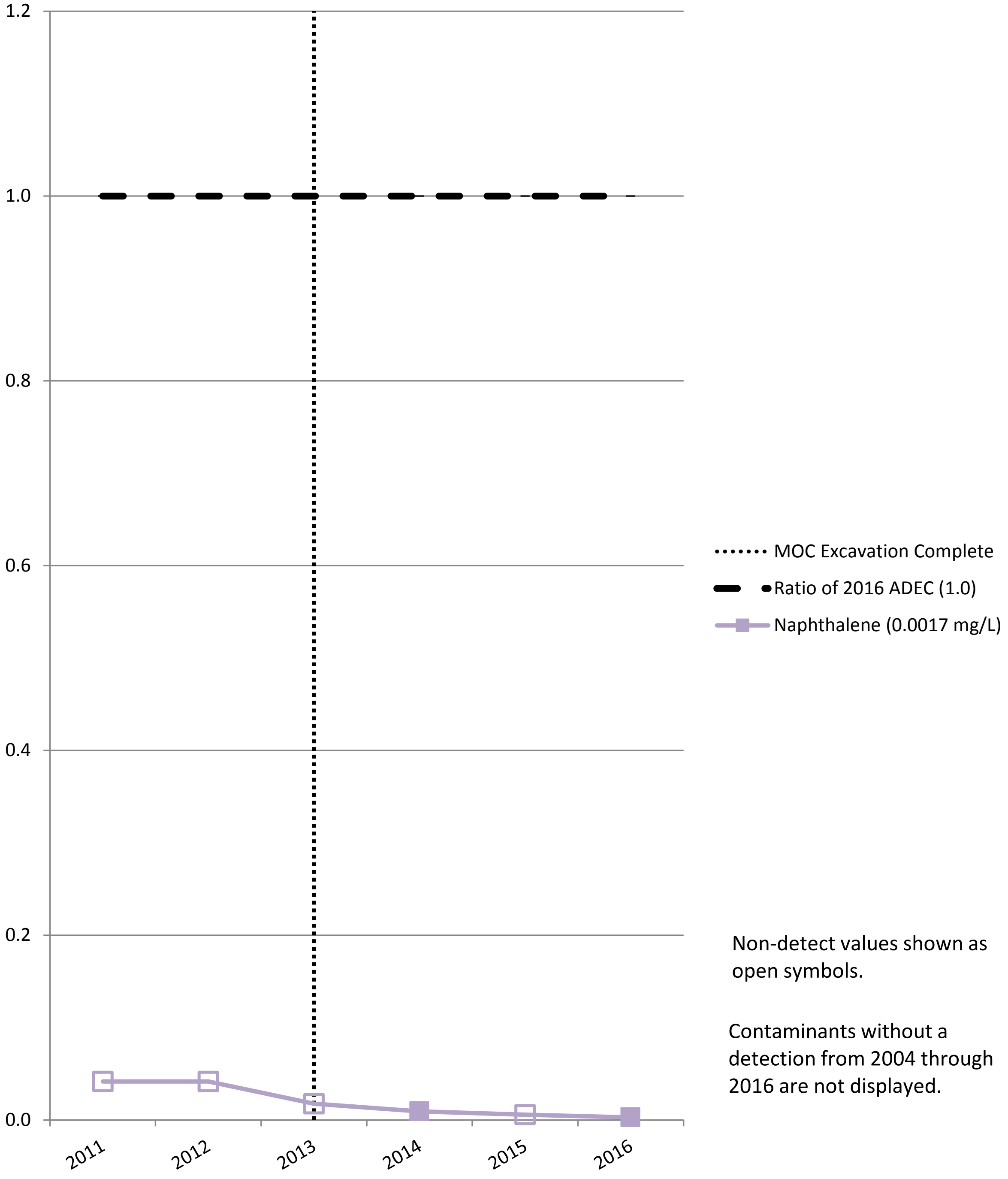
Plot C-3.3.8 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in Crossgradient Monitoring Well 17MW1 Over Time



Non-detect values shown as open symbols.

Contaminants without a detection from 2004 through 2016 are not displayed.

Plot C-3.3.9 Ratio of Naphthalene to the 2016 ADEC Evaluation Criteria in Crossgradient Monitoring Well MW10-1 Over Time



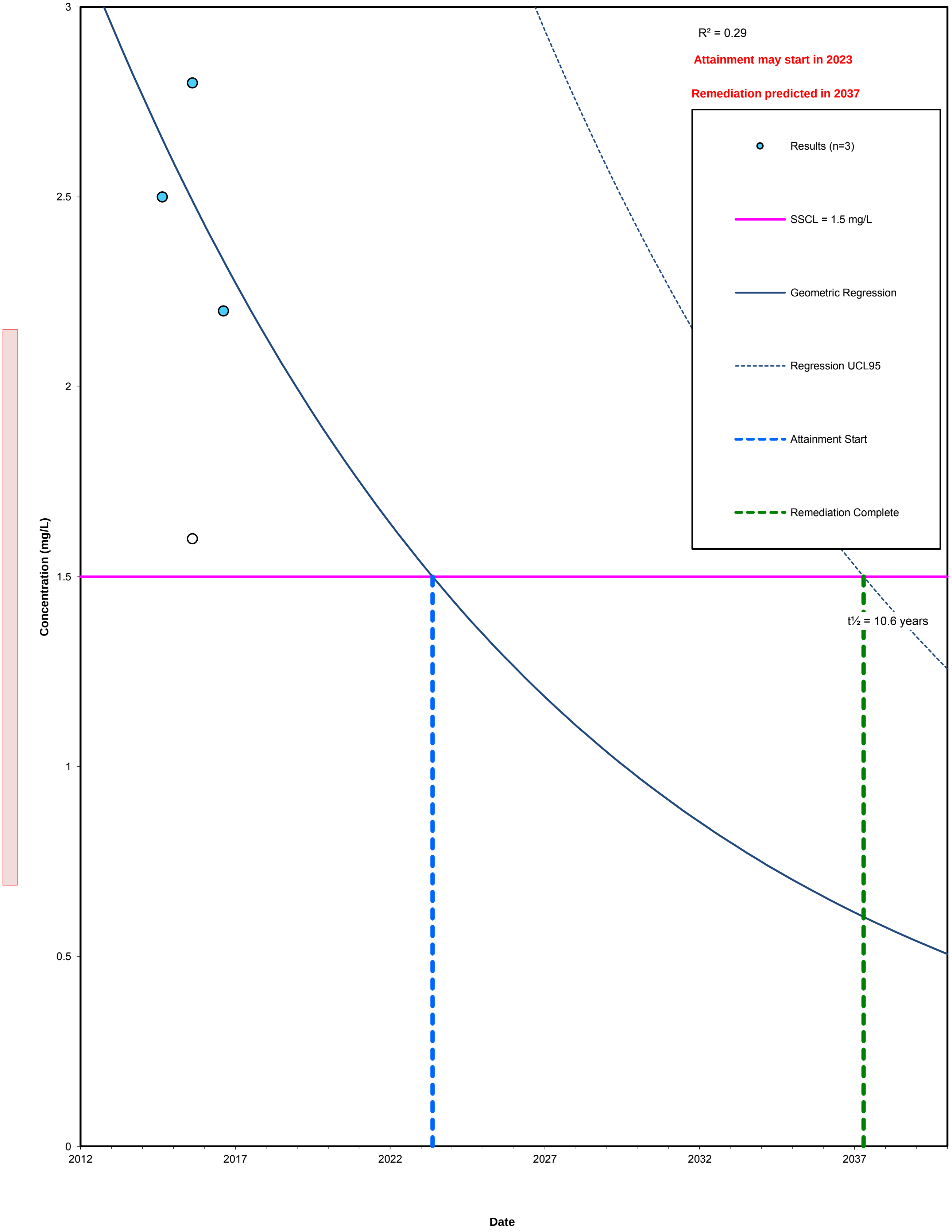
Non-detect values shown as open symbols.

Contaminants without a detection from 2004 through 2016 are not displayed.

ATTACHMENT C-4

DRO Trends Over Time

2016 Northeast Cape FUDS
Plot C-4.1.1 Well 14MW04 DRO



2016 Northeast Cape FUDS
Table C-4.1.1 Input Data

Statistical Geometric Regression to Evaluate Natural Attenuation

H. McLean with assistance from D. Ward; Jacobs Engineering January 2017

Plot Limits

	Year	X	Max Y
Start	2012	40910	3
End	2040	51138	2.8

NEC			
14MW04			
DRO			
Date	**mg/L**	**Qualifer**	**Log mg/L**
Included			11
8/23/2014	**2.5**		0.40
8/15/2015	**2.8**	**QN**	0.45
8/15/2016	**2.2**	**QL**	0.34
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
Excluded			
8/15/2015	**1.6**	**QL QN**	0.20
			#N/A

LinEst of Log COCs		
-7.77E-05	3.68	m (1/day), b
1.22E-04	5.17	se(m), se(b)
0.29	0.06	r², se(y intercept)
0.40	1	F,degrees of freedom
0.00	0.00	regression sum of squares, residual sum of squares
	0.06	Standard Deviation
	6.31	Student's t for one-tailed 95% confidence interval
	0.40	± for 95% CI

Cleanup Level	
Date	**DRO**
1/2/2012	**1.5**
1/3/2040	1.5

Goal Seek for Cleanup Dates

		Log			Linear			GoalSeek
Phase	**Date**	**-95%**	**Trend**	**+95%**	**-95%**	**Trend**	**+95%**	**Target**
Remed	4/18/2037	-0.61	-0.22	0.18	2.43E-01	6.04E-01	1.50E+00	1.000131
Attain	5/17/2023	-0.22	0.18	0.57	6.04E-01	1.50E+00	3.73E+00	1.000013

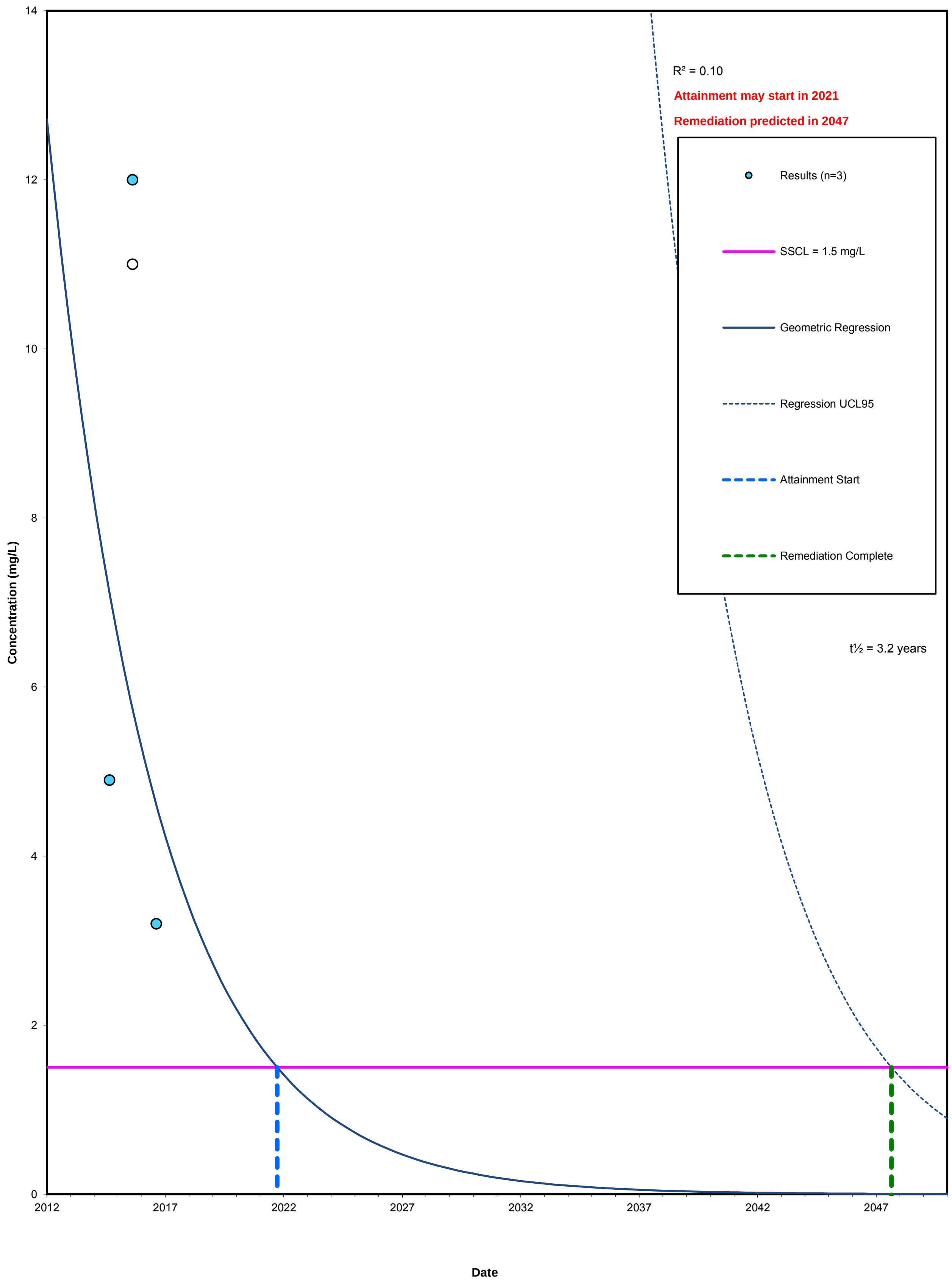
2016 Northeast Cape FUDS
Table C-4.1.2 Curve Data

	14MW04					
	Log			Linear		
Date	-95%	Trend	+95%	-95%	Trend	+95%
1/2/2012	0.10	0.50	0.89	1.269509654	3.152617943	7.82900694
5/5/2012	0.09	0.49	0.88	1.241504994	3.083072986	7.656303505
9/7/2012	0.08	0.48	0.87	1.214118101	3.015062151	7.487409809
1/10/2013	0.07	0.47	0.86	1.187335347	2.948551597	7.322241811
5/14/2013	0.06	0.46	0.85	1.161143405	2.883508228	7.160717326
9/16/2013	0.06	0.45	0.85	1.135529243	2.819899678	7.002755979
1/19/2014	0.05	0.44	0.84	1.110480114	2.757694296	6.848279169
5/24/2014	0.04	0.43	0.83	1.085983555	2.69686113	6.69721003
9/25/2014	0.03	0.42	0.82	1.062027376	2.637369909	6.54947339
1/28/2015	0.02	0.41	0.81	1.038599657	2.579191031	6.404995736
6/2/2015	0.01	0.40	0.80	1.01568874	2.522295545	6.263705177
10/5/2015	0.00	0.39	0.79	0.993283224	2.466655142	6.125531407
2/6/2016	-0.01	0.38	0.78	0.971371962	2.412242134	5.990405672
6/10/2016	-0.02	0.37	0.77	0.94994405	2.359029446	5.858260733
10/13/2016	-0.03	0.36	0.76	0.928988825	2.306990599	5.729030837
2/14/2017	-0.04	0.35	0.75	0.90849586	2.2560997	5.602651679
6/19/2017	-0.05	0.34	0.74	0.888454959	2.206331425	5.479060373
10/22/2017	-0.06	0.33	0.73	0.868856148	2.15766101	5.35819542
2/24/2018	-0.07	0.32	0.72	0.849689676	2.110064237	5.23999668
6/28/2018	-0.08	0.31	0.71	0.830946006	2.063517421	5.124405337
10/31/2018	-0.09	0.30	0.70	0.81261581	2.017997402	5.011363873
3/5/2019	-0.10	0.30	0.69	0.794689968	1.973481528	4.900816039
7/8/2019	-0.11	0.29	0.68	0.77715956	1.929947649	4.792706828
11/9/2019	-0.12	0.28	0.67	0.760015862	1.887374103	4.686982444
3/13/2020	-0.13	0.27	0.66	0.743250345	1.845739705	4.58359028
7/16/2020	-0.14	0.26	0.65	0.726854666	1.805023738	4.482478888
11/18/2020	-0.15	0.25	0.64	0.710820666	1.765205942	4.383597956
3/22/2021	-0.16	0.24	0.63	0.695140367	1.726266504	4.286898281
7/25/2021	-0.17	0.23	0.62	0.679805966	1.688186048	4.192331746
11/27/2021	-0.18	0.22	0.61	0.664809833	1.650945625	4.099851294
3/31/2022	-0.19	0.21	0.60	0.650144507	1.614526704	4.009410909
8/3/2022	-0.20	0.20	0.59	0.635802689	1.578911164	3.920965587
12/6/2022	-0.21	0.19	0.58	0.621777244	1.544081283	3.834471319
4/10/2023	-0.22	0.18	0.57	0.608061192	1.510019729	3.749885065
8/12/2023	-0.23	0.17	0.56	0.594647708	1.476709554	3.667164735
12/15/2023	-0.24	0.16	0.55	0.581530118	1.444134182	3.586269169
4/18/2024	-0.25	0.15	0.54	0.568701895	1.412277404	3.507158113
8/21/2024	-0.25	0.14	0.54	0.556156655	1.381123368	3.429792202
12/23/2024	-0.26	0.13	0.53	0.543888156	1.350656573	3.354132939
4/27/2025	-0.27	0.12	0.52	0.531890293	1.320861858	3.280142676
8/30/2025	-0.28	0.11	0.51	0.520157096	1.291724398	3.207784596
1/2/2026	-0.29	0.10	0.50	0.508682726	1.263229693	3.137022694
5/6/2026	-0.30	0.09	0.49	0.497461475	1.235363565	3.06782176
9/8/2026	-0.31	0.08	0.48	0.486487758	1.208112148	3.000147359
1/11/2027	-0.32	0.07	0.47	0.475756115	1.181461882	2.933965816
5/15/2027	-0.33	0.06	0.46	0.465261206	1.155399506	2.869244201
9/17/2027	-0.34	0.05	0.45	0.454997809	1.129912051	2.805950307
1/20/2028	-0.35	0.04	0.44	0.444960816	1.104986834	2.744052641

2016 Northeast Cape FUDS
Table C-4.1.2 Curve Data

	14MW04					
	Log			Linear		
Date	-95%	Trend	+95%	-95%	Trend	+95%
5/24/2028	-0.36	0.03	0.43	0.435145234	1.080611454	2.683520402
9/25/2028	-0.37	0.02	0.42	0.425546178	1.05677378	2.62432347
1/28/2029	-0.38	0.01	0.41	0.416158872	1.033461952	2.566432389
6/2/2029	-0.39	0.00	0.40	0.406978644	1.01066437	2.509818351
10/5/2029	-0.40	-0.01	0.39	0.398000927	0.988369689	2.454453187
2/6/2030	-0.41	-0.01	0.38	0.389221253	0.966566817	2.400309348
6/11/2030	-0.42	-0.02	0.37	0.380635254	0.945244903	2.34735989
10/14/2030	-0.43	-0.03	0.36	0.372238657	0.924393339	2.295578467
2/15/2031	-0.44	-0.04	0.35	0.364027284	0.904001748	2.244939313
6/20/2031	-0.45	-0.05	0.34	0.355997049	0.884059984	2.19541723
10/23/2031	-0.46	-0.06	0.33	0.348143957	0.864558124	2.146987576
2/25/2032	-0.47	-0.07	0.32	0.3404641	0.845486464	2.099626253
6/28/2032	-0.48	-0.08	0.31	0.332953655	0.826835514	2.053309693
10/31/2032	-0.49	-0.09	0.30	0.325608887	0.808595994	2.00801485
3/5/2033	-0.50	-0.10	0.29	0.318426141	0.790758826	1.963719186
7/8/2033	-0.51	-0.11	0.28	0.311401841	0.773315137	1.920400659
11/9/2033	-0.52	-0.12	0.27	0.304532494	0.756256245	1.878037714
3/14/2034	-0.53	-0.13	0.26	0.297814681	0.739573663	1.836609271
7/17/2034	-0.54	-0.14	0.25	0.291245058	0.723259089	1.796094716
11/19/2034	-0.55	-0.15	0.24	0.284820358	0.707304406	1.756473889
3/23/2035	-0.56	-0.16	0.23	0.278537383	0.691701673	1.717727076
7/26/2035	-0.56	-0.17	0.23	0.272393007	0.676443128	1.679834994
11/28/2035	-0.57	-0.18	0.22	0.266384172	0.661521178	1.642778791
3/31/2036	-0.58	-0.19	0.21	0.260507889	0.646928397	1.606540026
8/3/2036	-0.59	-0.20	0.20	0.254761234	0.632657525	1.571100668
12/6/2036	-0.60	-0.21	0.19	0.249141346	0.61870146	1.536443082
4/10/2037	-0.61	-0.22	0.18	0.24364543	0.605053258	1.502550022
8/12/2037	-0.62	-0.23	0.17	0.23827075	0.591706128	1.469404624
12/15/2037	-0.63	-0.24	0.16	0.233014633	0.578653428	1.436990395
4/19/2038	-0.64	-0.25	0.15	0.227874463	0.565888663	1.405291205
8/22/2038	-0.65	-0.26	0.14	0.222847682	0.553405481	1.374291281
12/24/2038	-0.66	-0.27	0.13	0.217931789	0.541197671	1.343975198
4/28/2039	-0.67	-0.28	0.12	0.213124338	0.529259159	1.31432787
8/31/2039	-0.68	-0.29	0.11	0.208422936	0.517584003	1.285334546
1/3/2040	-0.69	-0.30	0.10	0.203825245	0.506166394	1.256980797

2016 Northeast Cape FUDS
Plot C-4.2.1 Well 14MW05 DRO



2016 Northeast Cape FUDS
Table C-4.2.1 Input Data

Statistical Geometric Regression to Evaluate Natural Attenuation

H. McLean with assistance from D. Ward; Jacobs Engineering January 2017

Plot Limits

	Year	X	Max Y
Start	2012	40910	14
End	2050	54791	12

NEC			
14MW05			
DRO			
Date	**mg/L**	**Qualifer**	**Log mg/L**
Included			11
8/23/2014	4.9		0.69
8/15/2015	12		1.08
8/15/2016	3.2	QL	0.51
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
Excluded			
8/15/2015	11		1.04
			#N/A

LinEst of Log COCs		
-2.61E-04	11.80	m (1/day), b
7.67E-04	32.40	se(m), se(b)
0.10	0.39	r², se(y intercept)
0.12	1	F,degrees of freedom
0.02	0.15	regression sum of squares, residual sum of squares
	0.39	Standard Deviation
	6.31	Student's t for one-tailed 95% confidence interval
	2.48	± for 95% CI

Cleanup Level	
Date	**DRO**
1/2/2012	1.5
1/3/2050	1.5

Goal Seek for Cleanup Dates

		Log			Linear			GoalSeek
Phase	**Date**	**-95%**	**Trend**	**+95%**	**-95%**	**Trend**	**+95%**	**Target**
Remed	8/26/2047	-4.78	-2.30	0.18	1.67E-05	5.01E-03	1.50E+00	1.000247
Attain	9/22/2021	-2.30	0.18	2.65	5.01E-03	1.50E+00	4.49E+02	0.999466

2016 Northeast Cape FUDS
Table C-4.2.2 Curve Data

Date	14MW05					
	Log			Linear		
	-95%	Trend	+95%	-95%	Trend	+95%
1/2/2012	-1.37	1.10	3.58	0.0424711	12.71577	3807.076
4/18/2012	-1.40	1.08	3.55	0.0398071	11.91815	3568.271
8/4/2012	-1.43	1.05	3.52	0.0373101	11.17056	3344.444
11/19/2012	-1.46	1.02	3.50	0.0349697	10.46987	3134.658
3/7/2013	-1.48	0.99	3.47	0.0327762	9.813128	2938.031
6/23/2013	-1.51	0.96	3.44	0.0307203	9.197581	2753.737
10/8/2013	-1.54	0.94	3.41	0.0287933	8.620646	2581.004
1/24/2014	-1.57	0.91	3.38	0.0269872	8.0799	2419.106
5/11/2014	-1.60	0.88	3.36	0.0252943	7.573074	2267.363
8/27/2014	-1.63	0.85	3.33	0.0237077	7.098039	2125.139
12/13/2014	-1.65	0.82	3.30	0.0222206	6.652801	1991.835
3/30/2015	-1.68	0.79	3.27	0.0208268	6.235492	1866.894
7/16/2015	-1.71	0.77	3.24	0.0195204	5.844359	1749.789
10/31/2015	-1.74	0.74	3.21	0.0182959	5.477761	1640.031
2/16/2016	-1.77	0.71	3.19	0.0171483	5.134159	1537.157
6/3/2016	-1.79	0.68	3.16	0.0160726	4.812109	1440.736
9/18/2016	-1.82	0.65	3.13	0.0150644	4.510261	1350.363
1/4/2017	-1.85	0.63	3.10	0.0141195	4.227346	1265.659
4/21/2017	-1.88	0.60	3.07	0.0132338	3.962178	1186.268
8/7/2017	-1.91	0.57	3.05	0.0124037	3.713643	1111.857
11/23/2017	-1.93	0.54	3.02	0.0116257	3.480698	1042.114
3/10/2018	-1.96	0.51	2.99	0.0108964	3.262365	976.7455
6/26/2018	-1.99	0.49	2.96	0.0102129	3.057727	915.4774
10/11/2018	-2.02	0.46	2.93	0.0095723	2.865926	858.0524
1/27/2019	-2.05	0.43	2.91	0.0089719	2.686155	804.2295
5/15/2019	-2.08	0.40	2.88	0.0084091	2.517661	753.7827
8/30/2019	-2.10	0.37	2.85	0.0078816	2.359736	706.5003
12/16/2019	-2.13	0.34	2.82	0.0073872	2.211717	662.1838
4/1/2020	-2.16	0.32	2.79	0.0069238	2.072983	620.6471
7/18/2020	-2.19	0.29	2.76	0.0064895	1.942952	581.7158
11/3/2020	-2.22	0.26	2.74	0.0060825	1.821077	545.2267
2/18/2021	-2.24	0.23	2.71	0.0057009	1.706846	511.0263
6/6/2021	-2.27	0.20	2.68	0.0053433	1.599781	478.9712
9/21/2021	-2.30	0.18	2.65	0.0050082	1.499432	448.9269
1/7/2022	-2.33	0.15	2.62	0.004694	1.405377	420.7671
4/25/2022	-2.36	0.12	2.60	0.0043996	1.317222	394.3737
8/10/2022	-2.38	0.09	2.57	0.0041236	1.234597	369.6359
11/26/2022	-2.41	0.06	2.54	0.0038649	1.157155	346.4498
3/13/2023	-2.44	0.04	2.51	0.0036225	1.08457	324.7181
6/29/2023	-2.47	0.01	2.48	0.0033953	1.016539	304.3496
10/15/2023	-2.50	-0.02	2.46	0.0031823	0.952774	285.2587
1/30/2024	-2.53	-0.05	2.43	0.0029827	0.89301	267.3653
5/17/2024	-2.55	-0.08	2.40	0.0027956	0.836994	250.5943
9/2/2024	-2.58	-0.11	2.37	0.0026202	0.784492	234.8754
12/18/2024	-2.61	-0.13	2.34	0.0024559	0.735283	220.1424
4/5/2025	-2.64	-0.16	2.31	0.0023018	0.689161	206.3335
7/21/2025	-2.67	-0.19	2.29	0.0021574	0.645932	193.3909
11/6/2025	-2.69	-0.22	2.26	0.0020221	0.605415	181.2601
2/22/2026	-2.72	-0.25	2.23	0.0018953	0.567439	169.8902

2016 Northeast Cape FUDS
Plot C 2-4.2 Curve Data

Date	14MW05					
	Log			Linear		
	-95%	Trend	+95%	-95%	Trend	+95%
6/9/2026	-2.75	-0.27	2.20	0.0017764	0.531846	159.2335
9/25/2026	-2.78	-0.30	2.17	0.001665	0.498485	149.2453
1/10/2027	-2.81	-0.33	2.15	0.0015605	0.467216	139.8836
4/28/2027	-2.83	-0.36	2.12	0.0014626	0.437909	131.1092
8/14/2027	-2.86	-0.39	2.09	0.0013709	0.410441	122.8851
11/29/2027	-2.89	-0.41	2.06	0.0012849	0.384695	115.1769
3/16/2028	-2.92	-0.44	2.03	0.0012043	0.360564	107.9522
7/1/2028	-2.95	-0.47	2.01	0.0011288	0.337947	101.1807
10/17/2028	-2.98	-0.50	1.98	0.001058	0.316749	94.83399
2/2/2029	-3.00	-0.53	1.95	0.0009916	0.29688	88.88535
5/20/2029	-3.03	-0.56	1.92	0.0009294	0.278258	83.30985
9/5/2029	-3.06	-0.58	1.89	0.0008711	0.260804	78.08409
12/21/2029	-3.09	-0.61	1.86	0.0008165	0.244444	73.18612
4/8/2030	-3.12	-0.64	1.84	0.0007652	0.229111	68.59539
7/25/2030	-3.14	-0.67	1.81	0.0007172	0.21474	64.29262
11/9/2030	-3.17	-0.70	1.78	0.0006722	0.20127	60.25974
2/25/2031	-3.20	-0.72	1.75	0.0006301	0.188645	56.47984
6/12/2031	-3.23	-0.75	1.72	0.0005906	0.176812	52.93704
9/28/2031	-3.26	-0.78	1.70	0.0005535	0.165721	49.61647
1/14/2032	-3.29	-0.81	1.67	0.0005188	0.155326	46.50418
4/30/2032	-3.31	-0.84	1.64	0.0004863	0.145583	43.58712
8/16/2032	-3.34	-0.87	1.61	0.0004557	0.136451	40.85304
12/1/2032	-3.37	-0.89	1.58	0.0004272	0.127892	38.29046
3/19/2033	-3.40	-0.92	1.55	0.0004004	0.119869	35.88862
7/5/2033	-3.43	-0.95	1.53	0.0003753	0.11235	33.63744
10/20/2033	-3.45	-0.98	1.50	0.0003517	0.105303	31.52747
2/5/2034	-3.48	-1.01	1.47	0.0003297	0.098698	29.54985
5/23/2034	-3.51	-1.03	1.44	0.000309	0.092507	27.69628
9/8/2034	-3.54	-1.06	1.41	0.0002896	0.086704	25.95898
12/25/2034	-3.57	-1.09	1.39	0.0002714	0.081265	24.33066
4/11/2035	-3.59	-1.12	1.36	0.0002544	0.076168	22.80447
7/28/2035	-3.62	-1.15	1.33	0.0002384	0.07139	21.37402
11/12/2035	-3.65	-1.17	1.30	0.0002235	0.066912	20.03329
2/28/2036	-3.68	-1.20	1.27	0.0002095	0.062715	18.77667
6/15/2036	-3.71	-1.23	1.25	0.0001963	0.058781	17.59887
9/30/2036	-3.74	-1.26	1.22	0.000184	0.055094	16.49495
1/16/2037	-3.76	-1.29	1.19	0.0001725	0.051638	15.46027
5/4/2037	-3.79	-1.32	1.16	0.0001617	0.048399	14.4905
8/19/2037	-3.82	-1.34	1.13	0.0001515	0.045363	13.58155
12/5/2037	-3.85	-1.37	1.10	0.000142	0.042517	12.72963
3/22/2038	-3.88	-1.40	1.08	0.0001331	0.03985	11.93114
7/8/2038	-3.90	-1.43	1.05	0.0001248	0.037351	11.18273
10/24/2038	-3.93	-1.46	1.02	0.0001169	0.035008	10.48128
2/8/2039	-3.96	-1.48	0.99	0.0001096	0.032812	9.82382
5/27/2039	-3.99	-1.51	0.96	0.0001027	0.030754	9.207603
9/11/2039	-4.02	-1.54	0.94	9.628E-05	0.028825	8.630039
12/28/2039	-4.04	-1.57	0.91	9.024E-05	0.027017	8.088704
4/14/2040	-4.07	-1.60	0.88	8.458E-05	0.025322	7.581325
7/30/2040	-4.10	-1.62	0.85	7.927E-05	0.023734	7.105773

2016 Northeast Cape FUDS
Plot C 2-4.2 Curve Data

	14MW05					
	Log			Linear		
Date	-95%	Trend	+95%	-95%	Trend	+95%
11/15/2040	-4.13	-1.65	0.82	7.43E-05	0.022245	6.66005
3/2/2041	-4.16	-1.68	0.80	6.964E-05	0.020849	6.242286
6/18/2041	-4.19	-1.71	0.77	6.527E-05	0.019542	5.850727
10/4/2041	-4.21	-1.74	0.74	6.118E-05	0.018316	5.48373
1/19/2042	-4.24	-1.77	0.71	5.734E-05	0.017167	5.139753
5/7/2042	-4.27	-1.79	0.68	5.374E-05	0.01609	4.817352
8/22/2042	-4.30	-1.82	0.65	5.037E-05	0.015081	4.515175
12/8/2042	-4.33	-1.85	0.63	4.721E-05	0.014135	4.231952
3/26/2043	-4.35	-1.88	0.60	4.425E-05	0.013248	3.966495
7/11/2043	-4.38	-1.91	0.57	4.147E-05	0.012417	3.71769
10/27/2043	-4.41	-1.93	0.54	3.887E-05	0.011638	3.484491
2/11/2044	-4.44	-1.96	0.51	3.643E-05	0.010908	3.26592
5/29/2044	-4.47	-1.99	0.49	3.415E-05	0.010224	3.061059
9/14/2044	-4.49	-2.02	0.46	3.201E-05	0.009583	2.869048
12/30/2044	-4.52	-2.05	0.43	3E-05	0.008982	2.689082
4/17/2045	-4.55	-2.07	0.40	2.812E-05	0.008418	2.520404
8/2/2045	-4.58	-2.10	0.37	2.635E-05	0.00789	2.362307
11/18/2045	-4.61	-2.13	0.35	2.47E-05	0.007395	2.214127
3/6/2046	-4.64	-2.16	0.32	2.315E-05	0.006931	2.075242
6/21/2046	-4.66	-2.19	0.29	2.17E-05	0.006497	1.945069
10/7/2046	-4.69	-2.22	0.26	2.034E-05	0.006089	1.823061
1/22/2047	-4.72	-2.24	0.23	1.906E-05	0.005707	1.708706
5/10/2047	-4.75	-2.27	0.20	1.787E-05	0.005349	1.601524
8/26/2047	-4.78	-2.30	0.18	1.675E-05	0.005014	1.501066
12/11/2047	-4.80	-2.33	0.15	1.57E-05	0.004699	1.406909
3/28/2048	-4.83	-2.36	0.12	1.471E-05	0.004404	1.318658
7/13/2048	-4.86	-2.38	0.09	1.379E-05	0.004128	1.235942
10/29/2048	-4.89	-2.41	0.06	1.292E-05	0.003869	1.158416
2/14/2049	-4.92	-2.44	0.04	1.211E-05	0.003626	1.085752
6/1/2049	-4.94	-2.47	0.01	1.135E-05	0.003399	1.017646
9/17/2049	-4.97	-2.50	-0.02	1.064E-05	0.003186	0.953812
1/3/2050	-5.00	-2.52	-0.05	9.973E-06	0.002986	0.893983

2016 Northeast Cape FUDS
Table C-4.3.1 Input Data

Mann-Kendall Input Data

Time	14MW02	14MW04	14MW05
Year	DRO (mg/L)		
0	1.3	2.5	4.9
1	1.6	2.8	12
2	1.6	2.2	3.2

mg/L = milligram per liter

DRO = diesel range organics

2016 Northeast Cape FUDS
Table C-4.3.2 Trend Test Analysis 14MW02

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.18/24/2017 8:00:42 AM
From File	2017 NE Cape DRO Groundwater.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW02 - DRO

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	3
Number Values Reported (n)	3
Minimum	1.3
Maximum	1.6
Mean	1.5
Geometric Mean	1.493
Median	1.6
Standard Deviation	0.173
Coefficient of Variation	0.115

Mann-Kendall Test

M-K Test Value (S)	2
Tabulated p-value	N/A
Standard Deviation of S	1.633
Standardized Value of S	0.612
Approximate p-value	0.27

Insufficient evidence to identify a significant trend at the specified level of significance.

2016 Northeast Cape FUDS
Table C-4.3.3 Trend Test Analysis 14MW04

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.18/24/2017 7:51:05 AM
From File	2017 Ne Cape DRO Groundwater.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW04 - DRO

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	3
Number Values Reported (n)	3
Minimum	2.2
Maximum	2.8
Mean	2.5
Geometric Mean	2.488
Median	2.5
Standard Deviation	0.3
Coefficient of Variation	0.12

Mann-Kendall Test

M-K Test Value (S)	-1
Tabulated p-value	N/A
Standard Deviation of S	1.915
Standardized Value of S	0
Approximate p-value	0.5

Insufficient evidence to identify a significant trend at the specified level of significance.

2016 Northeast Cape FUDS
Table C-4.3.4 Trend Test Analysis 14MW05

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.18/24/2017 7:51:54 AM
From File	2017 Ne Cape DRO Groundwater.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW05 - DRO

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	3
Number Values Reported (n)	3
Minimum	3.2
Maximum	12
Mean	6.7
Geometric Mean	5.73
Median	4.9
Standard Deviation	4.668
Coefficient of Variation	0.697

Mann-Kendall Test

M-K Test Value (S)	-1
Tabulated p-value	N/A
Standard Deviation of S	1.915
Standardized Value of S	0
Approximate p-value	0.5

Insufficient evidence to identify a significant
trend at the specified level of significance.

APPENDIX D
Field Documentation

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- MOC	MOC MNA Sampling	14MW07	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)** 11231	**Date**	**Sampler Initials**
overcast, calm	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/13/2016	CC, HM

Well Information

Screened 23-33'

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
[✓ Good] Fair Poor	(-0.25)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
——	25.35	33.2 (final)	——

Max Purge Volume = (33 ft – 25.35 ft) • 0.163 gal/ft • 3 = 3.74 gal • 3.785 L/gal = 14.16 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

No sheen

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1746	1815	26.5	Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	[✓ Yes] ~~No~~ HM 8/13/2016 / Yes [✓ No]	YSI Multi Meter 096101665 Hach Turbidimeter 17396

Purging reached: [✓ Stability] Max Vol. | Purge water was: [✓ Treated] Stored Other Note: GAC Filter

Time (HH:mm)	Volume (Gallons or [✓ Liters]) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize) ± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
1749	0.5	0.5								25.5
1755	2.25	2.75	~~38~~ 375 HM 8/13	4.16	57	10.81	5.59	160.8	15.4	25.51
1800	2.5	5.25	500	3.76	53	10.21	5.36	181.2	6.7	25.52
1805	2.5	7.75	500	3.81	52	10.24	5.36	185.6	4.52	25.52
1810	2.25	10.0	450	3.74	52	10.09	5.42	187.7	3.35	25.51
+	2.0	12.0								

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1815	1832 / 8/13/2016	26.5	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-14MW07-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.0 ppm

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA Vial w/ HCl	SW8260 / AK101 / RSK175	BTEX, GRO, Methane
3- 1L amber	SW8270D SIM / 8082	PAHs, PCBs
2-250 mL amber w/ HCl	AK102 / 103	DRO, RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate, Alkalinity
2- " " w/ HNO_3	SW 6020 / 7470	Total Metals RCRA 8 Ni, V, Zn Diss. ↓ ↓, Mn

Nitrate = 0.1 mg/L

1848

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- MOC	MOC MNA Sampling	MW88-1	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)** 910685	**Date**	**Sampler Initials**
Overcast, light wind.	Ambient 0.0 Breathing Zone 0.0 In Well 0.2	8/13/2016	CC, HM

Well Information

casing frost jacked and cover will not close.

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.15)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
—	16.71	23.20 (final)	—

Max Purge Volume = (20.5 ft – 16.71 ft) * 0.163 gal/ft * 3 = 1.85 gal * 3.785 L/gal = 7.01 L

(20.5 = Previous Total Depth; 16.71 = Depth to Water or Depth to Top of Filter Pack; 0.163 = Gallons per Ft; 1.85 = Max Purge Vol; 7.01 = Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1553	1628	17.75		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No]	Yes [✓ No]	YSI Multi Meter 096101665 Hach Turbidimeter 17396

Purging reached: [✓ Stability] [✓ Max Vol.] Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters]) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
1556	2.0	2.0								16.71
1604	1.5	3.5	188	5.54	58	6.21	5.08	177.4	6.68	16.74
1609	1.25	4.75	250	5.86	58	~~37.8~~ 4.63 HM 8/13	5.22	177.1	3.14	16.74
1614	1.75	6.5	350	6.10	58	4.33	5.22	180.1	0.14*	16.74
HM 8/13/16 ~~1615~~ 1619	1.75	8.25	350	6.15	58	4.09	5.23	183.7	2.19	16.74
+	1.25	9.5								

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1628	1647 / 8/13/2016	17.75'	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-MW88-1-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.1 ppm

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/HCl	SW8260/AK101/RSK175	BTEX / GRO/ Methane
3-1L amber	SW8270DSIM / 8082	PAH/ PCB
2-250 mL amber w/HCl	AK 102 / 103	DRO/ RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate/Alkalinity
2-250 mL HDPE w/ HNO_3	SW 6020 / 7470	Total RCRA Metals & Ni, V, Zn Diss ↓ ↓ ↓ ↓ ↓ & Mn

Suggested Notation: * E6 error. Verified check stds to be reading ok.

"——" = not measured "✓"= stable "+" = rising "-" = falling Nitrate = 0.2 ppm 1703

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	14MW06	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast, 500' ceiling, 50°F light breeze	Ambient 0.0 Breathing Zone 0.0 In Well 18.9	8/13/16	KR, SS

Well Information

Screened 5-15'

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.50)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	3.40	14.74 (final)	N/A

Max Purge Volume = (15 ft – 3.40 ft) • 0.163 gal/ft • 3 = 5.67 gal • 3.785 L/gal = ~~870~~ L HM 8/15/2016 21.5 L

Previous Total Depth / Depth to Water or Depth to Top of Filter Pack / Gallons per Ft / Max Purge Vol / Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1232	1302	5.0		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate [✓ Faint] Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3% ✓	± 10% or 0.1 mg/L x	± 0.1 ✓	± 10 mV ✓	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	(feet btoc)
1233		200	200/min	9.95	259	1.34	6.55	99.4	12.4	3.50
1236		800	200/min	9.48	251	1.26	6.32	97.1	9.95	3.53
1240		1500	225/min	9.41	245	0.88	6.24	87.7	6.07	3.53
1244		2500	250/min	9.32	241	0.83	6.37	72.3	4.69	3.53
1248		3250	250/min	9.30	238	0.85	6.50	60.8	3.77	3.53
1252		4100	250/min	9.31	236	0.73	6.57	52.7	3.30	3.53
1256		4800	250/min	9.29	235	0.58	6.57	49.7	2.68	3.53
1300		5500	250/min	9.33	235	0.45	6.57	47.2	2.29	3.53
Sampled @		1310								

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1310	1417 / 8/13/2016	5.5	Peristaltic Pump [✓ Submersible Pump]

SAMPLE ID: 16NEC- 14MW06 - WG(-9) QC: [✓ Dup] MS/MSD Ferrous Iron (Fe^{2+}) (mg/L) = 2 mg/L

Limited volume: vial cap broke

x 2

Container/Preservative	Analysis Requested	Notes
* 8-40 mL VOA vials w/ HCl	SW8260, AK101, RSK175	VOCs, GRO, Methane
2-40 mL VOA vials	SW8015	Glycol
3-1L ambers	SW8270DSIM, SW8082	PAHs, PCBs
2-250 mL ambers w/ HCl	AK102, AK103	DRO, RRO
1-250 mL HDPE	EPA 300.0, EPA 310.1	Sulfate, Alkalinity
2-250 mL HDPE w/ HNO_3	SW6020, SW7470	Total RCRA metals plus Ni, V, Zn
		Diss. RCRA metals plus Mn, Ni, V, Zn

Suggested Notation:

Nitrate - 0.2 mg/L

"——" = not measured "✓" = stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	MW88-3	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast, light wind, light showers	Ambient 0.0 Breathing Zone 0.0 In Well 6.0	~~8/15/16~~ HM 8/16	KR, CC

Well Information

8/16/2016

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.2)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	12.05	19.52 (final)	N/A

Max Purge Volume = (19.45 ft – 12.05 ft) • 0.163 gal/ft • 3 = ~~1.21~~ 3.62 gal • 3.785 L/gal = ~~4.56~~ 13.69 L
(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
~~1223~~ 1233	1327	14.00		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear [✓ Cloudy] Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: Stability Max Vol. | Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or Liters)		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			✓ Conductivity (µS/cm)	DO (mg/L)	✓ pH (std units)	+ ORP (mV) ✓	Turbidity (NTU)	(feet btoc)
1235		1.500	300	4.00	66	4.01	4.81	228.5	~~4.37~~ 437	12.03
1240		3.00	300	3.68	63	2.24	4.10	280.7	204	12.26
1245		4.300	260	3.78	62	2.45	4.33	265.3	137	12.22
1250		6.700	480	3.90	62	2.58	4.62	245.3	85.2	12.22
1255		7.600	180	3.97	62	2.80	4.04	229.7	53.2	12.21
1300		8.200	~~320~~ 120	3.84	60	3.22	4.92	227.4	45.2	12.29
1305		9.800	320	3.47	58	3.68	4.86	229.8	Error code 7	12.30
1310		11.700	380	3.46	57	3.99	4.75	233.4	14.5	12.29
1315		13.00	260	3.33	57	4.16	4.90	224.3	12.3	12.30
1320		15.000	400	3.33	57	4.52	4.96	219.6	9.34	12.30
1325		16.600		3.25	57	~~5.20~~ 4.70	5.00	218.1	7.98	12.31
Total purge = ~~??~~ 17.5L Purged clear Sampled @ 1330										

NTU 25.6

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1330	1405 / 8/16/2016	14.00	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-MW88-3-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.0 mg/L

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/ HCl	SW8260, AK101, RSK 175	BTEX, GRO, Methane
3-1 L amber	SW8270D SIM / 8082	PAHs, PCBs
2-250 mL amber w/ HCl	AK 102/103	DRO, RRO
1-250 HDPE	EPA 300.0/310.1	Sulfate, Alkalinity
2-250 HDPE w/ HNO_3	SW6020/7470	Total RCRA plus Ni, V, & Zn Dissolved RCRA " " & Mn.

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate = 0.0 mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	14MW05	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, Windy 40°F	Ambient 0.0 Breathing Zone 0.0 In Well 23.0	8/15/16	KR, CC

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.52)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	3.06	14.55 (final)	N/A

Max Purge Volume = (15' ft – ~~14.5~~ 3.06 ft) • 0.163 gal/ft • 3 = 5.84 gal • 3.785 L/gal = 22.10 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1508	1552	5.00	Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	None Moderate [✓ Faint] Strong	Yes [✓ No] / Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity ✓ (µS/cm) ✓	✓ DO (mg/L)	✓ pH (std units)	✩ ORP (mV) ✓	Turbidity (NTU)	(feet btoc)
1510		0.200	180	7.92	102	1.36	5.73	99.3	17.6	3.20
1515		1.100	180	7.65	108	1.10	5.72	101.1	16.8	3.13
1520		1.900	160	7.57	112	0.95	5.74	108.7	21.3	3.2
1525		2.700	160	7.44	115	0.81	5.77	89.7	10.1	3.31
1530		4.100	280	7.03	116	0.65	5.79	97.6	13.3	3.22
1535		4.900	160	7.05	118	0.44	5.82	90.5	11.0	3.30
1540		6.300	280	6.94	121	0.47	5.83	79.7	10.4	3.31
1545		7.700	280	6.86	125	0.47	5.85	75.6	9.45	3.30
1550		9.00	260	6.82	127	0.46	5.87	~~7H6~~ 71.6	8.45	3.30

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1553	1635 / 8/15/16	~~4~~ 5.00	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-14MW05-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 10.0+ mg/L

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/HCL	SW8260, AK101, RSK175	BTEX, GRO, methane
3-1L amber	SW8270D SIM/SW8082	PAHs + PCBs
2-250 mL amber w/HCL	AK102/103	DRO/RRO
1-250 mL HDPE	EPA 300.0/310.1	Sulfate + Alkalinity
2-250 mL HDPE w/HNO3	SW6020/7470	Total metals RCRA "Dissolved"

Suggested Notation:

Nitrates = 0.0 mg/L

"——" = not measured "✓" = stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	22MW2	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, Windy 45°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/14/16	KR, SS, CC

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.45)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	27.25	34.49 (final)	N/A

Max Purge Volume = (34.2 ft – 27.25 ft) • 0.163 gal/ft • 3 = 1.13 gal • 3.785 L/gal = 4.29 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1510	1536	28.5	Bailer Peristaltic Pump [✓ Submersible Pump]

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow	Temperature (°C)	Water Quality (three must stabilize)					Water Level
	Change	Total	(0.013-0.13 gpm, 50-500 mL/min)		± 3% Conductivity (µS/cm) ✓	± 10% or 0.1 mg/L DO (mg/L) ✓	± 0.1 pH (std units)	± 10 mV ORP (mV) ✓	± 10% or 0.5 NTU Turbidity (NTU)	Drawdown < 0.3 ft (feet btoc)
1514		0.2	.125	4.66	58	14.01	5.86	221.1	14.8	27.25
1519		1.1	.125	4.40	57	12.69	5.53	241.3	17.1	27.25
1524		2.25	225/min	4.49	56.	12.45	5.40	239.2	5.63	27.26
1529		3.1	225/min	4.49	55	12.33	5.47	232.6	3.98	27.27
1534		4.0	225/min	4.50	55	12.15	5.52	230.6	2.95	27.27
Sampled @ 1542										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1542	1617 8/14/16	28.5	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-22MW2-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 6.0

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/HCl	SW8260/AK101/RSK175	BTEX/ GRO/ Methane
3-1 L amber	SW8270DSIM/8082	PAHs/ PCBs
2-250 mL amber w/HCl	AK 102/103	DRO/ RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate / Alkalinity
2-250 mL HDPE w/HNO_3	SW6020/7470	Total Metals RCRA & Ni, V, Zn
		Diss. Metals RCRA & Mn, Ni, V, Zn

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

Nitrate = 0.1 mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- MOC	MOC MNA Sampling	MW10-1	0SDK8702

Weather Conditions	PID Readings of Total VOCs (ppm) 910685	Date	Sampler Initials
Overcast, light wind	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/13/2016	CC, HM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
[✓ Good] Fair Poor	2.20	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47

Depth to Product (ft)	Depth to GW (ft btoc)	Total Depth of Casing (ft btoc)	Product Thickness (ft) and Volume Recovered (mL)
NA	5.20	11.0 (final)	—

Max Purge Volume = (10.75 ft – 5.20 btoc ft) • 0.163 gal/ft • 3 = 2.71 gal • 3.785 L/gal = 10.3 L
(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1221	1254	6.25'	Bailer Peristaltic Pump [✓ Submersible Pump]

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	[✓ Yes] — slight ~~No~~ HM 8/13	Yes [✓ No]	YSI Multi Meter 09G101665 Hach Turbidimeter 17212

Purging reached: [✓ Stability] Max Vol. | Purge water was: [✓ Treated] Stored Other | Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters]) Change	Total	Flow (0.013-0.13 gpm, 50-500 [✓ mL/min])	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
1226	1.25	1.25								5.42
1231	1.25	2.5	250	10.10	72 ~~0.1010~~ HM 8/13/16	5.82	5.23	215.9	8.03	5.8
1236	1.2	3.7	240	10.28	~~72~~ 71	~~5~~4.88	5.19	224.8	7.10	5.75
1241	0.5	4.2	100	10.31	71	4.68	5.26	225.5	11.3	5.70
1247	0.75	4.95	125	10.03	69	4.75	5.25	225.1	11.1	5.72
1254	1.0	5.95	143							

Lowered tubing 0.3 ft & reduced flow.

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1254	1350 / 8/13/2016	Start 6.25' End	Peristaltic Pump [✓ Submersible Pump]

SAMPLE ID: 16NEC-MW10-1-WG | QC: Dup [✓ MS/MSD] | Ferrous Iron (Fe^{2+}) (mg/L) = 0.0 ppm

Container/Preservative	Analysis Requested	Notes
* 8-40 mL VOAS w/HCl 2-40 mL VOA	SW8260, AK101, RSK 175	VOCs, GRO, Methane
3-1L amber	SW8015	Glycols
	SW8270 ~~D~~ DSIM, SW 8082	PAHs, PCBs
2-250 mL amber w/ HCl	AK 102, AK 103	DRO, RRO
1-250 mL HDPE	EPA 300.0, EPA 310.1	Sulfate, Alkalinity
2-250mL amber w/ HNO_3	SW6020, SW ~~7470~~	Total RCRA plus Ni, V, & Zn Diss. RCRA plus Mn, Ni, V, & Zn

*Limited Volume: 1 vial cap broke

x3

Nitrate = 0.2 mg/L

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC - MOC	MOC MNA Sampling	20MW-1	0SDK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast, windy, 45°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/14/16	KR, SS, CC

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.15)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	22.26	29.13 (final)	N/A

Max Purge Volume = (24.5 ft – 22.26 ft) * 0.163 gal/ft * 3 = 1.095 gal * 3.785 L/gal = 4.14 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1823	1855	23.5		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] [✓ Max Vol] Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3% ✓	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm)	DO (mg/L) ✓	pH (std units) ✓	ORP (mV) ✓	Turbidity (NTU)	(feet btoc)
1828		1.200		4.08	73	13.00	5.60	225.4	52.8	22.42
1833		2.300		4.17	73	11.78	5.29	247.2	34.2	22.40
1838		3,360	200/min	4.39	73	11.56	5.33	245.0	17.3	22.40
1843		4.400	225/min	4.46	73	11.60	5.51	226.9	12.3	22.40
1848		6.500	250/min	4.54	73	11.37	5.57	230.0	9.12	22.40
1853		6100		4.63	73	11.65	5.60	222.5	6.05	22.38
End Purging @ 1855, Total purge volume = 6.6L Sampled @ 1858										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1858	1922/8/14/2016	23.5	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-20MW-1-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.0

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/ HCl	SW8260/AK101/ RSK 175	BTEX HM 8/11 ~~VOCs~~ / GRO / Methane
3-1L amber	SW8270DSIM / 8082	PAHs / PCBs
2-250 mL amber w/ HCl	AK 102 /103	DRO / RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate / Alkalinity
2-250 mL HDPE w/ HNO_3	SW6020/7470	Total RCRA plus Ni, V, Zn
		Diss. RCRA plus Mn, Ni, V, Zn

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

Nitrate = 0.1 mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- MOC	MOC MNA Sampling	26MW1	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast, windy 45°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.2	8/14/16	WR, SS, CC

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
[✓ Good] Fair Poor	(-0.4)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	34.54	41.70 (final)	N/A

Max Purge Volume = (41.5 ft – 34.54 ft) * 0.163 gal/ft * 3 = 3.4 gal * 3.785 L/gal = 12.88 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1652	1734	36.0		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC Filter

Time (HH:mm)	Volume (Gallons or Liters)		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm) ✓	DO (mg/L) ✓	pH (std units)	✓ ORP (mV) ✗	Turbidity (NTU)	(feet btoc)
1657		0.900	100/min	4.76	51	12.73	5.51	239.3	54.5	34.56
1702		1.400	100/min		52	12.88	5.55	227.7	42.8	34.55
1707		3.200	250/min	4.30	50	13.27	5.41	251.7	13.5	34.56
1712		5.900	540/min	3.87	49	13.83	5.11	257.9	7.93	34.56
7.00 1717		8.400	500/min	3.72	48	13.59	5.08	253.2	8.42	34.56
1722		10.00	320/min	3.99	49	13.37	5.29	240.7	4.47	34.56
1727		11.90	380/min	4.25	49	13.01	5.42	234.2	3.81 ~~3.18~~	34.56
1732		13.00	224/min	4.54	50	12.98	5.48	231.4	3.98	34.56

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
~~1733~~ 1737	1810 / 8/14/2016	36.0	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-26MW1-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.0

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials	SW8260/AK101/ RSK 175	BTEX / GRO/ Methane
3- 1 L amber	SW8270DSIM / SW8082	PAHs / PCBs
2-250 mL amber w/HCl	AK 102 /AK103	DRO / RRO
1-250 mL HDPE	EPA 300.0 / EPA 310.1	Sulfate/Alkalinity
2-250 mL HDPE w/HNO3	SW6020/ SW7470	Total RCRA plus Ni, V, Zn ~~Zn~~ ~~[illegible]~~ 8/11
		Diss. RCRA plus Mn, Ni, V, Zn

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate = 0.0 mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- MOC	MOC MNA Sampling	MW88-10	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast, 300 ceiling. 50°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.1	8/13/16	KR, SS

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.35)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	20.4	25.67 (final)	N/A

Max Purge Volume = (25.4 ft – 20.4 ft) * 0.163 gal/ft * 3 = 2.44 gal * 3.785 L/gal = 9.25 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1800	1826	22.5	Bailer Peristaltic Pump [✓ Submersible Pump]

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear [✓ Cloudy] Brown Other:	None Moderate [✓ Faint] Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters]) mL		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3% ✓	± 10% or 0.1 mg/L	± 0.1 ✓	± 10 mV ✓	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	(feet btoc)
1803		300	125/min	5.19	62	3.86	5.51	171.6	30.7	20.62
1807		1000	125/min	4.81	61	2.44	5.09	204.2	23.8	20.58
1812		1700	125/min	5.26	62	2.07	5.62	177.3	20.4	20.53
1816		1900	100/min	5.25	62	1.71	5.63	180.6	11.5	20.69
1821		3100	200/min	4.22	62	1.41	5.55	186.3	10.9	20.64
1825		3900		4.50	62	1.06	5.54	189.6	8.5	20.64
Sampled		@	1829							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1829	1859 / 8/13/2016	22.5	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-MW88-10-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.2 mg/L

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA Vials w/ HCl	SW8260/AK101/ RSK175	BTEX/ GRO/ Methane
3-1 L amber	SW8270DSIM / 8082	PAHs / PCBs
2-250 mL amber w/ HCl	AK 102/ 103	DRO/ RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate / Alkalinity Total RCRA Metals & Ni, V, Zn
2-250 mL HDPE w/ HNO_3	SW 6020 / 7470	Diss. RCRA metals & Mn, Ni, V, Zn

Suggested Notation:

Nitrate = 0.1 mg/L

"——" = not measured "✓" = stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	17MWi	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, windy 45°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/14/16	KR. SS, CC

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.15)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	12.10	15.65 (final)	N/A

Max Purge Volume = (15.5 ft – 12.10 ft) * 0.163 gal/ft * 3 = 1.6 gal * 3.785 L/gal = 6.29 L

(15.5 = Previous Total Depth; 12.10 = Depth to Water or Depth to Top of Filter Pack; 0.163 = Gallons per Ft; 1.6 = Max Purge Vol; 6.29 = Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging	
1328	~~1422~~ HM 8/15/2016 1417	13.5	Bailer Peristaltic Pump [✓ Submersible Pump]	
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear [✓ Cloudy] Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. | Purge water was: [✓ Treated] Stored Other | Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize) ✓					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm) ✓	DO (mg/L) ✓	pH (std units) ✓	ORP (mV) ✓	Turbidity (NTU)	(feet btoc)
13.32		0.800	125/min	3.93	65	11.43	5.40	238.1	149	12.10
1337		1.400	125/min	4.36	65	11.10	5.24	236.8	497	12.10
1342		2.300	125/min	4.35	60	10.67	5.32	233.9	162	12.10
1347		3.200	125/min	4.18	58	10.75	5.36	242.6	73.5	12.10
1352		5.200	250/min	3.31	56	10.98	5.03	257.9	25.7	12.10
1357		6.900	250/min	3.16	56	11.04	4.93	260.3	15.1	12.10
1402		8.900	200/min	3.48	56	10.69	5.24	239.4	6.96	12.10
1407		9.500	200/min	3.82	56	10.41	5.45	225.2	3.75	12.10
1412		10.80	200/min	3.55	56	10.63	5.48	222.3	2.88	12.10
1417		12.00	200/min	3.94	56	10.31	5.45	223.4	2.84	12.10
Sampled @ 1422										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1422	1455 8/14/16	13.5	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-17MWI-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.0

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/ HCl	SW8260 / AK101 / RSK175	BTEX / GRO / Methane
3-1 L amber	SW8270DSIM / 8082	PAHs / PCBs
2-250 mL amber w/ HCl	AK 102 / 103	DRO / RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate / Alkalinity
2-250 mL HDPE w/ HNO_3	SW6020 / 7470	Total RCRA metals & Ni, V, Zn Diss. RCRA metals & Mn, Ni, V, Zn

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate = 0.2 mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name NEC - MoC	Event MoC MNA Sampling	Well ID 14MW04	Project Number 050K8702
Weather Conditions overcast, windy, 40°F	PID Readings of Total VOCs (ppm) Ambient 0.0 Breathing Zone 0.0 In Well 0.9	Date 8/15/16	Sampler Initials KR, CC

Well Information

Well Integrity Good [✓ Fair] Poor	TOC Stickup (ft ags) (-0.48)	Well Casing Material [✓ PVC] SS	Casing Diameter(in) / Gallons per linear foot(gal/ft) 1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft) N/A	Depth to GW (ft btoc) 3.85	Total Depth of Casing (ft btoc) 13.35 (final)	Product Thickness (ft) and Volume Recovered (mL) N/A

Max Purge Volume = (15' ft – 3,85 ft) * 0.163 gal/ft * 3 = ~~1.817~~ 5.45 gal * 3.785 L/gal = 20.63 L
(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time 1801	Finish Time 1838	Depth of Tubing (ft btoc) 5.5		Equipment Used for Purging Bailer Peristaltic Pump [✓ Submersible Pump]
Color Clear [✓ Cloudy] Brown Other:	Odor None Moderate [✓ Faint] Strong	Sheen Yes [✓ No]	Purged Dry Yes [✓ No]	Meter Used During Purging [✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm) ✓	✓ DO (mg/L) ✱	pH (std units) ✓	ORP (mV) ✓	Turbidity (NTU)	(feet btoc)
1802		100mL	100	7.62	253	2.61	6.36	99.0	852	3.60
1807		1,400	260	7.24	259	1.87	6.19	103.9	—	3.68
1812		2,900	300	7.27	254	0.78	6.19	98.3	—	3.55
1817		4,200	260	7.32	237	0.56	6.14	98.2	—	3.45
1822		5,900	320	7.45	227	0.53	6.12	92.6	—	3.49
1827		6.200	75	7.44	211	0.61	6.07	91.0	—	3.44
1832		6,900	~~160~~ 70	7.60	207	0.64	6.06	90.7	—	3.43
1837		7.700	160	7.66	203	0.62	6.05	91.4	—	3.40
Sampled @ 1840				Aprox 8L Purged						

Error code on turbidity meter @ 1807. Unable to read. Purge water may be too cloudy to read.

Sample Collection Information

Start Time 1840	Finish Time / Date 1910 / 8/15/2016	Depth of Tubing (ft btoc) 5.5	Equipment Used for Sampling Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-14MW04-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 3.5 mg/L

Container/Preservative	Analysis Requested	Notes
8- 40 mL VOA vials w/HCl	SW8260, AK101, RSK 175	BTEX, GRO, methane
3- 1L amber	SW8270D sim/SW8082	PAHs + PCBs
2- 250 mL amber w/HCl	AK102/103	DRO/RRO
1- 250 mL HDPE	EPA 300.0 /310.1	Sulfate + Alkalinity
2- 250 mL HDPE w/HNO3	SW6020/7470	Total metals RCRA "Dissolved"

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate = 0.0 mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	14MW02	0SDK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Low clouds, windy	Ambient 0.0 Breathing Zone 0.0 In Well 3.4	8/10/2016	CC, HM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
[✓ Good] Fair Poor	(~0.3)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
—	10.49	16.85 (final)	—

Max Purge Volume = (17 ft – 10.49 ft) • 0.163 gal/ft • 3 = 3.18 gal • 3.785 L/gal = 12.05 L
(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1734	1817	11.5	Bailer Peristaltic Pump [✓ Submersible Pump]

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
[✓ Clear] Cloudy Brown Other:	None [✓ Faint] Moderate Strong	Yes [✓ No]	Yes [✓ No]	YSI Multi Meter 096101665 Hach Turbidimeter 17212

Purging reached: [✓ Stability] [✓ Max Vol] Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	(feet btoc)
1740	1.5	1.5								10.52
1745	0.75	2.25	150	6.70	97	1.48	5.77	23.0	14.0	10.56
1750	2.3	4.55	460	6.12	99	1.03	5.32	30.6	9.39	10.52
1755	1.0	5.55	200	6.82	106	0.75	5.98	-0.5	7.78	10.57
1800	1.5	7.10	300	7.15	113	0.65	5.98	-0.9	6.99	10.55
1805	2.2	9.30	440	6.90	115	0.49	5.94	3.6	6.28	10.56
1810	2.0	11.30	400	6.84	118	0.42	5.89	8.8	5.35	10.55
1815	2.0	13.30	400	6.84	123	0.51	5.88	11.6	4.60	10.55

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1817	1852 8/10/2016	11.5	Peristaltic Pump [✓ Submersible Pump]

SAMPLE ID: 16NEC-14MW02-WG(-9 QC: [✓ Dup] MS/MSD Ferrous Iron (Fe^{2+}) (mg/L) = 10.0

X2*

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/ HCl	BTEX, GRO, Methane	SW8260, AK101, RSK 175
3-1L amber	PAH, PCB	SW8270 SIM, SW8082
2-250 mL amber w/ HCl	DRO, RRO	AK102/103
2-250 mL HDPE w/ HNO_3	** Metals (Total & Dissolved)	SW6020/7470
1-250 mL HDPE	sulfate, alkalinity	EPA 300.0 /310.0

Suggested Notation:

Nitrate = 0.0 ppm

"——" = not measured "✓" = stable "+" = rising "-" = falling

Page 1

** Total - RCRA plus Ni, Zn, V
Dissolved - ↓ , & Mn

* while collecting dissolved metals, part of acid accidently expelled from bottle. Will note this on COC.

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- MOC	MOC MNA Sampling	14 MW01	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
cloudy, overcast, windy	Ambient 0.0 Breathing Zone 0.0 In Well 22.4	8/10/2016	SS, KR, CC, HM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
[✓ Good] Fair Poor	(-0.15)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
—	15.65	22.2 (final)	—

Max Purge Volume = (22 ft – 15.5 ft) * 0.163 gal/ft * 3 = 3.18 gal * 3.785 L/gal = ~~10.18~~ 12.04 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1511	1623	16.5	Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	[✓ None] Moderate Faint Strong	Yes [✓ No] / Yes [✓ No]	YSI Multi Meter 09G101665 Hach Turbidimeter 17396

Purging reached: Stability [✓ Max Vol] Purge water was: [✓ Treated] Stored Other Note: GAC

Time (HH:mm)	Volume (Gallons or [✓ Liters]) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
* 1515	2.0	2.0	—	—	—	—	—	—	—	15.71 *
1523	0.8	2.8	100	5.04	176	0.82	5.34	-20.8	546	15.67
1530	0.6	3.4	86	4.64	156	0.65	5.90	-32.1	9.99	15.71
1538	2.0	5.4	250	4.75	114	0.76	5.79	-20.7	76.9	15.71
New Turbidimeter 17212 → 1545	1.3	6.7	163	5.32	110	0.99	6.15	-22.6	63.5	15.68
1551	0.70	7.40	117	5.50	109	1.01	6.18	-18.0	49.7	15.68
1557	0.75	8.15	125	5.64	108	1.12	6.18	-12.5	43.1	15.68
YSI turned off → 1604	1.25	9.4	179	4.91	98	0.70	6.13	-7.2	38.3	15.67
1610	0.50	9.9	83	5.22	99	0.70	6.12	-7.3	40.9	15.68
1615	0.50	10.4	160	5.46	99	1.46	6.18	-6.2	42.5	15.68
1620	2.25	12.65	450	4.37	44	0.53	6.02	0.6	20.4	15.68

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1625	1642 8/10/2016	16.5'	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-14MW01-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 10.0 mg/L

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/ HCl	BTEX, GRO, Methane	SW8260, AK101, RSK 175
3-1 L amber	PAH, PCB	SW8270SIM, SW8082
2-250 mL amber w/ HCl	DRO, RRO	AK102, AK103
1-250 HDPE w/ HNO_3 1-250 HDPE w/ HNO_3	** Metals (total & dissolved)	SW6020, 7470
1-250 HDPE	Sulfate, alkalinity	EPA 300.0, EPA 310.1

Suggested Notation:

Nitrate = 0.0 ppm

"——" = not measured "✓" = stable "+" = rising "-" = falling

Page 1

* Had issue with stabilizing pumpflow

** Total - RCRA plus Ni, Zn, V

Dissolved - ↓ & Mn

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	14MW03	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, windy, 40F	Ambient 0.0 Breathing Zone 0.0 In Well 1.0	8/15/16	VR, CC

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	(-0.2)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	11.90	23.98 (final)	N/A

Max Purge Volume = (24 ft – 11.90 ft) * 0.163 gal/ft * 3 = 5.92 gal * 3.785 L/gal = 22.39 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1315	1351	14.0		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	None [✓ Moderate] ~~Faint~~ Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi-Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC Filter

Time (HH:mm)	Volume (Gallons or [✓ Liters])		Flow	Temper-ature (°C)	Water Quality (three must stabilize)					Water Level
			(0.013-0.13 gpm, 50-500 mL/min)		± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm) ✓	DO (mg/L) ✓	pH (std units) X	ORP (mV) ✓	Turbidity (NTU)	(feet btoc)
1320 ~~1315~~		0.500	100 /min	5.20	95	1.62	5.83	17.0	24.1	12.19
1325		1.700	240	4.43	93	0.80	5.59	18.4	17.7	12.09
1330		3.300	320	4.19	93	0.60	5.68	21.2	8.58	12.13
1335		4.500	240	4.02	93	0.60	5.86	21.5	9.32	12.19
1340		6.200	340	3.85	94	0.67	5.83	30.6	18.15	12.14
1345		7.500	260	3.95	93	0.61	5.94	29.9	26.5	12.09
1350		8.700	240	4.14	93	0.60	5.99	26.7	~~26.6~~ 26.1	12.07
Sampled @ 1354, approx 9L purged										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1354	1436 / 8/15/16	14.0	Peristaltic Pump [✓ Submersible Pump]
SAMPLE ID: 16NEC-14MW03-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 10.0 + mg/L

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/HCl	SW8260, AK101, RSK 175	BTEX, GRO, Methane
3-1L amber	SW8270D SIM / SW8082	PAHs & PCBs
2-250 mL amber w/HCl	AK102/103	DRO / RRO
1-250 mL HDPE	EPA 300.0 / 310.1	Sulfate & Alkalinity
2-250 mL HDPE w/HNO_3	SW6020 / 7470	Total Metals RCRA & Ni, V, Zn Dissolved " " & Mn

Suggested Notation: Nitrate 0.0 mg/L

"——" = not measured "✓"= stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC-MOC	MOC MNA Sampling	14MW03	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, no breeze 50°F	Ambient 0.0 Breathing Zone 0.0 In Well 6.3	8/13/16	KL, SS

Well Information

Screened Interval 12-22' ~~bgs~~ tm 8/12

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
[✓ Good] Fair Poor	(-0.2)	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	11.87	(final)	N/A

Max Purge Volume = (22 ft – 11.~~68~~ 87 ft) • 0.163 gal/ft • 3 = 4.95 gal • 3.785 L/gal = 18.75 L
(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1608	1640	13.5		Bailer Peristaltic Pump [✓ Submersible Pump]
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
[✓ Clear] Cloudy Brown Other:	None [✓ Moderate] Faint Strong	Yes [✓ No]	Yes [✓ No]	[✓ YSI Multi Meter] [✓ Hach Turbidimeter]

Purging reached: [✓ Stability] Max Vol. Purge water was: [✓ Treated] Stored Other Note: GAC filter

Time (HH:mm)	Volume (Gallons or [✓ Liters]) mL		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3% ✓	± 10% or 0.1 mg/L ✓	± 0.1	± 10 mV ✓	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	(feet btoc)
1609		750	250/min	5.30	98	2.92	6.70	9.8	23.2	12.14 ,27
1613		1300	250/min	5.16	96	1.82	6.22	35.4	17.6	11.98 ,12
1617		1750	250/min	6.63	96	1.10	6.34	25.5	15.3	11.98
1621		2000	100/min	5.95	96	1.25	6.63	8.5	13.2	11.98
1625		2600	125/min	6.73	97	0.89	6.78	-0.6	12.8	11.98
1629		3100	125/min	6.81	98	0.79	6.73	1.1	12.2	11.98
1633		3600	125/min	6.42	97	0.85	6.60	5.5	10.2	11.98
1637		4100	125/min	5.90	96	0.82	6.48	11.9	13.1	11.98

* Sampled @ 1644. Purged total of 6L.

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1644	1727/8/13/16	13.5	Peristaltic Pump [✓ Submersible Pump]

SAMPLE ID: 16NEC-~~MW10-1~~ 14MW03 -WG tm 8/11 QC: Dup MS/MSD Ferrous Iron (Fe^{2+}) (mg/L) = 0.2 mg/L

Container/Preservative	Analysis Requested	Notes
8-40 mL VOA vials w/ HCl	SW8260/AK101 / RSK175	BTEX, GRO, Methane
3-1L amber	SW8270DSIM / 8082	PAH / PCB
2-250 mL amber w/ HCl	AK102 / 103	DRO/ RRO
1-250 mL HDPE	EPA 300.0/ 310.1	Sulfate/ Alkalinity
2- " " w/ HNO_3	SW6020 / 7470	Total RCRA Metals & Ni, V, Zn Diss. " " & Mn

Suggested Notation: Nitrate = 0.0 mg/L

"——" = not measured "✓"= stable "+" = rising "-" = falling

* sampler error. ORP just outside of range.

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NEC- ~~MNA~~ tm 8/8 MOC	MOC-MNA Sampling	14MW03	05DK8702
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, breezy 50°F	Ambient ____ Breathing Zone ____ In Well 0.6	8/10/16	KR, SS

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good [✓ Fair] Poor	N/A	[✓ PVC] SS	1 / 0.041 [✓ 2 / 0.163] 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	12.02	23.98 (final)	N/A

Max Purge Volume = (24 ft – 12 ft) • 0.163 gal/ft • 3 = 5.86 gal • 3.785 L/gal = 22.21 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
				Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. | Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
	Change	Total			± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Drawdown < 0.3 ft (feet btoc)
PUMP DID NOT WORK; WELL NOT SAMPLED										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
			Peristaltic Pump Submersible Pump
SAMPLE ID:		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) =

Container/Preservative	Analysis Requested	Notes

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

NEC 1 of 2

2016

Hollee McLean

Rite in the Rain®
ALL-WEATHER
ENVIRONMENTAL
FIELD BOOK
№ 550

05DK8702

V20120FLD

AE-ECC-J07-05DK8702-
H04-001

8/4/2016 - 8/24/2016

Rite in the Rain®
ALL-WEATHER WRITING PAPER

ALL-WEATHER

ENVIRONMENTAL FIELD BOOK

Numbered Pages

Name ECC & Jacobs

Address

Phone

Project NEC 05DK8702

Rite in the Rain — A patented, environmentally responsible, all-weather writing paper that sheds water and enables you to write anywhere, in any weather. Using a pencil or all-weather pen, *Rite in the Rain* ensures that your notes survive the rigors of the field, regardless of the conditions.

Specifications for this book

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 550	Item No. 550F

RiteintheRain.com

Made in the USA
US Pat No. 6,863,940

CONTENTS

Reference Page Index

CONTENTS

PAGE	REFERENCE	DATE

Location NORTHEAST CAPE (NEC)/Nome Date 8/4/2016

Project / Client 05DK8702 / USACE & ECC

Nome

0715 Pick up remaining items from Jacobs
office

0830 Arrive at airport

0955 Depart for Nome.
Prepare SPAS on plane.

1130 Arrived in Nome.

1200 Taxi to Stampede Auto.
Performed vehicle inspection.

1215 Arrive at BSNC Building. Receive access
to office space.

1300 Arrive at old Alaska Rooms

1345 Receive first shipment from Alaska
Air Cargo.

1645 Complete transfer of all gear from
AK Air Cargo to office space.
Start unpacking boxes.

1930 EOD

Summary: Mob to Nome
Started preparing
office & equipment.

Location NEC / Nome Date 8/5/2016

Project / Client 05DK8702 / USACE & ECC

Nome

0730 Arrive at BSNC office space.
unpack coolers & prepare sample kits.

1130 Receive call that ECC (Stan Seegars & Kristopher Reidt) & AK Total Safety (Chris Carson) arrived in Nome. Transported ECC & AK T.S. to vehicle rental & AK Rooms.

1230 Continue prepping Sample kits.

1530 Drop gear at Be~~a~~ring Air. HM 8/6
Arranged 8 AM departure.
Discussed w/ pilot likelihood of flight and best time of day to fly

1700. Review SPAs & HSP

1745 Drop additional gear at Be~~a~~ring Air HM 8/6 because elected to upgrade Navajo flight to larger aircraft

1815 EOD

~~Hollee~~ mcLean

Summary: ECC & TS arrive in Nome
- continue to prepare MOB to NEC.

Location NEC / Nome Date 8/6/2016

Project / Client 05DK8702 / USACE & ECC

~~Arrive at Bearing Air~~ HM 8/6

0710 Hold Safety Tailgate:
weather: cloudy, poor visibility (1/4 mile vis. in Savoonga), rain, 50°F's
Personnel: Stan Seegars (SS)
Kristopher Reidt (KR)
Chris Carson (CC)
Hollee McLean (HM)
Concerns: driving - pedestrians & atVs w/o helmet
weather delays likely (spoke w/ Bearing Air)
Obj: continue kit prep
Go through all equipment
Review Schedule
Review WP & SPAs
} assuming no air travel, will re-assess at Bearing Air
PPE: Modified Level D appropriate for task

0750 Depart for Be~~a~~ring Air. HM 8/6

0800 Arrive at Bering Air.

0810 Briefed at Bering Air. Stand down (from Pilot Kevin)
No one has been to runway this year; need 3 mile visibility so they can assess the runway and 1000 ft ceiling.

0900 Managed ice, reviewed WP, schedule, # of sample jars, and equipment (flow meter).

Location NEC/ Nome Date 8/6/2016

Project / Client 05DK8702/ USACE & ECC

Nome

1015 ECC & Total Safety mob to Bering Air; will try to perform dry set-up of tent in hangar to ensure comfort w/ & knowledge of process.

1045 Mob to Bering Air to set up emergency shelter. Model # H0004-067 weatherport

1315 completed set up and take down of emergency shelter.

1330 Procure additional items from hardware store.

1345 Talked with Bering Air. Aiming for 9 AM tomorrow. Someone flying to Savoonga today; should help w/ determining conditions.

1450 Calling EOD

Summary: Weather Day
-Practiced erecting emergency Shelter

Location NEC / Nome Date 8/7/2016

Project / Client 05DK8702 / USACE & ECC

Nome

0730 Mob to office to check ice and look for 2nd copy of WP.

0733 WP located in truck; will check ice later.

0810 Safety Tailgate:
Personnel: SS, KR, CC, HM
PPE: Modified Level D
Wx: Nome - Sunny w/ rains around noon.
NEC - overcast & foggy
Safety: Keep communication w/ Bering Air
Obj: set up shelter
site walk/ ride
well depths
- Performed a verbal group SPA w/ lessons learned for set-up for shelter.

0840 Mob to ~~Bedring~~ the Bering Air

0850 Discuss w/Bering Air travel to NEC. Hold off a few hours.

852 Mob to office; manage ice.

0920 Mob to creek to test flow meter. Additional practice/tutorial and manual are necessory.

1045 Mob to Bering Air. Check flight status. Ground fog near Savoonga. They are doing a "test flight" to determine if they can see the island.

Location NEC / Nome Date 8/7/2016

Project / Client OSDK8702 / USACE & ECC

Nome

1115 Make decision to go ahead.
Will start loading plane. First
flight will keep plane on ground
to set-up camp. Likely will not
have time for groundwater measurements.

1200 Reviewed Process/Procedure for Tsunami
while on island w/o alert system.
Completed SPA.

1205 Watched video tutorials for flow meter.
Team feels much more prepared for
task

1405 Told we are not flying.

1450 Practice stream-flow measurements.

1630 Complete field practice w/ stream
flow meter.
Downloaded test data.
Changed some settings on meter.

1720 Return to field, continue testing
stream flow meter.

1900 Transfer data to laptop.

1930 EOD

Summary:
Weather Standown
Acquainted selves w/ flowmeter

Location NEC / Nome Date 8/8

Project / Client OSDK8702 / USACE & ECC

Nome/NEC

0800 Call Bering Air; meet at 0900.

0810 Safety Tailgate:
Wx: Partly cloudy the overcast & cloudy
NEC similar but 10°F cooler
Personnel: SS, KR, CC, HM
Safety: one aircraft will stay w/ us
Obj: set up camp
site visit
well depths
PPE: Modified Level D

0900 Arrive at Bering Air.

0930 Depart on Navajo w/ CASA to follow.
Navajo pilot - Stan
Casa pilot - Kyle

1020 Arrive at NEC. Test satellite phone. Unpack
Navajo.

1040 Casa arrives. unpack casa.
Start setting up emergency shelter.

1100 Set up emergency shelter.

1325 Break for lunch.
Coordinates for Basecamp from Stan's GPS
E 0601636 UTMs
N 7023535

HM

Location NEC/ Nome Date 8/8

Project / Client OSDK8702/ USACE & ECC

NEC-MOC

1500 Calibrate PID 100ppm Isobutylene Lot # 16-5516
S/N 910685
Zero cal = 0.0 ppm
Span cal = 100.0 ppm

1510 SS & CC set-up weather station & check beach
KR & HM mob to MOC to collect well depths.

Time	Well ID	SU (ft)	DTW (ft) BTOC ~~Depth to GW (ft)~~	TD (ft) BTOC hm	PID
1534	MW10-1	2.21	5.04	11.0	0.0
1550	14MW07	(-0.25)	25.73	33.21	0.0

1610 Having difficulty locating wells.
Discussing plan forward.
SS, KR, CC, & HM locate all wells; record depths tomorrow.

1645 Mob from MOC to shelter.

1705 Load Navajo.
According to pilot Stan: 2 ~~3 hm 8/12~~ 2 mi vis & 500' ceiling for uninstrumented approach. company standard.
~~May be "flexible" if visibility is good at far away.~~ hm 8/8

1715 Depart NEC for Nome; saw ATVers on beach.

1801 Arrive in Nome.
Discussed w/ Bering Air future flights.
Will call tomorrow at 8 AM.

Location NEC / Nome Date 8/8

Project / Client OSDK8702 / USACE & ECC

Nome

1816 Mob to Old Alaska Rooms.

1830 Call K. Maher to check-in.

Daily Summary:
- Mob to NEC for first time
- Casa departed; Navajo remained on standby
- Set up weather shelter & weather station
- Located all MWs @ MOC
- Performed site walk.

Hallee McFann

Location NEC/ Nome Date 8/9

Project / Client 05DK8702 / USACE & ECC

Nome

0800 Call Bering Air, weather delay.

0805 Safety Tailgate:

personnel: SS, KR, CC, HM

PPE: Modified Level D

WX: overcast with showers, 55°F-59°F in Nome

safety: Non-Project personnel, wind, wildlife

Objectives: survey, GW depths, sample wells

0930 Mob to get ice. Prepare for 11AM departure.

0945 Mob to Bering Air. Discuss with pilot Stan about flying. We will try to go after surveyor arrives.

1020 Received brief from David Olsen. The plane will stay on the ground on stand-by.

Scott from ECO-Land arrives. Hold meeting for preparation of today's activities.

1030 David Olsen states weather is deteriorating.

We will wait on the ground for better weather.

1100 Call "No Flight" for now.

1238 Conference call with Kevin Maher. Discussed weather. Concern about local/visitor theft. Zero exposure on our end. Keep following the plan & check in.

Page out of order

Location NEC/ Nome Date 8/10

Project / Client 05DK8702 / USACE & ECC

NEC-MOC

Well ID	Time	Stick up (ft)	DTW (ft) BTOC	DTW (ft) BGS	Headspace PID (ppm)
17MW-1	1234	(-0.15)	12.15	HM 8/14 ~~12.0~~ 12.3	0.2
14MW01	1230	(-0.15)	15.65	15.8	12.6
14MW02	1227	(-0.30)	10.50	10.80	14.0
22MW2	1205	(-0.45)	27.57	28.02	0.1
14MW03	1222	(-0.2)	12.05	HM 8/14 ~~12.85~~ 12.25	37.0
20MW-1	1202	(-0.15)	22.60	HM 8/14 22.~~45~~75	0.0
14MW04	1219	(-0.48)	3.22	3.~~74~~ HM 8/14	3.1
MW88-10	1200	(-0.35)	~~20.69~~ HM 8/10 20.69	HM 8/14 ~~20.34~~ 21.04	0.3
MW88-1	1153	(-0.15)	16.94	HM 8/14 ~~16.79~~ 17.09	0.7
14MW07	1156	(-0.25)	25.63	25.88	0.10
14MW05	1215	(-0.52)	3.10	HM 8/14 ~~2.58~~ 3.62	70.2
MW88-3	1149	(-0.2)	12.32	HM 8/14 ~~12.12~~ 12.52	11.0
26MW1	1210	~~(-0.2~~ (-0.4) HM 8/10	~~12.32~~ HM 8/16 34.96	HM 8/14 ~~34.56~~ 35.36	~~11.0~~ HM 8/16 0.3
14MW06	1144	(-0.50) 8/10	3.47	3.97	33.6
MW10-1	1140	2.20	5.18	2.98	0.0

Location NEC / Nome Date 8/9/2016

Project / Client OSDK8702 / USACE & ECC Nome

1310 Calling day as weather day.

Hollee McLean

Location NEC / Nome Date 8/10/2016

Project / Client 05DK8702 / USACE & ECC Nome

0800 Call Bering Air. Break in the weather. will try to depart ~1000.

0845 Safety Tailgate

Personnel: Stanley Seegars (SS)
Kristopher Reidt (KR)
Chris Carson (CC)
Hollee McLean (HM)

PPE: Modified Level D

WX: 50°Fs w/ showers

Safety: Personnel, wild life, may not have Standby aircraft

objectives: inventory camp, GW depths, sample GW MWs

0920 Mob to office to gather ice.

0925 Arrive at office and prepare ice

0935 Mob to Bering Air.

0940 Arrive at Bering Air; aircraft will remain onsite.

1016 Depart Bering Air.

1100 Arrive at NEC; perform quick check that all gear is still present.

1116 Calibrate PIDs

	S/N	Zero	Span
MiniRae 3000	410685	0.0 ppm	100.0 ppm
MiniRae 2000	11231	0.0 ppm	Failed

Location NEC / Nome Date 8/10

Project / Client 05DK8702 / USACE / ECC

NEC - MOC

1138 MOB to MOC to measure GW Depths

See pg 13

1345 Calibrate PID

S/N 11231 zero 0.0 ppm span 100

1350 Calibrate Turbidimeter

Lot # A6061

Turbidimeter 17396 - cal'd

check Std	6.86	Read	6.95
	60.5		60.2
	506		507

Turbidimeter 17212 · cal'd

check Std	~~6.86~~ 6.86	Reading	6.99
	~~60.5~~ #4 8/10 56.9		55.7
	~~506~~ 513		515

1500 All Mob to 14MW01. Sample well as a group. ut 1625

See sample form; issues w/ Turb 17396

1705 GAC filter approx 4 gal about (KR)

5 meters from 14MW01

1715 Mob to 14MW02 (cc & HM) 1817

See Sample form. will note on COC that one dissolved metals jar may not be fully acidified.

Collect DUP ~~-1 vial broke while labeling.~~

1855 GAC filter approx. 4 gal (KR)

1915 Mob to shelter

Unpack gear & prepare for departure.

Location NEC / Nome Date 8/10

Project / Client 05DK8702 / USACE & ECC

NEC - MOC

1945 Depart for Nome

Perform sample sheet QC.

Prepare labels.

2034 Arrive in Nome.

2039 Pack out gear & samples.

2050 Arrive at office. Label samples & manage ice.

2135 Depart office after call to Kevin Maher

2145 ~~Br~~ Complete sample summary.

2215 Break for dinner

2230 Complete Sit Rep

2400 EOD

Daily Summary:

Sampled 2 wells

- 2 primary & 1 DUP.

Issues w/ turbidimeter & pump controller / battery.

- 16NEC-14MW01-WG @ 1625
- 16NEC-14MW02-WG(-9) @ 1817

Location NEC / Nome Date 8/11/2016

Project / Client 05DK8702 / USACE & ECC

Nome

0700 Sample management.
Create chains
Pack coolers
800 Call Bering Air. check in at 1000.
0930 List of items to bring back from NEC:
Tape, PIDs & Batteries,
ziplocs, Trip Blank
To purchase: Battery from auto shop.
0945 MOB to AK Air cargo
#9357
907-563-3322
05DK8702
0955 Arrive at AK Air Cargo.
Ship samples Air way Bill # 027-4010-5785
1000 Call Bering Air. No travel today.
1100 Purchase additional Battery @ Car Quest.
1105 EOD
• Daily Summary: Shipped 2 coolers
coc #1 Almond Joy
coc #2 Mounds
AWB # 027-4010-5785

HolleeMcLean

Location NEC / Nome Date 8/12/2016

Project / Client 05DK8702 / USACE & ECC.

Nome / NEC

0800 Call Bering Air; will try to depart at 930
0830 Safety Tailgate:
Personnel: Stan Seegars
Kris Reidt
Chris Carson
Hollee McLean
PPE: Modified Level D
WX: 54-61°F & showers in Nome, expect 40s°F in NEC.
Safety: Will not have standby aircraft.
Objectives: Sample at MOC
Eco-Land Survey cannot make today's flight.
Mob most of remaining gear because of travel on a King Air.
0850 Communicate w/ Kevin Maher. Sample all wells 1-2' below DTW.
0855 Mob to office to gather gear.
0910 Arrive at Bering Air. Meet with pilot Kevin.
0920 Call KM. Target analytes are near top of column. Will be drawing from surrounding aquifer. 1-2' ~~bgs~~ DTW for all samples. HM 8/12
0935 Load onto King Air w/ pilot Kevin.
0946 ~~0946~~ HM 8/12 Depart Nome for NEC (riding co-pilot).
~~Arrive in NEC~~ HM 8/12

Location NEC / Nome Date 8/12/2016

Project / Client 05DK8702 / USACE & ECC
Nome/NEC

0955 Received mid air report that ceiling in Savoonga dropped to 200'.

1025 could not make landing safely. Did not land. Return to Nome.

1056 Landed in Nome.

1100 Weather not expected to improve.

Summary:

- Attempted flight to NEC but could not land. weather stand-down.
- Need to check minimum weather requirements.

~~Hollee~~ McLean

Location NEC / Nome Date 8/13

Project / Client 05DK8702 / USACE & ECC
Nome

0800 Call Bering Air; need to call back at 900.

0830 Safety Tailgate:

Personnel: Stanley Seegars (SS)
Kristopher Reidt (KR)
Christopher Carson (CC)
Hollee McLean (HM)

PPE: Modified Level D

WX: 53-65°F, overcast, showers (Nome)
40s - 50s °F

Safety: low cloud ceiling

Objectives: sample GW
Survey

0900 Call Bering Air. Discuss waiting one more hour to ensure weather holds. Bering Air wants team to be ready to go at 1000.

0925 Mob to office for ice & coolers.

0940 Arrive at Bering Air.

0945 Scott (Eco-Land) arrives at Bering Air.
New personnel: Scott McClintock (SM)

1010 Depart Nome on Bering Air Navajo.

1054 Arrive at NEC

HM

Location NEC / Nome Date 8/13/2016

Project / Client 05DK8702 / USACE & ECC

NEC

1055 Mob survey gear, sample gear, & calibrate equipment. safety brief w/ SM.

1108 Calibrate Turbidimeters

Check Readings:

Stds	17396	17212
6.86	6.52 NTU	6.79 NTU
60.5	59.2 ↓	59.95 ↓
506	509	512

calibrate PIDs (check)

	S/N	Zero	100.0 ppm
1120	910685	0.0	100.0
1120	11231	0.0	100.0

1158 Mob to MOC

1205 Arrive at MW10-1

1221 start purging well

1254 Sample well MW10-1 & MS/MSD

See GW sampling form

Samplers: CC, HM

Sample ID: 16NEC-MW10-1-WG

1350 End sampling MW10-1

GAC Filter approximately 1.5 gallons

HM

Location NEC / Nome Date 8/13/2016

Project / Client 05DK8702 / USACE & ECC

NEC

1421 Collect equipment Blank

16NEC-10MW-1-~~DVS~~ DVW

HM 8/13/2016

Sampler: CC, HM

6-40mL VOAs w/HCl	VOCs, GRO	SW8260, AK101
2-40mL VOAs	Glycol	SW8015
3-1L amber	SW8270DSIM, SW8082	PAHs, PCBs
2-250mL amber w/ HCl	DRO/RRO	AK102/103
1-250mL HDPE w/HNO3	SW6020/7470	Diss. RCRA metals plus Mn, Ni, V, Zn

1440 Mob to camp for lunch.

1520 Return to MOC.

1545 Arrive at MW88-1

1553 Begin purge of well.

1628 Sample well MW88-1.

16NEC-MW88-1-WG

Samplers: CC, HM

See GW sampling Form

1647 End sampling MW88-1

1700 GAC filter approximately 2 gallons.

1710 Visitors arrive to site.

3 people; 2 adults & 1 child

Eugene Tooley; Marie, & Ty. - used to work w/ Bristol.

Report of rabid fox. Boated in from Savoonga

HM

Location NEC/ Nome Date 8/13/2016

Project / Client 05DK8702 / USACE & ECC

NEC/Nome

1730 Mob to 14MW07

1746 Start purging 14MW07

1815 Sample 14MW07

16NEC-14MW07-WG

See GW sample form

Samplers: CC, HM

1832 Endsampling 14MW07

1905 GAC filter approx 3 gallons

GAC filter approx 3 gallons Rinse water.

GAC filter approx 2 gallons alconoy

GAC filter approx 2.5 gallons DI H2O Rinse

2000 Pack Plane w/ Gear & samples.

2040 Depart NEC

2132 Arrive in Nome

2150 Transport gear & samples to office.

2230 ~~1036~~ HM 8/13/16 Return to old Alaska Rooms

EOD

Daily summary:

Survey for S29 & S08

Location NEC/ Nome Date 8/13/2016

Project / Client 05DK8702/ USACE & ECC

Sampled 6 wells, collected 1 DUP, 1 MS/MSD, & 1 EB

1254 -	MW10-1	16NEC-MW10-1-WG	MS/MSD
1310 -	14MW06	16NEC-14MW06-WG(-9)	DUP
1628 -	MW88-1	16NEC-MW88-1-WG	
1644 -	14MW03	16NEC-14MW03-WG	
1815 -	14MW07	16NEC-14MW07-WG	
1829 -	MW88-10	16NEC-MW88-10-WG	
1421 -	EB	16NEC-10MW-1-DVW	

Location NEC/Nome Date 8/14/2016

Project / Client 05DK8702 / USACE & ECC Nome

0830 Safety Tailgate:
PPE: Modified Level D
Safety: weather & flying
WX: Clear, 50-65 Nome
45-55, variable in NEC
Obj: Drive & fly
Collect samples
Prepare samples for shipment

0900 Call Bering Air. Weather hold.

~~0900 Mob to office.~~ HM 8/14

0900 Enter well depths from 8/16/2016 into spreadsheet

0930 Mob to office for sample management.

0932 Battery that did not work in field shows full charge after less than 1 hour. According to SS, after 5 min battery showed 70%.

1030 SS, KR, & CC mob to Bering Air for flight to NEC. HM stays behind to perform sample management. Prepare 5 coolers for shipment on 8/15/2016.

1530 Complete sample management. Return to Old Alaska Rooms to review equipment rentals vs. purchases.

Location NEC / Nome Date 8/14/2016

Project / Client 0SDK8702 / USACE & ECC Nome

2140 Mob to office to label samples & prepare coolers & sample management.

2300 Depart for old AK Rooms. Complete EOD paperwork

2330 EOD

Daily Summary:

Sampled 4 wells @ MOC

@ 1422	17MW1
@ 1542	22MW2
@ 1737	26MW1
@ 1858	20MW-1

Packed 7 coolers for shipment to ALS on 8/15/2016

~~@1422 17M~~ HM 8/14/16

CoC # 3	Milky way
" 4	100 Grand
" 5	Snickers
" 6	Caramello
" 7	Butterfinger
" 8	Twix
" 9	Kit Kat

Hollee McLoan

Location NEC / Nome Date 8/15/2016

Project / Client OSDK8702 / USACE & ECC

Nome / NEC

0800 Mob to office to continue sample mgmt.

0830 SS & KR ~~a~~arrive at office to help pack coolers.

0905 Arrive at AK Air Cargo. Ship 7 coolers to ALS

0940 AWB# 027-4010-6113
Depart for Bering Air.

0945 Received call from KM.
Need to resample 14MW03.
will have to get glassware from lab.
Need filter from KM
14MW03 did not meet stability before sample collection.

1030 Load plane to NEC.

1123 Arrive in NEC. Plane remains on ground.

1150 Turbidimeter check S/N 17212

check Std	Reading
6.86	6.77
60.5	58.9
506	509

All Turbidimeter checks okay

PID Calibrate check:

	Zero Cal	Span Cal
910685	0.0 ppm ✓	100.0 ppm. ✓

Location NEC/ Nome Date 8/15/2016

Project / Client OSDK8702 / USACE & ECC

NEC

1235 Mob to S29 to collect sediment, surface water flow. Samplers: SS & HM

Surface water (WS) at S29

2-1L amber	PAH	SW8270SIM
3-40ml VOA vial w/ HCl	BTEX	SW8260

Sediment (SD) at S29

2-8 oz amber	DRO/RRO	AK102/103
	PAH	SW8270SIM
	PCB	SW8082
	Metals As, Cr, Pb, & Zn	

Sample ID	Time	Date	Depth bgs	USCS
16NEC-S29-SD-010 1.5 ' H20	1310	8/15/2016	organics 0-1' SD collected 1-1.5'	saturated ML, Brown, Black patches.
16NEC-S29-SD-008 0.5 ' H20	1350		organics 0-1' SD collected 1-1.5'	ML, grey-ish brown little organics
* 16NEC-S29-SD-005 1.5 ' H20 Collected sample 1 ft from stake	1420		Organics 0-0.5' 0.5-1' for SD.	ML, brown with organics. At 1.0 foot bgs, brought up angular cobble of 3" and gravel

Location NEC / Nome Date 8/15/2016

Project / Client 05DK8702 / USACE & ECC

NEC

Sample ID	Time	Date	Depth ' bgs	USCS
*16NEC-S29-SD-006 2.0 ' H2O Organics 1.0 ' bgs	1445	8/15/2016	1.0 - 2.0	ML, trace gravel, little organics. Brown, cobbles & gravel @ 2' bgs
*16NEC-S29-SD-007 1.0' H2O organics 0.5 ' bgs	1520		0.5 - ~~2.0~~ hm 8/15 1.0	ML, little Sand, little organics. Brown. Some Rust color.
16NEC-S29-SD-009 1.5' H2O organics 1.5' bgs	1555		~~organi~~ 1.5- 2.0' bgs	ML, little sand (medium) damp. Little organics. Brown some rust color. strong odor
16NEC-S29-WS-004	1803			
16NEC-S29-SD-004 0.75' H2O organics 0.75-1.75 Rocks @ 2' (boulders)	1810		1.5 - 2; removed organics	SM, brown sand with silt and little gravel
16NEC-S29-~~SW~~ WS-003 MS/MSD	1910			
16NEC-S29-SD-003 & 16NEC-S29-SD-0039 H2O 1.0' ~~bgs~~ hm 1.5 ' bgs boulders & cobbles ~~1.0~~	1925		0-1.0 feet organics SD Sample 1.0- 1.5' bgs	1.0-1.25 ML, some organics, brown, saturated. 1.25-1.5 SW, medium sand, no fines.

Location NEC / Nome Date 8/15/2016

Project / Client 05DK8702 / USACE & ECC

NEC/Nome

* Require re-survey:

S29-SD-005	S29-001 (8/16/2016)
S29-SD-006	~~808-054 (8/17/2016)~~ hm 8/17
S24-SD-007	

1740 Verified mouth of Suki River blocked by sand berm.

1800 At sample location S29-004, strong winds prevail upstream but water still flowing downstream. Collected WS from flowing water / Suki River. "SD" sample collected from peninsula under submerged vegetation.

1910 Collected WS MS/MSD for S29 @ S29-003. 3X volume

1920 ~~Saw~~ hm Observed sheen while collecting SD sample. 2x volume.

1925 Collect Duplicate sample @ S29-SD-003

2020 Depart NEC for Nome.

2110 Arrive in Nome. Take Samples to office. Replace ice. Took 2 bags of IDW.

2130 Mob to Old Alaska Rooms; break for dinner.

HM

Location NEC/Nome Date 8/15/2016

Project / Client 0SDK8702/ USACE & ECC Nome

1015 (AM) Safety Tailgate:

PPE: Modified Level D

WX: ~~53-61~~ ~~40-55°F; 40-50°F~~ 45-55°F; 44-56°F

Personnel: Stanley Seegars (SS)
Kristopher Reidt (KR)
Christopher Carson (CC)
Hollee McLean (HM)

Obj: Continue sampling at MOC
Sample at S29.

Safety: weather & wind

Daily Summary:

- 2 primary WS & 1 MS/MSD
- 8 primary SD & 1 DUP
- 3 MW @ MOC
  - 14MW03 @ 1354
  - " "4 @ 1840
  - " "5 @ 1553
- Visual inspection of beach; SUQi outlet is blocked by sand.
- Removed 2 bags IDW trash.

2300 Start sit Rep & EOD

Hollee McLean

Location NEC/ Nome Date 8/16/2016

Project / Client 0SDK8702 / USACE & ECC Nome

0915 Safety Tailgate

WX: 53-61°F; mid to high 40°Fs

PPE: Modified Level D

Personnel Stanley Seegars (SS)
Kristopher Reidt (KR)
Christopher Carson (CC)
Hollee McLean (HM)

Safety: water, wildlife

Obj Finish MOC
Finish S29

920 Mob to office. Prep coolers & ice.

0950 Arrive at Bering Air.

1015 Depart Nome for NEC

1054 Arrive in NEC. Unload plane. Plane will remain on ground.

1107 Calibrate Turbidimeter 17212

Check Std	Reading
6.19	5.59
60.5	58.9
506	508

1121 Calibrate PID S/N 910685

Zero Cal 0.0 ppm Span Cal 100.0 ppm

1210 Mob to site 29. 3 visitors - the Tooley's arrive.

Location NEC/Nome Date 8/16/2016

Project / Client 05DK8702/USACE & ECC

NEC

S29 WS & SD

Samplers: SS & HM

Sample ID	Time	Date	'bgs Depth	USCS
16NEC-S29-WS-002 HM 8/16/2016 ~~lots of~~	1230	8/16/2016		
16NEC-S29-SD-002 - Lots of sheen upon river entry H2O' 3'	1235		0-1.5 organics 1.5-2.0 for SD Sample	ML, brown small patches of SW-SM. Lots of organics.
16NEC-S29-WS-001 & 16NEC-S29-WS-0019	1340			
16NEC-S29-SD-001 MS/MSD 1.5' H_2O	1350		0-1 ~~1.5'~~ organics 1-1.5 for SD	ML, brown small patches of SW-SM. Lots of organics

---

Location NEC/Nome Date 8/16/2016

Project / Client 05DK8702/ USACE & ECC

NEC

1346 SW DUP @ S29-WS-001

1350 SD MS/MSD @ S29-SD-001

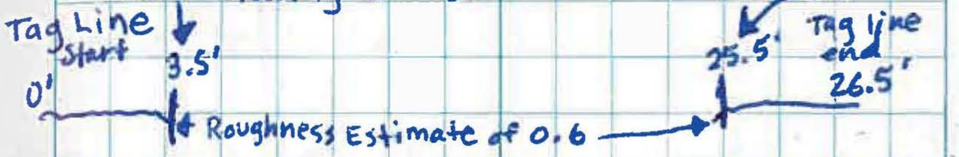
1430 Return to camp

1510 Mob to S29-004

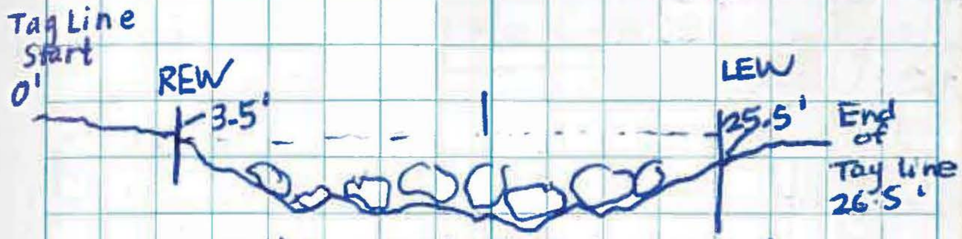
1515 S29-004 compass @ 310° from REW

REW- Right Edge water when facing downstream

Left edge water LEW



~~From start of tag line~~ ~~Depth~~ HM 8/16/2016



Boulder covered bottom / stream bed

1525

Distance from Start of Tag Line (ft) / Depth of H2O (ft)

3.5/0.6	9.5/1.4	15.5/1.3	21.5/0.9
4.5/0.8	10.5/1.7	16.5/1.6	22.5/0.8
5.5/1.2	11.5/1.2 - boulder	17.5/1.2	23.5/~~0.9~~ HM 1.4
6.5/0.9 - boulder	12.5/1.5	18.5/1.1	24.5/1.2
7.5/1.1	13.5/1.2	19.5/1.0 - boulder	25.5/1.2
8.5/1.6	14.5/1.2	20.5/1.2	

Location NEC /Nome Date 8/16/2016

Project / Client 05DK8702 / USACE & ECC

NEC

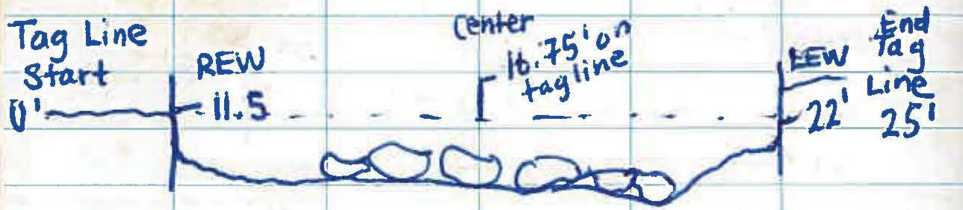
S29-004

1538 Depth measurement @ 14.5' of tagline is 1.2'. Center of stream at 14.5' tagline

~~0.2 Depth~~ HM 8/16	Ft below water surface	ft/sec Flow Reading
0.2 from surface	=0.24'	~~0.32~~ HM 8/16 0.46
0.4 "	" =0.48'	0.41
0.6 "	" =0.72'	0.39
0.8 "	" =0.96'	0.25

Although wind is blowing upstream, SUBI still flowing down stream

S29-003 compass 289 ° from REW



Boulder lined streambed.

Location NEC/ Nome Date 8/16/2016

Project / Client 05DK8702 / USACE & ECC

NEC

S29-003

1555 Distance from start of tagline (ft) / Depth of H_2O (ft)

11.5/0.9	16.5/1.2	21.5/0.5
12.5 ~~12.5~~ HM/8/16 / 0.9	17.5/1.4	22 /0.2
13.5/1.1	18.5/1.5	
14.5/1.1	19.5/1.6	
15.5/1.1	20.5/1.5	

1602 Distance across stream is 10.5'.

1/2 lenth of cross section is 5.25'

B Stream flow measurement at 16.75' on tagline

Depth at 16.75' is 1.2'	Depth below water surface (feet)	Flow Reading (ft/sec)
0.2 from surface = 0.24'	0.24'	1.31
0.4 from surface = 0.48'	0.48'	1.23
0.6 from surface = 0.72'	0.72'	0.96
0.8 from surface = 0.96'	0.96'	0.74

1615 Mob to S29-002

1635 **S29-002** compass 185 ° from REW

Tag Line start 0' ~~Center pt = 8.5' on tag tag line~~ on HM 8/16

REW 3.5'

LEW 11.5 width = 8.0' 7.5'

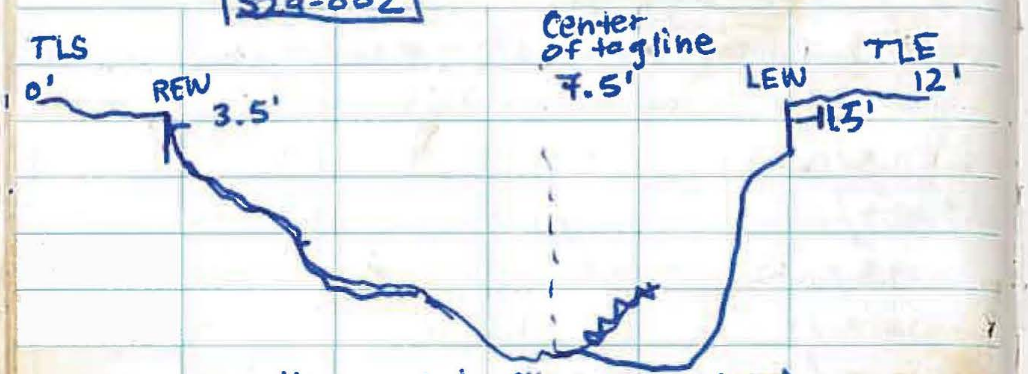
Tag Line End 12' center = 4.00' or ~~7.75~~ HM 8/16 On tagline

Location NEC / Nome Date 8/16/2016

Project / Client 05DK8702 / USACE & ECC

NEC

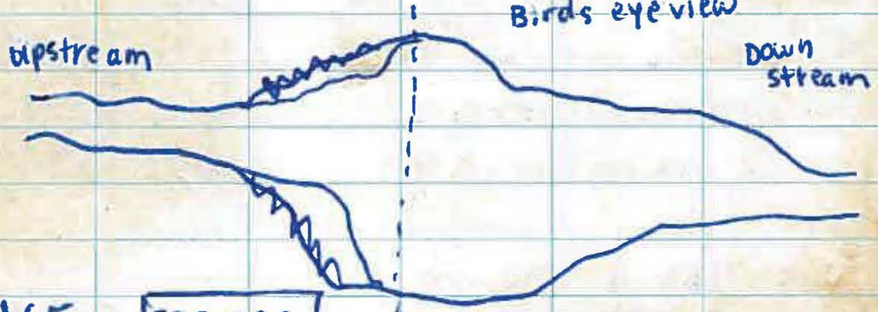
S29-002



smooth gravel & silt streambed

1645 Distance from start of tag line (ft) / Depth of H_2O (ft) S29-002

3.5/0.5	6.5/2.4	9.5/~~[illegible]~~ 3.3 Hm 8/16
4.5/1.4	7.5/3.2	10.5/0.4
5.5/1.8	8.5/3.4	11.5/0.3
		~~12.0/~~ Hm 8/16



1650 S29-002

~~165~~ Hm 8/16 Depth at center of ~~7.50~~ 7.50' Hm 8/16 on tagline = 3.2' H_2O

Measurement		
0.2	0.64'	from surface of H_2O
0.4	1.28'	↓
0.6	1.92'	
0.8	2.50	

Location NEC / Nome Date 8/16/2016

Project / Client 05DK8702 / USACE & ECC

NEC

S29-002

Depth from surface (ft)	Flow (ft/sec)
0.64'	0.45
1.28'	0.66
1.92'	0.58
2.50'	0.21

Center of stream in eddy.
Personnel did not enter water 7 3' deep.

1700 Team chooses to take measurements at estimated center of streamflow at 6.5 ' on tagline, depth 2.4'

1705	Depth from surface (ft)	Flow (ft/sec)
0.2	0.48	2.0
0.4	0.96	1.71
0.6	1.44	1.32
0.8	1.92	0.60

Mob to S29-001

S29-001

compass 170 ° from REW

TLS = 0 '
REW = 2.5 '
LEW = 11.0 '
TLE = 14.5 '

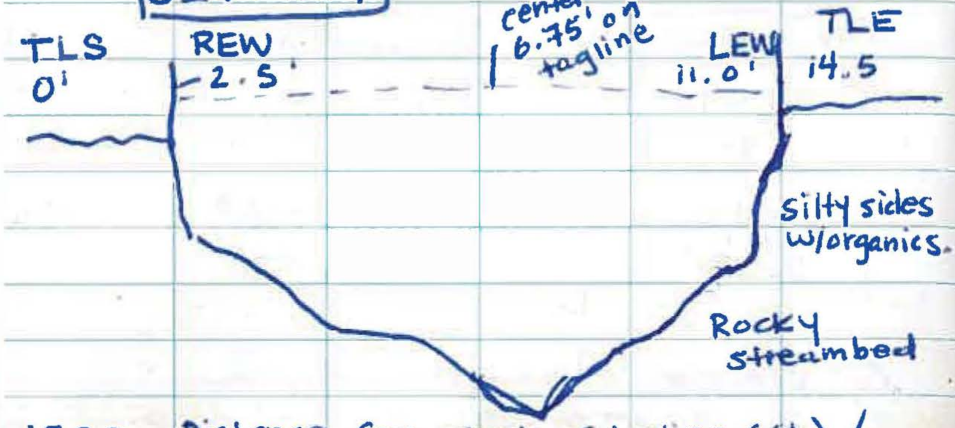
Width of stream = 8.5 '
Center pt = 4.25 '
Center pt on tagline = 6.75 '
Depth at center = 3.2

Location NEC/Nome Date 8/16/2016

Project / Client 05DK8702 / USACE & ECC

NEC

S29-001



1730 Distance from start of tagline (ft) / Depth of water (ft)

2.5/0.9 5.5/2.8 8.5/2.0 11/0.6
3.5/1.8 6.5/3.2 9.5/1.4
4.5/1.2 7.5/2.2 10.5/0.8

1735 Depth@ center (6.75') is 3.2' H_2O
~~of H_2O~~ HM

	Depth from Surface (ft) of H_2O	Flow (ft/sec)
0.2	0.64	0.41
0.4	1.28	0.45
0.6	1.92	0.45
0.8	2.56	0.40

vegetation approximately 2' upstream from measurement may affect flow. Vegetation along REW.

Location NEC / Nome Date 8/16/2016

Project / Client 05DK8702 / USACE & ECC

NEC

1750 Team elected to take additional measurements. Moved site 64° & 9.0' from post

TLS 0'
REW ~~1.5~~ HM 8/16 2.0'
LEW 9'
TLE 11.5'

~~Center = 7.~~ HM 8/16
Width = 7.0'
center = ~~3.75~~ HM 8/16 3.5'
Center on tagline = 5.5'

Distance from start of tagline (ft) / depth of water (ft) [Compass @ 170° REW]

2.0/2.1 5.0/2.9 8.0/2.2
3.0/2.3 6.0/2.9 9.0/2.1
4.0/2.9 7.0/2.8

1754 Depth at center (5.5' on tagline) is 2.9' H_2O.

	Depth from surface (ft) of H_2O	Flow (ft/sec)
0.2	0.58	0.16
0.4	1.16	0.17
0.6	1.74	0.23
0.8	2.32	0.26

All depth & flow measurements collected by SS, CC, & HM

1810 Pack up & Mob to camp. Remove 1 bag IDW.
1815 Load plane

Location NEC/Nome Date 8/16/2016

Project / Client 05DK8702 /USACE &ECC

NEC/Nome

1852 Depart NEC for Nome

1940 Arrive in Nome.

2000 Perform sample management

2200 End sample management

2300 Complete Sit Rep & EOD

Daily Summary

- sample 1 well @ MOC. MOC complete.
  1 primary sample
- sample S29
  2 sediment: 2 primary & 1 MS/MSD
  2 surface water: 2 primary & 1 DUP
- Collected flow on SU[illegible]i (S29)
  4 measurements
- Remove 1 bag IDW
- Pack 4 coolers.

Hollee Mclean

Location NEC/Nome Date 8/17/2016

Project / Client 05DK8702/ USACE & ECC

Nome

1015 Safety Tailgate:

Personnel: Stanley Seegars, Kristopher Reidt, Chris Carsuly, Hollee Mclean

WX:

PPE: Modified Level D

Safety: Fatigue management, wildlife, weather

Objectives: Sample S08

0845 Depart for office to prepare coolers.

0930 Arrive at AK Air Cargo to ship 4 coolers to ALS

COC#s 10-13

AWB# 027-4010-6345 Destination changed from SEA to PDX.

1000 Arrive at Bering Air.

1015 safety Tailgate. See above.

1035 Depart Nome for NEC.

1125 Arrive in NEC & pack gear to mob to Site 08. GAC filtered 9L of Decon water

1210 Mob to S08 to collect samples.

Samplers: SS, KR, CC, HM

Bottles;	Methods;	Analyses
1- 8 oz amber	DRO/RRO	AK102/103
	PAHs	SW8270DSIM

- All sample names start with:
  "16NEC-S08-"

Site 08 Sediment & surface soil sampling 16NEC-S08-...

Remainder of Sample ID (Location ID)	Date	Time	Sample Depth (ft bgs)	USCS & other observations
SD-065 (MS/MSD)	8/17/2016	1245	1.5-1.75	Grey, ML wet/saturated 0-1.5' organics & H2O
SD-066		1253	1.5-1.75	Grey & Brown, ML, wet/saturated 0-1.5 organics
SS-067 (MS/MSD)		1305	1.3-2	0-1.3' organics 1.3-2' brown, ~~damp~~ moist/wet ML, little organics.
SS-064 (9) (DUP)		1310	1.3-2	See above
~~SS~~ SD HM 8/17/2016 -063		1320	1.0-1.66	0-1' organics 1.0-1.66' brown, ~~damp~~ moist/wet ML HM 8/17
SD-062		1330	1.5-2.0	0-1.5' organics & water 1.5-2.0' brown/grey moist/wet ML
SS-058 (9) (DUP)		1336	1.5-2.0	~~0-1~~ 0-1.5' organics 1.5-2.0' brown ML wet
SS-059		1345	1.5-1.75	0-1.5' organic layer 1.5-1.75' brown ML, damp, trace organics

NEC

Remainder of Sample ID	Date	Time	Depth	USCS & other observations
SS-060	8/17/2016	1403	1.5-1.8	0-1.5 organics & water 1.5-1.8 ML, brown, ~~wet~~ moist, trace organics
SD-061		1412	1.7-2.2	0-1.7 organics & water 1.7-2.2 ML, brown, wet, little organics
SS-057		1427	1.5-2.0	0-1.5 organics 1.5-2.0 ML, brown, wet
SD-056		1432	1.75-2.25	0-1.75' organics 1.75-2.25 ML, brown, wet
SS-055		1438	1.7-2.1	0-1.7 organics 1.7-2.1 ML, brown, damp
SS-051		1442	1.4-1.75	0-1.4 organics 1.4-1.75 ML, brown, moist
SD-052		1459	1.5-2.0	0-1.5 organics & water 1.5-2.0' ML, wet, brown
SD-053 (9) DUP		1620	1.0-1.5	~~0-1'~~ H2O Depth 1 foot 0-1' organics 1.0-1.5' brown ML medium stiff, wet

NEC

Remainder of Sample ID	Date	Time	Sample Depth	USCS & other observations
SD- 054	8/17/2016	1636	1.5 - 2.0 ~~2.0-2.0~~	H2O depth 0.5'; organics @ 0' bgs - 1.5' 1.5-2.0 ML, wet, medium stiff, grey & brown, trace organics
SD-049	↓	1651	1.25-1.75	H2O Depth 0.75'; 0-1.25' bgs organics. 1.25-1.75 ML, grey & brown, wet/saturated
SD -050(9) DUP		1656	0.9- 1.25'	0-0.9' organics 0.9-1.25 ML; grey & brown, saturated
SS-048		1704	1.0-1.5	0-1' organics 1.0-1.5 ML, brown, moist/wet, little organics
SS -045		1712	1.25-1.75	0-1.25' organics 1.25-1.75' ML, brown, damp
SS --046		1717	1.5 -1.75	0-1.5' organics 1.5-1.75' ML, moist, brown
SS -047		1726	1.0-1.5	0-1' organics 1.0-1.5 ML, brown, damp, medium stiff strong odor *
SS-003		1742	0.75-1.0	0-0.75' organics 0.75-1.0' ML, brown, moist, trace gravel with organics & rust color, fuel odor *
SS-004	↓	1752	2.5-3.0	Not Sampled; along roadside. collect sand or go down to silt?
SS-008		1806	1.25-1.75 ~~1.5-2.0~~	placed PID into holed reads 194 ppm. 0-1.25 organics 1.25-1.75' ML, brown wet. Max reading of 373 ppm on PID
SD-007		1813	1.75-2.0	0-1.75 organics 1.75-2.0 ML, brown, wet wet at 2.0'
~~006~~ SS -005		1829	1.5-1.75	0-1.5 organics. 1.5-1.75 submerged, ML, brown/grey, wet, little organics
SS-002 (MS/MSD)		1835	1.0-1.5	0-1 organics 1-1.5 ML, brown, trace organics, w/ medium sand, moist, trace gravel
SS -001	↓	1840	1.0-1.5	organics @ 0-1' 1.0-1.5' ML, Brown, damp, with organics.

* PID reading at S08-008 not calibrated.

1634 S08-054 Relocated original location w/ cobbles @ 2' bgs (6-10" cobbles) that appear similar to those lining the edge of the road bed.

1752 Want guidance for S08-004 & S08-075.

Location NEC/Nome Date 8/17/2016

Project / Client OSDK8702/ USACE & ECC

NEC/Nome

1850 Mob to camp. Load up samples & gear.

1926 Depart NEC for Nome.

2015 Arrive in Nome. Take samples to office & refresh ice. Transported 1 bag camp trash & 1 bag IDW.

See Logbook 2 for info on ~~8~~ visitors today.

Daily summary:

Shipped 4 coolers to ALS

Collected SS: 17 primary, 2 DUP, 2 MS/MSD

SD: 12 primary, 2 DUP, 1 MS/MSD

2100 Break for dinner

2230 Sample Summary & sample tracking

2330 EOD

Location NEC/Nome Date 8/18/2016

Project / Client OSDK8702/ USACE & ECC

Nome

0700 Prepare labels for sample shipment.

0750 Call from KM regarding sample locations along & within roadbed.

0805 Safety Tailgate:

Personnel: Stan Seegars
Kristopher Reidt
Chris Carson
Hollee McLean

PPE: Modified level D

WX:

Safety: Fatigue

Obj. ship samples, Sample SC8

0825 Mob to office for sample management

0930 Mob to AK Air Cargo.

Ship two soil/sediment coolers to ALS.
Allison - AK [illegible]

AWB# 027-4010-6430

1000 Arrive at Bering Air. Meet w/ Scott McClintok for survey.

1010 Receive call from KM regarding sample points immediately adjacent to roadside.

18663654406 7513429

1035 Conference call w/ KM & Don Maloney From Aaron Snowman. Should not sample in road bed. In 20' grid along road bed, relocate

Location NEC/Nome Date 8/18/2016

Project / Client OSDK8702/USACE & ECC

Nome/NEC

directly west at vegetation.

From 10' centroid, relocate N/W until we reach vegetation. (73 & 75) (69)

1100 Field team boards plane. Very strong fuel odor. Alerted pilot to strong smell. Pilot (Jack) got out of plane to check for leaks. HM 8/18/2016 ~~No leaks~~. Pilot started plane but team continued to express concern. Asked pilot to please not take off. We all got out of plane. Turns out the odor was epoxy from a new door seal that ~~have~~ HM 8/18/2016 had been installed the night before. The fumes were trapped inside the aircraft.

1150 Depart Nome for NEC

1242 Arrive in Nome. Missing survey equipment. Must still be in other plane?

1245 2 visitors (Floyd and his wife) arrive to collect birthday cake.

1335 Field team mobs to SØ8 to determine pts that need to be relocated.

1345 Field team elects to relocate SØ8-04, 13, 21, 39, 69, 73, & 75

For samplers, bottles, & Methods see pg # 43.

Location NEC/Nome Date 8/18/2016

Project / Client OSDK8702/USACE & ECC

NEC

Site 08 Sediment & Surface Soil Sampling 16NEC-SØ8-...

ID (Loc ID) Remainder of Sample	Date	Time	Depth	USCS & other observations
SS -011	8/18/2016	1415	1.5-2.0	0-1.5' organics 1.5-2.0' ML, brown, little sand, with organics damp/moist
~~SS~~ -010 SD		1422	1.5-2.0	0-1.5' organics ~~0-0~~ H2O 0.25' 1.5-2' ML, brown, trace sand, little organics, moist
SD -009		1425	1.75-2.25	0.25' H2O 0-1.75' organics. 1.75-2.0' ML, brown, wet/saturated, little organics
SS -012		1432	1.75-2.25	0-1.75' organics PID=7.3ppm 1.75-2.25' ML, brown, moist, trace organics.
SS -006		1440	1.75-2.25	0-1.75' organics PID=1.4ppm 1.75-2.25' ML, brown, trace organics
SD -014		1449	1.5-2.0	0-1.5' organics 1.5-2.0 ML, brown, little organics, moist
SS-018 (9) DUP		1459	1.5-2.0	0-1.5' organics 1.5-2.0' ML, brown, trace sand, damp/moist

Location NEC / Nome Date 8/18/2016

Project / Client 05DK8702 / USACE & ECC

NEC

S08-004	ADJ	7'	W°
S08-013	ADJ	7.25'	W°
~~S08-021~~	~~ADJ~~		~~W°~~ HM 8/18
S08-069	ADJ	3.75'	NW°
S08-021	ADJ	6'	W°
S08-073	ADJ	8.25'	NW°
S08-075	ADJ	6.5'	NW°
S08-039	ADJ	7.5'	W°

1455 PID Bag Blank 0.6 ppm

1805 GAC filter approx. 8 gal decon water.

1835 Load Plane for departure to Nome

1842 Depart NEC for Nome. Brought 1 bag IDW

1930 Arrive in Nome. Transport samples & gear to office.

2100 complete labels & sample mgmt

Sit-Rep, send photos of sample relocation.

Daily Summary

- Relocated 7 sample locs that conflict with road.
- collect samples @ SOB
  - SS - 12 primary & 1 dup (1 in permafrost)
  - SD - 10 primary & 1 dup
- No survey; base station left in Nome.

EOD

Location NEC / Nome Date 8/18/2016

Project / Client 05DK8702 / USACE & ECC

NEC

Remainder of Sample ID (Loc ID)	Date	Time	Depth	USCS & other observations
SS -022	8/18/2016	1510	1.0-1.5	0-1' organics ~~&~~ blackish. 1.0-1.5' ML, brown, moist, with organics
SS -027 - tussick		1517	1.5-2.0	0-1.5' organics 1.5-2.0 ML, darkbrown, some organics moist/wet
SS-031 - tussick		1526	1.0-1.5	0-1' organics 1.0-1.5 ML greyish brown, moist, trace organics
SD -036(9) SD DUP		1533	1.5-2.0	0-1.5' organics 1.5'-2.0 ML, greyish brown, moist, trace organics
SD-040		1543	2.0-2.5	0-2' organics. H2O@ surface 2.0-2.5 ML, see above, moist / wet
SD-041		1616	2.0-2.5'	~~• 2'~~ HM 8/18/2016 ~~see SD-040, brown~~ HM 0-2' organics H2O@ surface 2.0-2.5' ML, dark brown, moist/wet, some organics
SD -017		1626	1.5-2.0	0-1.5' organics. H2O @ surface 0.7 ppm on PID 1.5-2.0 ML, brown, trace organics, moist
SD -016		1632	1.5-2.0	0-1.5' organics 1.5-2.0' ML, brown, trace organics, moist

Location NEC / Nome
Date 8/18/2016
Project / Client 05DK8702 / USACE & ECC NEC

Remainder of Sample ID (Loc ID)	Date	Time	Depth	USCS & other Observations
SD-015	8/18/2016	1638	2.0-2.5	0-2' organics H20 0.25' bgs. 2-2.5 ML, greyish brown, moist, little organics
SS-019	↓	1643	2.0-2.5	0-2' organics 2.0-2.5' brown, damp, little organics, ML
SS-020		1715	1.25-1.5	0-0.25' organics 0.25-1.25' - cobbles 3" - 9", some boulders (similer to those along road. 1.25'-1.5' SW, coarse sand with gravel
SD-026		1720	1.0-1.25	0-.25' organics 0.25'-1' Gravel & cobbles 1.0-1.25 some organics, saturated, ML ~~b~~ brown. * sheen & odor during sampling 3.7 ppm PID in headspace of bag Due to wet sample, difficult to PID.
SS-024 tussick		1737	1.5-2.5	0-2' organics w/ coarse sand & gravel (SW) 2'-2.5 ML, brown, damp
SS-023 * tussick		1749	2.0-2.5	0-2' organics 2.0-2.5 * Permafrost, ML, brown, little organics.
SS-028		1801	2.0-2.5	0-2.0' organics 2.0-2.5 brown, ML, damp, with organics.

Location NEC/ Nome
Date 8/19/2016
Project / Client 05DK8702 / USACE & ECC
Nome

0800 Call Bering Air. Call back at 930

930 call Bering Air. call back at 1100

Call TTT to verify special shipping info:

Batteries - DO NOT need declaration.

PID cal gas

Return unused.

Sticker
- Battery, non-spillable
- UN 2800 Battery, wet, non-spillable

AWB → NOT RESTRICTED per SPECIAL Provision

A67

Cal gas - IATA certified to ship.

$100 - to package

$65 - to handle

If fully expelled, throw bottle away

Puncture & recycle.

1050 Call Angela

Give away air horns.

Neutralize acids from bottles

3372 or cell 907-350-6742

Greg Rutkowski

1105 called Bering Air. Not flying today due to weather.

Location NEC / Nome Date 8/19/2016

Project / Client 05DK8702 / USACE & ECC

1106 Call Greg Rutkowski

* Lithium-ion battery

Flow meter? PID

Check all batteries

Lithium Ion battery sticker -

\- on AWB: Nature & Quant of Goods

lithium ion batteries in compliance

with section II of PI966.

* NAC - for chemetrics test kit

\# 1019 - NAC shipping account

1115 Prepare samples & supplies for shipment.

1345 Ship 1 cooler to ALS via Goldstreak

AWB# 027-4010-6555

Ship 2 pallets of gear from Nome to Anchorage office; notify K. Maher on arrival.

To ship on cargo flight 8/20

issue w/ Knowing AMPS of Lithium ion batteries contained in equipment. Confirmed w/ agent "DOES NOT CONTAIN DG"

AWB# 027-4010-6566

EOD

Location NEC / Nome Date 8/19/2016

Project / Client 05DK8702 / USACE & ECC

2300 Receive message from Linda at AK Air Cargo. Cooler/Refrigerator broke & shipment not taken on plane. Samples placed outside in a secure cart. I will stop by tomorrow to replace the ice. Called agent back so we could get cooler tonight to refresh ice. Linda will get cooler & drop it off at Old Alaska Rooms

2325 Linda calls. Cooler is in the mail truck behind locked gate. She cannot find the Key to the truck. I will pick up cooler tomorrow at 830.

Location NEC/Nome Date 8/20/2016

Project / Client 05DK8702/USACE & ECC

Nome

0800 Call Bering Air. Weather hold. Bering Air is not making any scheduled flights. call back at 1000.

0835 Arrive at AK Air Cargo. Pick up cooler.

0846 Arrive at office to replace ice.

0915 Ship cooler to PDX on same AWB.

1015 Call Bering Air. NO flight yet. Call back at noon.

To DO:

Ship chemetrics via NAC to ANC

Ship/PKG remaining items to ANC

- defrost freezer.
- ship coolers to ALS.

1200 NO flight.

Location NEC/Nome Date 8/21/2016

Project / Client 05DK8702/ USACE & ECC

Nome

0800 Call Bering Air. No one answers phone.

0830 Call Bering Air. Not looking good.

1000 called as WX day.

Started working on reports.

EOD

Location NEC/Nome Date 8/22/2016

Project / Client ~~USACE~~/ HM 05DK8702 / USACE & ECC

Nome/NEC

0800 Call Bering Air. Depart at 930.

0900 Safety Tailgate:

WX: 38-49°F, windy

PPE: Modified Level D

Personnel: Stanley Seegars

Kristopher Reidt

Christopher Carson

Hollee McLean

Safety: wind & windchill

Obj: Site 08

0905 Depart for office

0930 Arrive at Bering Air.

0945 Load plane

0950 Depart Nome for NEC.

1035 Arrive in NEC

Tent moved in the wind. Must have rolled over in wind. Someone came an secured the tent in our absence.

1200 Try to verify that all moved locations are there.

S29-006 still there but under approx. 5ft of H_2O See Logbook #2

1300 Mob to Site 8. See pg 43 for bottles, analyses, & samplers

---

Location NEC/Nome Date 8/22/2016

Project / Client 05DK8702 / USACE & ECC

NEC

S08 SD & SS Sampling

Remainder of Sample ID (Loc ID)	Date	Time	Sample Depth	USCS & other observations
Moved -025 Location.	8/22/2016			0.5' H_2O. 0.35' bgs organics. 0.5 - 1.5 cobbles (5-8")
SD - 025 7' from actual 025 & 17.2' from 028		1330	0.5-1.0'	0-0.5' organics. H_2O@ 0.25' bgs 0.5-1.0 ML, dray brown/with grey, wet, trace organics
SS - 004		1338	1.0-1.5	0-1.0' organics H_2O@ 0.5' bgs ML, brown, little organics, moist
SS -013 (9) DUP		1343	1.0-1.5	0-0.5' organics. 0.5-1.0' ~~SP~~ SW 1.0-1.5'. Fuel odor & sheen. SW & ML brown, medium to coarse sand, wet, sand with gravel.
SS -069 • collected from original location (green flag) (MS/MSD not needed.		1353	0.5-1.0	0-0.5' cobbles 0.5-1.0' SW - coarse sand trace gravel, moist, little silt

Location NEC / Nome
Project / Client 05DK8702/ USACE & ECC
Date 8/22/2016

Remainder of Sample ID / Loc ID	Date	Time	Depth	USCS & other observations
SS -021	8/22/2016	1404	1.0-1.5	0.5' organics, 0.5-1.0' Cobbles, H_2O@ ~0.75' bgs 1.0-1.5' SW & ML, wet, little gravel, with organics
SS -071		1412	1.5-2.0	0-1.5' organics. 1.5'-2.0' ML, brown & grey, little organics, trace gravel, damp/moist.
SD -068 MS/MSD		1423	1.5-2.0	~~0-.75' organics~~ 0-1.5' organics & cobbles, H_2O@ 0.25' bgs 1.5-2.0' Brown, ML, ~~little organics, moist~~ /wet little coarse sand
SD -070		1430	1.5-2.0	0-1.5' organics. H_2O@ surface 1.5-2.0' brown, ML, little organics, little coarse sand, moist
SS -072		1442	1.0-1.5	0-1' cobbles 1.0-1.5' SW, coarse sand, little silt, wet with gravel
SS -073		1456	2.0-2.5	0-1' organics 1'-2' cobbles 2'-2.5' - Grey ML, little organics, damp/moist, sample
SD -074		1504	1.0-1.5	0-1' organics. 1.0-1.5' Greyish brown, ML, little organics, moist/wet, sample submerged
SD -075		1512	1.5-2.0	0-1.0 vegetation. 1.0-1.5 cobbles. 1.5-2.0 Grey, ML, little organics, moist/wet, sample submerged
SS -039		1522	2.0-2.5	0-2' organics. ML, light & dark brown, trace organics, damp to moist
SS -044	↓	1537	2.0-2.5	0-2 organics with cobbles. sample under H_2O. 2-2.5 see SS-039

Location NEC / Nome
Project / Client 05DK8702/ USACE & ECC
Date 8/22/2016

SD -043		1541	1.5-2.0	0.5' H_2O 0-1.5' organics 1.5-2.0' ML brown, trace organics, moist, trace gravel
SD -042		1553	1.5-2.0	0.5' H_2O 0-1.5' organics 1.5-2.0 see 043
SD -038		1601	1.5-2	" " " " 1.5-2.0 ~~brown~~ grey, ML, trace organics, moist
SD -037(9) DUP		1608	2-2.5	0.5' H_2O 0-2.0' organics. 2.0-2.5' ML, grey, trace organics, moist/wet
SS-032		1616	1.0-1.5	0-1' organics. 1.0-1.5' ML, brown, little organics, damp
SD -033		1622	1.0-1.5	0-1' organics 1-1.5' ML, brown, wet
SD-034		1630	1.5-2.0	0-1.5' organics. H_2O@ surface. 1.5-2.0 see 037
SD-035		1639	1.5-2	0.75' H_2O 0-1.5 organics 1.5-2 see 033
SD -029		1645	1.5-2	H_2O@ surface 0-1.5 organics. 1.5-2.0 see 033 ~~with~~ little organics
SS -030	↓	1655	1-1.5	Fuel odor. 0-1.0 organics & cobbles 1.0-1.5 SW, coarse sand with gravel. Trace organics. Wet.

Location Nome / NEC Date 8/22/2016

Project / Client 0SDK8702 / USACE & ECC

1700 Empty vials of HCl from VOAs &
trip branks.
GAC filter approximately **7 gallons**
of decon water

1715 Mob to shelter & pack plane. **1 Bag IDW**

1820 Start plane to leave NEC.

1915 Arrive in Nome.

Daily Summary:
Salvage shelter.
verify swing tie method for survey.
S08 finished
not needed.
SS - 11 primary (1 DUP & 1 MS/MSD)
SD - 13 primary (& 1 DUP & 1 MS/MSD)

complete sample labels & SitRep

2200 EOD

Location Nome / NEC Date 8/23/2016

Project / Client USACE & ECC / 0SDK8702

Nome

0630 Arrive at office to prepare samples for
shipment & gear for demob.

0930 called Chemetrics
ship - as dangerous good in
accepted quantities class #8
Disposal - special Handling w/RCRA

1005 Arrive at AK Air Cargo. Waiting for them
to open at 1030 AM.

1015 opened early for me.
Shipped 1 coolers to ALS Goldstreak.
AWB 027-4010-6765
027-4010-6$\overset{5}{7}$76 - empty coolers general freight

Shipped sampling supplies to ANC
AWB 027-4010-6780

1115 Prepare to depart Nome for NEC.

1216 Arriva in NEC.
Check Beach @ mouth of Sugi. Beach has been leveled-off.

1247 Stop at culvert on SU Q1. Water is higher
than yesterday downstream of SU Q1.

Location Nome / NEL Date 8/23/2016

Project / Client 05DK8702 / USACE & ECC

NEC

ADJ	Pt	Dist	Pt	Dist
054 ~~060~~	054	3.06'	57	19.27'
039	039	7.35'	44	22.10'
075	030	8.40'	75	6.11'
073	073	8.16'	072	7.05'
021	021	5.83'	071	17.17'
013	013	7.25'	068	15.21'
004	007	23.73	003	13.38'

1400 Floyd & 2 kids visit camp. Spent 1.5 hours securing our shelter.

1500 Mob to 508 & 529. Removed all stakes @ 508. From 529, removed 001, 002, & 003. Remainder under H_2O.

1515 3 ATVs & ~~8~~ 5 people arrive at 508. HM 8/23

1535 Return to camp. Wait for CASA.
1730 CASA arrived. Load gear & 1 bag general trash
1755 Start Navajo. Head for Nome.
1844 Arrive in Nome.
2000 Arrive at old AK Rooms.
EOD

[illegible] McLean

Location Nome / NEC Date 8/24/2016

Project / Client 05DK8702 / USACE & ECC

Nome

0645 Dispose of 2 bags general trash
Recycle amber bottles (by George).
0900 ship test kits via NAC.
NOA - H. McLean
AWB# 345 2303 9041
1100 Return vehicle to Stampede Auto
1115 Receive ride to airport to wait for ~1220 departure.
1400 Arrived in Anchorage

[illegible] McLean

6 32281 55011 2
ISBN 978-1-932149-36-4

NEC 2 of 2

2016

Kristopher Reidt

Rite in the Rain®
ALL-WEATHER
ENVIRONMENTAL
FIELD BOOK
№ 550

05DK8702
V20120FLD

AE-ECC-J07-05DK8702-
H04-002

8/6/2016 - 8/23/2016

Rite in the Rain®
ALL-WEATHER WRITING PAPER

ALL-WEATHER
ENVIRONMENTAL FIELD BOOK

Numbered Pages

Name ECC + Jacobs

Address

Phone

Project NEC 050K8702

Rite in the Rain — A patented, environmentally responsible, all-weather writing paper that sheds water and enables you to write anywhere, in any weather. Using a pencil or all-weather pen, *Rite in the Rain* ensures that your notes survive the rigors of the field, regardless of the conditions.

Specifications for this book:

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 550	Item No. 550F

RiteintheRain.com

Made in the USA
US Pat No. 6,863,940

CONTENTS

PAGE	REFERENCE	DATE

Reference Page Index

CONTENTS

PAGE	REFERENCE	DATE

Location NEC / Nome Date 8/6/16

Project / Client 05DK8702 / USACE + ECC

0710 Hold tailgate safety meeting @ Old Alaska Rooms: 1/4 mile vis. in Savoonga. Expected weather delays.

personnel: Stan Seegars (SS)
Kristopher Reidt (KR)
Chris Carson (CC)
Hollee Mclean (HM)

Safety Topics: Driving though Nome (pedestrians + ATV's), weather delays onsite, air travel.

Todays objectives: Continue sample kit prep.
- Continue go though all equipment and workplan.
- Review schedule and possible Scenarios
- Practice setting up emergency camp tent.

0750 Depart for Bering Air

0810 Arrive at Bering Air. Discussed weather and flight schedule w/ Kevin (Pilot) No one has flown to site yet this year. Bering Air will require 1000 ft ceiling and 3 mile visibility.

0900 Arrive at field office. Discuss workplan and sample procedures.

Location NEC / Nome Date 8/6/16

Project / Client 05KD8702 / USACE + ECC

1045 Return to Bering Air to practice setting up weatherport shelter.

1300 Finish setting up and packing shelter. Go to Builder Supply to purchase tools and cable clamps for setting up shelter in the field.

1300 Return to Bering Air. Discuss w/ Chris (scheduler) about attempting a flight tomorrow morning @ 0900.

1330 Responded to a email correspondence from Scott McIntock (Surveyor) regarding remaining questions about sample locations. Also called Dan Malony (ECC PM) and gave him a status update of the project.

1400 End of day

KR

Location NEC / Nome Date 8/7/16

Project / Client 05DK8702 / USACE + ECC

Mostly sunny, scatter clouds, lsh wind. Foggy conditions in Savoonga. Fog expected to lift soon.

0830 Hold tailgate safety meeting @ Old Alaska Rooms. Expect to fly to NEC this morning. Personnel in attendance:

Stan Seegars (SS)
Kristopher Reist (KR)
Chris Carson (CC)
Hollie McLean (HM)

Safety topics: Hazards associated w/ setting up emergency shelter, wearing appropriate PPE, Hazards associated with working at the site.

Todays objectives: 1st flight to NEC setup emergency camp and stage field equipment.

0840 Depart for Bering Air

0850 Check in with scheduler Chris regarding this morning's flight. Was notified that there was a lifting fog over Savoonga that is expected to clear later in the morning.

Location NEC / Nome Date 8/7/16

Project / Client 05DK8702 / USACE + ECC

0900 Arrive at field office to check on gel ice. Restocked and sorted freezer to allow for better freezing of Gel ice packs. Will wait for phone call from Bering Air for when they anticipate they will be able to fly.

0915 Set up stream flow velocity meter on the slough outside of town to practice collecting stream flow measurements. Chris Casa had noticed the lack of cell phone signal at that location. Returned to field office to

1000 wait for phone call from Bering Air for possible flight to NEC.

1130 Begin loading equipment onto aircraft for attempted mobilization flight to NEC. Chris from Bering Air voiced their interpretation of the flight schedule. Bering Air was under the impression that flights would be "daily" but not necessarily twice a day. Aircraft will wait on the ground while field team sets up emergency camp. Schedule changes or possible changes to number of flights a day for field duration.

Location NEC / Nome Date 8/7/16

Project / Client 05DK8702 / USACE + ECC

1200 Was notified by Bering Air that the aircraft are loaded and are now waiting for a weather update from the afternoon scheduled flight to the Island. Inquired about standby rates for the Navajo and King Air aircraft to wait onsite.

1230 Reviewed stream velocity gauging procedures while waiting on standby at Bering Air. Emailed a project to Don Maloney regarding flight status, anticipated aircraft and change in plans w/ keeping plane on ground on site. Emailed Scott from Ecoland Survey and responded to his earlier question regarding site #29 location names vs. coordinates. Holly McLean had suggested he review the data on the second tab of the spreadsheet. If this does not answer his questions, we will need to arrange a meeting to discuss.

1430 Was notified by Kyle from Bering Air that today's flight has been cancelled. CASA aircraft is loaded and will make another attempt tomorrow morning at 0900.

Location NEC/NOME Date 8/7/16

Project / Client 05DK8702 /USACE + ECC

1430 Contacted Scott regarding Survey Schedule. Addressed his questions about Site #29 by pointing out the second tab on the Excel File. Will attempt the site survey on Tuesday following the mobilization flight.

1300 Continued to practice with the stream flow velocity meter. Updated Dan Maloney on schedule.

1645 Return to lodging to review expanded equipment manual for flow meter and catch up on log book notes. Reviewed user's manual for stream flow meter

1730 End of day

ve

Location NEC /NOME Date 8/8/16

Project / Client 05DK8702 /USACE + ECC

Mostly Sunny, light breeze, good vis in Savoonga

0800 Called David Olsen to discuss possible flight to NEC. Was notified that we will plan for 0900 departure.

0810 Conducted tailgate safety meeting: at Alaska Rooms. Personnel in Attendance

Stan Seegars (SS)
Kris Reidt (KR)
Chris Carson (CC)
Hollee Mclean (HM)

Discussed similar topics as 8/7/16. with the addition of safe wildlife encounters and preparing a tsunami evacuation plan.

0900 Arrive at Bering Air

0930 Depart on Navajo w/ CASA for mobilization flight.

Navajo pilot - Stan
CASA pilot - Kyle

1020 Arrive at NEC. Wait for CASA to arrive.

1040 CASA arrives. Begin unloading aircraft and setting up weatherport.

1325 Finish tent setup. Break for lunch

Location NEC / Nome Date 8/8/16

Project / Client 05DK8702 / USACE + ECC

1500 Calibrate PID: S/N: 910685
Zero cal = 0.0 ppm
Span cal = 100.0 ppm

1510 SS + CC finish site setup
KR + HM begin Groundwater elevations at the MOC. (Well depth measurements are recorded in field notebook #1).

1600. Reassess effort. Focus on strictly locating wells.

1645. All groundwater sampling locations identified. Return to Base Camp and prepare for demobe back to Nome.

1715 Depart NEC.

1801 Arrive at Bering Air. Discuss tomorrow's schedule w/ Kyle. Will try to allow for drop-off morning flight and then return flight. Otherwise, may have to keep plane on Standby. Will notify Don Maloney if they will not provide two flights.

End of day

Location NEC / Nome Date 8/~~8~~ 9 KR/16

Project / Client 05DK8702 / USACE + ECC

Overcast, 1000 ft + ceiling, 50F, expected showers

0805 Conduct morning tailgate safety meeting at Old Alaska Rooms. Personnel present: Stan Seagars (SS)
Kris Reist (KR)
Hollee McLean (HM)
Chris Carson (CC)
New topics: Securing equipment on site. Will get lock for trailer. Need to consider how to secure equipment while field team is in Nome.

0812 Make Morning Call to Bering Air. to check status of 0900 departure. Was notified that they are unable to get weather information from Savoonga and may not get a flight out at 0900.

0815 Called Scott McClintock and left voicemail to relay status update.

0840 Called Don Maloney to discuss flight delays. Was told to see how long the survey will take and take a flight to see if we

Location NEC/Nome Date 8/9/16

Project / Client 05DK8702 /USACE + ECC

Overcast, 50°F, Foggy in Savoonga.

get in to the site assuming we can possibly be on the ground long enough to finish.

0850 Called Scott McClintock. Was notified his survey at NEC will take at least 8 hours to complete.

1000 Cloud ceiling in Savoonga seems to be holding at 500'. Will make attempt to fly in to NEC. Contacted Scott McClintock and notified him of our intention to disembark. Notified Don Maloney of the weather delay.

1100 Weather moved in over Savoonga. Delayed flight. Field team decided to take the following day off work as Savoonga is forecast to be foggy for several days.

1200 Called Don Maloney and discussed the possibility of intentionally staying out on the Island as an alternative approach to using the camp for emergencies only. Was told that he will discuss this option w/ Jacobs and USACE.

1230 End of Day

Location NEC/NOME Date 8/10/16

Project / Client 05DK8702 /USACE + ECC

Overcast, 50°F, 3 mile+ visibility in Savoonga

0815 Called David @ Bering Air. Was notified that the weather has cleared over Savoonga and we can attempt a flight to NEC. Scheduled flight departure @ 1000. Notified Don Maloney of change to field schedule.

0900 Conducted morning safety meeting @ Old Alaska Rooms. Personnel in attendance: Stan Seagars (SS)
Kris Reidt (KR)
Chris Cason (CC)
Hollie McClean (HM)

Safety topics: air travel, weather delays, wildlife/people encounters, and doing an inventory of equipment on site before aircraft departs.

Will make sure Bering Air has our contact info in the field.

1000 Arrive @ Bering Air to wait for departure.

1100 Arrive @ NEC. Begin site inventory. Everything appears to be here. Begin collecting GW elevations (see field notebook #1) for data.

Location NEC/NOME Date 8/10/16

Project / Client 05DK8702 /USACE + ECC

Overcast, low cloud ceiling (300') 50°F

1354 Begin calibration of YSIs

YSI #1 (SN: 09G101038)

YSI #2 (SN: 096101665)

Conductivity Solution: 1413 µs/Cm EXP: 11/2018

Part # 00653-18 - opened 8/10/16

~~YSI~~	Pre-cal	Post-cal
YSI #1	1.432	1.413
YSI #2	1.375	1.413

Dissolved Oxygen

YSI #1	106.1	100.1
YSI #2	104.3	99.7

PH 7.00 Part # 00654-04 EXP: 11/2017

YSI #1	7.28	7.01
YSI #2	6.88	7.01

PH 4.00 Part # 00654-00 Exp = 7/2017

YSI #1	4.20	4.04
YSI #2	3.97	4.04

PH 10.00 Part # 00654-08 Exp = 08/2017

YSI #1	9.88	9.89
YSI #2	9.46	9.90

ORP Part # 8032 Exp: 09/2019

YSI #1	256.3	240.0
YSI #2	264.9	240.0

Location NEC/Nome Date 8/10/16

Project / Client 05DK8702 /USACE + ECC

overcast, low cloud ceiling (300') 50°F, windy

1430 Begin round of groundwater sampling.

1500 Setup on monitoring well 14MW01.
Refer to field notebook #1 for
details of sampling at this location.
Refer to Groundwater collection form
for sample details.

* 1625 Collected GW sample ID
16NEC-14MW01-WG

1712 Setup at monitoring well 14MW03.
Samplers: KR + SS
Having issues with submersible pump.
unable to hold a load on the controller.

1730 Stop sampling effort at this location
Return field equipment to Base Camp
and assist samplers HM & CC at
well location 14MW02.

* 1817 Collected GW sample ID
16NEC-14MW02-WG(-9)
Refer to GW sampling form for details
to sampling

1915 Return to shelter. Begin equipment clean
and preparing for flight to nome.

Location NBC / Nome Date 8/10/16
Project / Client 05DK8702/USACE + BCC

2034 Arrive @ Nome.
2050 Arrive @ office. Prepare sample labels and get Ice.
- Was notified by pilot (Stan) that NBC is not on the charter itinerary for tomorrow. He said he would make himself available if weather is favorable for flight tomorrow.
- Notified Scott McClintock that we will attempt to fly to NBC in the morning.
- Prepare daily report to BCC PM.

2400 End of day

KC

Location NBC / Nome Date 8/11/16
Project / Client 05DK8702 / USACE + BCC

0800 Call Bering Air to check on weather conditions. Was notified of low cloud ceiling above Savoonga.
0815 Notified Dan Maloney and Scott McIntock about weather delay.
0830 KR, SS, CL go to field office to help prepare samples for shipment.
0945 Go to Alaska Air Cargo to ship sample coolers.
1015 Called Bering Air. Was notified of low cloud ceiling. Will call @ 1300.
1300 Called Bering Air. Was notified of continued cloud cover. Field team will end attempts to fly to NBC.

KC

Location -NEC / NOME Date 08/12/16

Project / Client 05DK8702 / USACE + ECC

Overcast, 50°F, Cloud ceiling in Savoonga around 400'

0800 Made morning call to Bering Air. Was notified of favorable conditions. Will plan a a drop off flight @ 0930. Bering Air will provide air King Air at the expense of a Navajo Aircraft. Called Scott McIntock. He will not be available today due to meeting w/ another client.

0930 Arrive @ Bering Air. Prepare to depart to NEC

1020 Fly over NEC. Cloud ceiling had dropped to 200' w/ zero visibility. Returned aircraft to Nome.

1110 Called Don Maloney and notified him of the weather delay. Today will be the 4th Option Task 1 weather delay and first option Task 3 turnaround flight due to weather.

VK

Location NEC / NOME Date 08/13/16

Project / Client 05DK8702 / USACE + ECC

Overcast 45-50°F @ NEC lifting Clouds 500' ceiling

0800 Called Bering Air. Was notified of lifting Cloud ceiling. Will call back @ 0900. Notified Scott McIntock.

0830 Conducted Tailgate safety meeting @ Old Alaska Rooms. Personnel on Site:
Stan Seegars (SS), Chris Cason (CC)
Hollee McLean (HM), and Kris Reat (KR)

Safety Topics: Travel in Nome
Travel to NEC
Travel while onsite
Emergency weather over @ NEC.

0900 Called Bering Air. Was notified that we will attempt a flight @ 1000.
Notified Scott McIntock.

1015 Departed Bering Air (Nome) for NEC

1100 Arrive at ~~Bering Air~~ NEC. All equipment accounted for. Visibility was approx. 15 mi and cloud ceiling around 500' during the approach. Unpacked field/camp equipment, calibrated instruments and prepared for GW sampling.

Location NEC/Nome Date 8/13/16

Project / Client 05DK 8702 /USACE +ECC

Overcast @ NEC, 500' ceiling 50°F 15mi visibility

1115 Calibrated YSI meters.

Conductivity Solution

Instrument	pre-cal	post-cal
YSI#1	1.378	1.413
YSI#2	1.036	1.415
Dissolved Oxygen		
YSI#1	104.9	99.3
YSI#2	97.5	99.5
PH 4.00 (4.01)		
YSI #1	3.75	4.01
YSI #2	4.05	4.01
pH 10.00 (10.01		
YSI #1	9.93	10.01
YSI #2	9.84	10.01
pH 7.00 (7.01)		
YSI#1	7.10	7.01
YSI #2	6.98	7.01
ORP Solution		
YSI#1	238.7	240.1
YSI#2	237.6	240.0

See pg. 14 for calibration Lot #'s and expiration dates.

Location NEC / Nome Date 8/13/16

Project / Client 05DK 8702 /USACE +ECC

Broken clouds, 500't Ceiling. 50°F no wind.

1220 Samplers KR + SS setup @
monitoring well 14MW06

1232 Began purging well.

*1310 Collect GW sample 16NEC-14MW06-WG.
and duplicate sample 16NEC-14MW06-WG-9
Break for lunch. finished sampling
this location @ 1417.

1600 Samplers KR + SS setup on well
14MW03

*1644 Collect GW sample
16NEC-14MW03-WG. Finished
Sampling this location @ 1727.

1800 Samplers KR + SS Setup @ well
location 16NEC-MW88-10-WG

*1829 Collect GW sample
16NEC-MW88-10-WG. Finished
Sampling @ this location at 1859.
Begin site breakdown.

2040 Depart NEC for Nome.

Location NEC / Nome Date 8/14/16

Project / Client 05DK870Z / USACE + ECC

Mostly Sunny @ Nome. 200' cloud ceiling @ Savoonga.

0830 Conduct morning safety @ Old Alaska Rooms. Personnel: KRIS Reidt, Stan Seegars, Hollee McLean, Chris Carson.
Safety Topics: Travel to and from Site. Travel around Nome, wildlife encounters fatigue management.

0920 Called Bering Air. Was notified that we are presently on a weather delay. Will call after 10:00 am. Notified Dan Malany of delay. Hollee McLean and Stan Seegars departed for the office to prepare sample labels.

1009 Was called by Bering Air. Notified that the field team can head down for departure. Hollee McLean will stay in Nome to process samples.

1114 Depart Nome for NEC in Navajo airplane.

1200 Arrive @ NEC. Limited visibility and Cloud Ceiling @ 400'-500'. Pilot had suggested that we remain on the ground for a while.

Location NEC / Nome Date 8/14/16

Project / Client 05DK870Z / USACE + ECC

Low cloud ceiling 400' 50°F, Light breeze

1220 Calibrated PID SN: 592-910685
Fresh air calibration: 0.0 ppm
Isobutylene cal gas: 100 ppm

1229 Calibrated YSI SN: 09G101665 (YSI #2)
(See pg 14 for cal solution lot #s & exp date)

~~Conductivity~~

	pre-cal	post-cal
Conductivity	1.403	1.413 mS/cm²
pH 7.00	7.00	7.01
pH 4.00	3.99	4.00
pH 10.00	9.98	10.06
ORP	238.1	240.0
DO	96.0%	99.6%

1245 Break for lunch.

1310 Setup at well 17MW-1
DTW = 12.10 TD = 15.65
PID: 0.0 for all spaces

1328 Start Purging
Initial turbidity = 149 NTU

✱ 1422 Collected GW sample 16NEC-17MW-WG

1505 Setup at well 22MW2

1540 Visitors arrive on 4-wheeler. Same visitors as yesterday. Eugen and his family at collecting water at the top of the valley.

Location NEC / Nome Date 8/14/16

Project / Client 05DK8702 / USACE + ECC

Windy, 45°F, overcast, 500' ceiling

* 1542 Collect GW sample 16NEC-22MW2-WG

1640 Setup at well 26MW1. Begin Purging @ 1652.

* 1737 Collected GW Sample 16NEC-26MW1-WG (see GW Sampling data sheet for details)

1815 Setup at well 20MW-1. Begin Purging @ 1823.

* 1858 Collect GW sample 16NEC-20MW-1-WG (see GW Sampling Sheet for details) Breakdown site, Return to Camp.

1958 Board Navajo and disembark for Nome.

2045 Arrive in Nome. Drop sample coolers off at office and put fresh ice on samples.

-End of day

VC

Location NEC / NOME Date 8/~~14~~15/16

Project / Client 05DK8702

Windy, 40-45F overcast

0900 - Made morning check-in call to Bering to confirm flight to NEC. Was notified that the weather @ Savoonga looks favorable so they will attempt a flight. Requested a departure time of 1030.

- Package and ship sample coolers to ALS.

1000 Arrive at Bering Air. Was notified by Don Maloney that USACE had directed ECC to resample monitoring well 14MW03 due to lack of stabilization of three parameters.

1034 Depart Nome via Navajo airplane. 1000' cloud ceiling on approach to NEC.

1140 Arrive @ NEC. Begin preparing for GW Sampling and Surface Water Stream gauging.

1158 Calibrate PID (see field book #1)

1159 Calibrate YSI (see following pg).

Location NEC / NOME Date 8/15/16

Project / Client 05DK8702

Windy, 40-45F, overcast

YSI SN: 05G101665	pre-cal	post-cal
Dissolved Oxygen	105.5 %	99.6 %
Specific Conductance	1,398 mS/cm²	1413 mS/cm²
pH 7.00 (7.06)	7.10	7.06
pH 4.00 (4.00)	4.00	4.00
pH 10.00 (10.06)	10.06	10.06
ORP (240.0)	242.9	240.0

1300 Samplers KR + CC setup on monitoring well 14MO3. Begin purging @ 1315.

* 1354 collect GW sample 16NEC-14MW03-WG

1454 Samplers KR + CC setup at well 14MW05.

* 1553 collect GW sample 16NE-14MW05-WG

1640 Break

1740 Samplers KR + CC setup at well 14MW04 Begin purging @ 1801.

* 1840 Collect GW Sample 16NEC-14MW04WG

1920 Return to camp and begin preparing for departure.

2010 Depart NEC for Nome.

Total of 3 GW samples collected

Location NEC / NOME Date 8/15/16

Project / Client 05DK8702

Windy, 40-45 F, overcast

0955 Arrive at Bering Air in Nome

* Note on monitoring well 14MW04: Purge water was very turbid throughout purging process. Initial turbidity read was approximately 860 while the subsequent readings showed a error code on the instrument which indicated the water was too turbid for the instrument to read. A calibration solution was used which was read accurately.

* Tailgate Safety briefing was conducted @ 1015 at Bering Air.

personnel on site: Stan Seegars, Kris Reast, Kollee Mclean, Chris Casa

Safety topics: Travel on site, flight to-from Nome/NEC, driving around Nome, exposure to weather, fatigue management

* Discarded two bags of IDW and trash from camp at Bering Air.

Location NEC / NOME Date 8/$\overset{16}{15}$/16

Project / Client 05 DK8702

Overcast, 500'-300' ceiling, 45°F, light breeze

0800 Called Dan Maloney about having Sample locations resurveyed @ the Snake River site.
Called Scott McIntuck about resurveying the site. Scott said he will let us know his availability in two days time.

0915 Conducted morning tailgate safety meeting @ Old Alaska Rooms.
Personnel on site: Stan Seagars, Kris Root Hollee McLean, Chris Casa
Safety discussion: Travel and Nome, Travel to NEC, working in open water exposure to elements.

1000 Arrive @ Bering Air. Disembark for NEC.

1055 Arrive @ NEC, 800-900 cloud ceiling, good visibility, moderate wind, Approx 45°F Anemometer does not appear to be working ~~app~~ accurately.

Location NEC / NOME Date 8/$\overset{16}{15}$/16

Project / Client 05DK8702

Overcast @ NEC, 45°F, light - no breeze

Calibrate Instruments for GW sampling
YSI #2 SN: 096101665
(see pg 14 for Cal. solutions Lot #'s and expiration dates)

	pre-cal	post-cal
Dissolved Oxygen	101.2%	100.4%
Conductivity	1.431 mS/cm²	1.432 mS/cm²
pH 7.00 (7.01)	7.06	7.01
pH 4.00 (4.01)	3.96	4.01
pH 10.00 (10.01)	10.00	10.01
ORP	239.7	240.0

1220 Samplers KR + CC setup @ well MW88-3, Began purging @ 1233

* 1330 Collect GW sample 16NEC-MW88-3-WG

1405 Finish @ well MW88-3, Return to Camp to retrieve tool kit to close well monument.

1500 Collect final total depth from well 22MW2, Return to camp to Prepare GW field equipment to move back to Nome.

1600 Sampler C.C. goes to assist the rest of the field team w/ stream water flow measurements.

Location NFC/Nome Date 8/16/16

Project / Client 05DK870C

Overcast. 500' cloud ceiling 45°F

~~Clear skies in Nome, 50°F, light breeze~~

1730 Sample K.R. goes to join the field team w/ stream water measurements. (Refer to fieldnote book #1 for details pertaining to Site 29)

1900 Complete Sampling and stream flow measurements along the Sugi river.

* Camp was visited by Eugene Tully and his family again. They had left a package for one of the pilots at the ~~#~~ shelter for the field team to bring back to Nome.

1955 Arrive in Nome. Discard 1 bag of camp related trash at Bering Air.

· Notify Dan Malaney of progress. Contact Scott McIntock that we will require additional survey @ NFC. He will attempt to come w/ field team tomorrow

2020 - Go to office to prepare samples for shipment to lab.

2230 End of day.

KC

Location NFC/Nome Date 8/17/16

Project / Client 05DK870C

Clear skies in Nome, 50+°F light - no breeze

0830 Return rental truck (BCC) to the Dredge no 7 Because a balding tire was beginning to show the threads. Replaced vehicle w/ a jeep.

0900 Go to office to prepare samples for shipment.

1000 Drop sample coolers off @ Alaska Airlines

1005 Conduct Tailgate Safety Meeting @ Bering Air.

Personnel on site: Stan Segars, Chris Cosa, Hollee McLean, Kristopher Reid

Safety Topics discussed: Fatigue management, Slips/trips/falls, travel to-from site.

1035 Depart Nome for NFC in Navajo airplane

1115 Approaching NFC. Skies look clear w/ unlimited visibility. Conducted 360° fly-over NFC for aerial photos.

1128 Arrive @ NFC. Prepare for sampling @ Site E.

1224 Field team arrives @ Site 8.

1530 Four visitors came by the camp on two 4-wheelers. One of the visitors is the daughter of Eugene Tully who has a cabin 10 miles to the west. The visitors had asked the pilot if they could bring a birthday

Location NBC / Nome Date 8/17/16

Project / Client 05DK8702 / USACE + ECC

Clear skies, 60+°F, light breeze

cake for his son's birthday. Four more visitors showed up (8 total). It was Eugene Tully and his wife and grandchildren.

1857 End sampling @ Site 8. Collected a total of 29 sediment samples and additional QA/QC samples (duplicate + MS/MSD)
- Begin site cleanup and prepare for departure back to Nome.

1932 Take off for Nome.

2015 Arrive back at Bering Air. Discarded 2 bags of trash (1 camp trash, 1 IDW).

2045 Go to office to put fresh ice on samples. Collected a total of 17 primary soil samples w/ 2 duplicates and 2 MS/MSD samples & 12 sediment w/ 2 duplicate and 1 MS/MSD samples.

2110 End of day

Location NBC / Nome Date 8/18/16

Project / Client 05DK8702 / USACE + ECC

Overcast, light breeze, 45°F, cloud ceiling 600-700'

0800 Morning tailgate safety meeting @ Old Alaska Rooms.
Personnel on site: Stan Seagas, Kris Reint, Hollee McLean, Chris Carson
Safety topics: Travel to and from Nome, fatigue management, slips/trips/falls

0830 Field team heads to office to prepare samples to ship to the lab.

0900 Called Bering Air to confirm morning flight to NBC. Followed up with confirmation to Scott McClintock to confirm schedule for today.

0956 Arrive @ Bering Air.
Communicated w/ Kevin Maher and Dan Maloney about adjust several sample locations at Site 8.

1040 Held conference call w/ Kevin and Dan regarding plan for adjusting sample locations at Site 8 and surveying adjusted sample locations at Site 9. ~~(Refer to fi~~
(Refer to field notebook #1 for details regarding which samples will be adjusted).

Location NEC / Nome Date 8/10/16

Project / Client 05DK8702 / USAC + ECC

Overcast in Nome. 50+ °F

1100 Board Navajo airplane for NEC. Strong petroleum odor was experienced in the cabin. Asked pilot if the smell was normal for this particular aircraft.

- Pilot conducted a walk around the plane to affirm there were no fuel leaks or for any obvious indications of source of smell. No sources of the odor were found. Field team commented again on how strong the odor was, saying it was giving people a headache. Again, team asked pilot if we could ask the maintenance people if they could confirm the source of odor. Pilot shut down aircraft and said we would use a different plane. Chris, who works in scheduling later had said the odor was not from petroleum but from "revving the engines up" and/or is from new plastic, perhaps from a new tote in the plane.

1140 Board new aircraft. Pilot notified field team that source of odor in previous aircraft was due to ~~door~~ sealant material on the door.

Location NEC / NOME Date 8/10/16

Project / Client 05DK8702

Windy, Overcast, 600-800' ceiling 45 °F

1250 Arrive @ NEC. Upon unloading the aircraft, the surveyor realized his tote of equipment was not loaded on to the new aircraft. Surveyor will not be able to survey the adjusted locations today. Will be available tomorrow.

1325 Calibrate PID SN: 592-910685
Zero cal gas: 0.0 ppm
Span cal gas: 100.7 ppm

1400 Field team heads to site 8 to continue sediment / soil sampling.

1808 Prepare to disembark for Nome. Field team heads to camp to clean up work area and board aircraft.

1830 Take off for Nome

1915 Arrive back at Bering Air. Field team heads to office to put fresh ice ~~of~~ on samples

2030 End of day

Location NEC/NOME Date 8/19/16

Project / Client 05DK8702 / USACE + ECC

Foggy + low cloud ceiling in Nome, high winds and rain

0749 Called Bering Air to check status of charter flight. Was notified that we are on a weather standby and was instructed to call back @ ~~1100,~~ 0930.

0930 Called Bering Air. Still on standby. Will call again @ 1100. Currently high winds and rain in Savoonga. Temperature in the 50°s.

1100 Called Bering Air, spoke w/ David Olson regarding today's flight. Was told a storm is blowing through and the worst will be tomorrow. Will stand down today and call in the morning.

- Notified Scott McClintock of delay and told him that we will plan on tomorrow morning.
- Notified Dan Maloney of weather delay.
- Field team heads to office to pack field equipment and prepare samples for shipment.

1400 Go to Alaska Airlines to ship equipment

Location NEC/NOME Date 8/20/16

Project / Client 05DK8702 / USACE + ECC

Nome - Foggy, rain, breezy

0757 Called Bering Air to check a status of charter flight to NEC. Was told they are not flying any scheduled flights today. Foggy in Savoonga. Will call back @ 1000

0845 Call Scott McClintock. Notified him of the weather delay. Was told that he will not be available to conduct the rest of the survey. Suggested that we survey tie in the remaining points

0900 Called Dan Maloney. Notified him of weather delay and status of the survey. Requested a 300' survey tape to do survey ties.

1012 Called Bering Air to check a flight status. Still poor weather conditions in Savoonga. The NOAA weather observation at the Savoonga airport reports overcast sky w/ 200' cloud ceiling. Will call back at 1200.

Location NEC / NOME Date 8/21/16

Project / Client 05DK8702 / USACE + ECC

Nome - Overcast / foggy, 45°F, rainy

Savoonga - Overcast, 45°F, windy; cloud ceiling 800'

0830 Called Bering Air for flight status to NEC. Was told by the scheduler that flights this morning. Will be contacted by Kyle (weekend manager or Dave Olson) regarding flight today.

1030 Called Bering Air. Still a stand down due to tourists' flight tours.

VK

Location NEC / NOME Date 8/22/16

Project / Client 05DK8702 / USACE + ECC

Nome - Mostly cloudy, windy, 45°F

0800 - Called Bering Air to check on flight. Was notified that conditions are favorable and will depart @ 0930.

0900 - Go to office to pick up ice and sample coolers.

0940 - Disembark Bering Air for NEC

1020 - Arrive @ NEC. Strong winds (40 mph) 40°F. The camp shelter had been blown over during the 3 day weather delay. The Tilly's had come by to secure it down. The tent is destroyed. The field equipment inside is a mess but appears serviceable.

- Contacted Dan Maloney and updated him on the situation. Was instructed to look at the adjusted sample locations to see if they can be sampled.

1200 - The lower Sagi River is several feet higher than when previously sampled.

Location NEC/Nome Date 8/22/16
Project / Client 0SDK870Z /USACE + BCC

Sample locations for Site 29 that require Survey
~~S29-0~~ S29-005 - Surveyed
S29-006 - Adjusted in the field. Presently
submerged under water. Appears w/in 700'
to location S29-005 ~~to~~ and S29-008
which is across the river.
- S29-007 - Adjusted in the field. w/in
the river. New location w/in 300' of
S29-005 and S29-008. Location is
about chest deep in the water.
- S29-001 - All samples ~~and~~ flow were collected
at the surveyed point. extra flow measurements
were collected from a better area in the stream
This location cannot be surveyed.
There is only the original location w/in
close proximity. Maybe does not require

1300 Begin sediment / soil sampling @ Site 8

Location NEC/Nome Date 8/23/16
Project / Client 0SDK870Z /USACE +BCC
Overcast / windy / 45°F

1030 ship field equipment provided by
Jacobs' Engineering back to Anchorage.

1115 Depart Bering Air for NEC.

1210 Conduct aerial survey of the
estuary of the Suqi River. Land @
NEC.

1230 Conduct ground survey of the estuary.
Sand bar appears leveled from the wave
action. Grass on top of sand bar
knocked over from waves.
Top of sand bar looks about 6' above
current ocean water level. The river
looks several feet higher than the ocean
- Area of Suqi River near the bridge
where samples were collected
appears higher than yesterday.

1245 Field team heads to Site 8 to
collect survey tie measurements for
select sample locations. (Refer to
field book #1 for data)

APPENDIX E
Photograph Log

2016 Northeast Cape 2016 MNA Groundwater Annual Sampling Report
Northeast Cape, Alaska

PHOTOGRAPH LOG
TABLE OF CONTENTS

(intentionally blank)

Photo No. 1 – 08 August 2016; 1044 hours.
Field gear loaded into the CASA. View facing northwest.

Photo No. 2 – 08 August 2016; 1058 hours.
Field gear unloaded from the Bering Air CASA. View facing north.

Photo No. 3 – August 2016; 1113 hours.
Erecting emergency shelter. View facing south.

Photo No. 4 – 08 August 2016; 1534 hours.
Emergency and field gear stored inside weatherport shelter. Inside.

Photo No. 5 – 08 August 2016; 1704 hours.
Emergency weatherport shelter, weather station, and ATV. View facing northeast.

Photo No. 6 – 10 August 2016; 1216 hours.
Collecting in well air measurement using a PID at well 14MW04. View facing south.

Photo No. 7 – 10 August 2016; 1217 hours.
Typical collection of groundwater depth at a monitoring well; well 14MW04. View facing down.

Photo No. 8 – 13 August 2016; 1252 hours.
Stability parameter collection at well 14MW06. View facing southeast.

Photo No. 9 – 10 August; 1535 hours.
Purging groundwater at monitoring well 14MW01. View facing southeast.

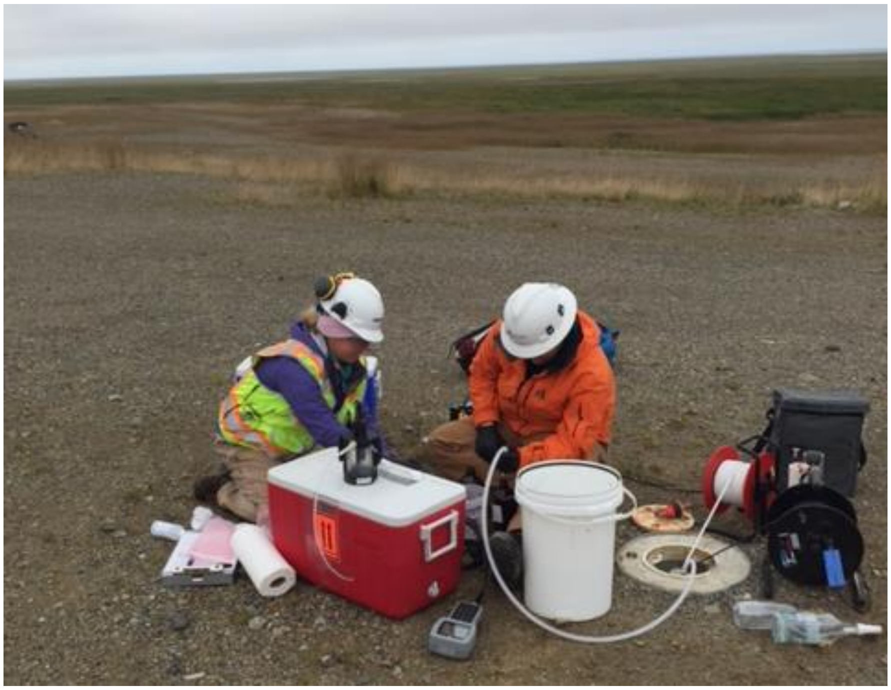


Photo No. 10 – 13 August 2016; 1631 hours.
Sample collection at well MW88-1. View facing north.

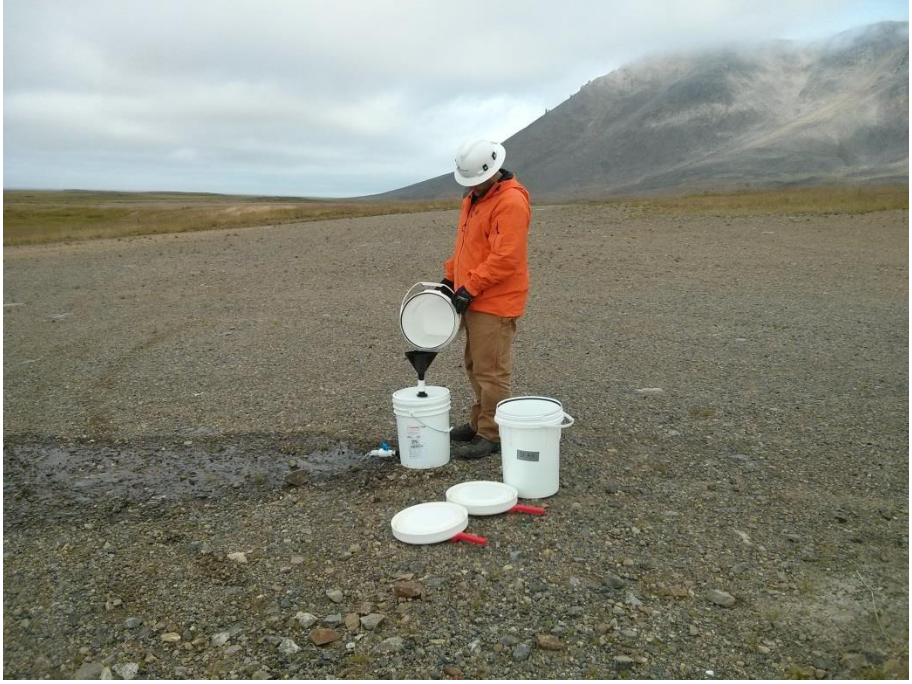


Photo No. 11 – 13 August 2016; 1918 hours.
Using GAC filter on-site. View facing east.

Photo No. 12 – 14 August 2016; 1245 hours.
Washout near Suqi River culvert. View facing southeast.

Photo No. 13 – 14 August 2016; 1253 hours.
Flagging placed as safety barrier around washout near Suqi River culvert. View facing southeast.

Photo No. 14 – 22 August 2016, 1038 hours.
Location of emergency shelter after storm event. View facing east.

Photo No. 15 – 22 August 2016, 1040 hours.
State of equipment inside emergency shelter upon arrival to NEC after storm event. Inside.

Photo No. 16 – 22 August 2016, 1105 hours.
Water in drip pan after storm event. View facing down.

APPENDIX F
Responses to Comments

Alaska Department of Environmental Conservation (ADEC)
Contaminated Sites Program
Document Reviewed: Draft 2016 Northeast Cape FUDS Main Operations Complex (MOC) Groundwater MNA Monitoring Report
Commenters: Curtis Dunkin-ADEC Project Manager
Date Submitted: June 12, 2017; ADEC Received RTCs on August 7, and Submitted Review Determinations on August 16, 2017 (post comment resolution meeting conducted on August 10, 2017)

#	Page #	Section	ADEC Comment	Response
1.	ES-1	Executive Summary	Please revise/amend the first bullet at the bottom of this page to better clarify whether the observed water table variability and/or what appears to be the predominant groundwater (GW) flow direction is based on both the historical as well as the 2016 results, or just 2016 results. It would be helpful to clarify throughout the document whether such statements are specific to annual and/or seasonal variability based upon the data sets and time frames of collection being considered. Please revise/amend the second bullet at the bottom of this page to clarify that although natural attenuation appears to be occurring, only two wells were suitable/appropriate at this time to calculate and evaluate natural attenuation based on availability of adequate data; and not due to a determination of relevance/applicability with respect to the other well locations. Findings of the 2016 RAOs should also include bullets for all major points;	Accepted. The ES and Section 6.2 will be revised to provide clarification. The first bullet of the ES will be revised to state: “*The elevation of the water table at the MOC is variable and the groundwater flow direction is predominantly northwest. The elevation of the water table at the MOC varies both across the site and annually while the groundwater flow direction at the MOC was predominantly northwest in 2016*”. Section 6.2, last sentence of the second paragraph, will be revised to state: “*Based on data collected during the 2016 sampling event, groundwater flow at the MOC was predominantly northwest (Figure A-3.1)*”. **ADEC-Accepted August 15, 2017** Accepted. The text will indicate the number of wells used to make this assertion. The second bullet of the ES will be revised to state: “*Current groundwater conditions in wells 14MW04 and 14MW05 indicate natural attenuation is occurring at the MOC*”. **ADEC-Accepted August 15, 2017** Accepted. Exceedances of the 2016 ADEC

#	Page #	Section	ADEC Comment	Response
			including but not limited to i.e. COCs for which analytical results indicate concentrations exceed applicable cleanup levels that were not designated a site-specific cleanup level (SSCL) in the 2009 Decision Document (DD).	levels will be stated in the ES. The third bullet of the ES will be revised to state: "*…exceeded groundwater SSCLs and DRO, naphthalene, chromium, and lead exceeded 2016 ADEC evaluation criteria*". **ADEC-Accepted August 15, 2017**
2.		2.0	Please apply all applicable comments which ADEC submitted on section 2.0 for the draft 2016 Suqi River and Site 8 Monitoring Report (which ADEC submitted previously to the Corps) to this section. Please also apply any other general applicable ADEC comments on the 2016 Suqi/Site 8 report to the subject MOC report based on the two efforts having been implemented concurrently by the same field crews during the same mobilizations.	Accepted. The historical analytical suites will be included in the text. Please see revised text for Section 2.2.1, paragraph eight, at the end of this document. **ADEC-Accepted August 15, 2017** Accepted. The two concurrent field efforts will be presented in the same way as the 2016 Suqi River and Site 8 Monitoring Report. Section 5.2, first paragraph, will be revised to state: "*NEC sampling occurred from 10 through 22 August 2016. Groundwater sampling activities at the MOC occurred from 10 through 16 August 2016. Soil, sediment, and surface water sampling activities occurred from 13 through 22 August 2016 and are presented under separate cover (USACE 2017). Copies of the field logbooks are provided in Appendix D*". **ADEC-Accepted August 15, 2017**
3.	2-5	2.2	In the first sentence of the last paragraph on this page it would be helpful to state the range of dates associated with the demolition actions.	Accepted. The range of dates will be added. Section 2.2, first sentence of last paragraph, will be revised to state: "*Demolition and*

#	Page #	Section	ADEC Comment	Response
				removal of the buildings and the majority of other structures from 1990 through 2014 were completed under multiple USACE contracts (USACE 2016a)". **ADEC-Accepted August 15, 2017**
4.	2-6	2.2.1	Please elaborate and provide more context for the referenced 'undocumented incidents of much larger spills' which is stated in the third paragraph of this section. Please revise/amend the last sentence of the third paragraph of this section to clarify that the referenced boundary only pertains to the extent of removal that was approved by ADEC due to the likelihood that advancing the excavations further northward, past this boundary, would have resulted in greater damage to the downgradient drainage system as well as a downgradient release of contaminated groundwater to the surface water pathway. Please also clarify further that contamination is known to remain at areas associated with the northern most MOC areas of concern and that residual contamination exceeding the SSCLs remains in soils located downgradient of the MOC throughout the Site 28 drainage. Please apply this rationale throughout the document where applicable.	Accepted. The First Five-Year Review will be included in the text. Section 2.2.1, third sentence of third paragraph, will be revised to state: "*As noted in the First Five-Year Review, interviews with former installation personnel suggest there were several undocumented incidents of much larger spills from the large aboveground storage tanks (USACE 2015a)*". **ADEC-Accepted August 15, 2017** Accepted. Text will be added to clarify why upgradient excavation was not performed. Section 2.2.1, fourth through sixth sentences of third paragraph, will be revised to state: "*Based on the results of the excavation and removal activities, the northernmost edge of the areas excavated at the MOC contains petroleum in subsurface soils at concentrations that are below the risk-based site-specific cleanup levels (SSCL) identified in the 2009 DD. Additional excavation further northward was not performed due to the likelihood that excavation would have*

#	**Page #**	**Section**	**ADEC Comment**	**Response**
				resulted in greater damage to the downgradient wetland area known as Site 28 Drainage Basin. Residual contamination exceeding the soil SSCLs remains within the Site 28 Drainage Basin downgradient of the MOC". **ADEC-Accepted August 15, 2017**
5.	2-7	2.2.1	Please add a short clarification to the second sentence of the first paragraph on this page to better clarify why the ISCO was not effective at the MOC. Noting that ADEC's understanding is that the ineffectiveness was not solely due to the organic material content of the soil, rather also due to the variability in substrate materials, conductivity, preferential flow, etc. This is all helpful information to better define the CSM in relation to the site conditions and how they impact the residual contamination, MNA, etc. Recommend revising the reference to 'existing monitoring wells' in the second paragraph on this page, and elsewhere throughout the report where applicable to clarify that this is intended to mean the installed wells to date which are considered serviceable and part of the MOC groundwater well monitoring network. Please revise/amend the last sentence of the second paragraph on this page, and apply to similar statements where applicable throughout the report, that not all of these wells were sampled during the stated time frame, and clarify that the referenced wells were installed and sampled in different years.	Accepted. Text will be added to discuss additional reasons ISCO was not effective. Section 2.2.1, fourth sentence of the fifth paragraph will be revised to state: "*Results indicated that ISCO was not an effective means of remediating the petroleum-contaminated soil present at the MOC due to the peat and organic silts in the soil, the presence of permafrost and/or frozen zones, and the observation of preferential flow zones (USACE 2015a)*". **ADEC-Accepted August 15, 2017** Accepted. References to 'existing monitoring wells' will be replaced with "currently installed and serviceable monitoring wells". Text will be revised in Sections 2.2.1 and 6.3. Section 2.2.1, sixth paragraph, will be revised as follows: "*Several monitoring wells have been installed and removed over time at the MOC. Monitoring well installation at the MOC began during RIs and continued through 2014 (USACE 2015b). Previous*

#	Page #	Section	ADEC Comment	Response
			Please amend the discussion in the third paragraph on this page to clarify whether the soil and groundwater associated with the installation locations of the subject upgradient wells were confirmed to be below applicable cleanup levels at the time of installation. **ADEC-Tentatively Accepted August 15, 2017; noting that it would also be helpful to include a brief summary of the ranges of analytical detections in soil samples for all six monitoring wells that were installed in 2014 in order to emphasize whether these were close to the applicable cleanup levels, well below, or whether there was a wider range. Please also clarify in the amended/added statement above, and elsewhere throughout the document where applicable, that not all of the cleanup levels that were selected and approved in the 2009 DD were/are considered SSCLs; rather some of these, like PCBs are the default most stringent concentration of 1 mg/kg in soil.**	*groundwater sampling events, from 2002 through 2015, collected groundwater from various combinations of monitoring wells (USACE 2016a). Currently installed and serviceable monitoring wells at the MOC, installed between 2002 and 2014, are 17MW-1, 20MW-1, 22MW2, 26MW1, MW10-1, MW88-1, MW88-3, MW88-10, 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, 14MW06, and 14MW07 (Figure A-3.1)*”. **ADEC-Accepted August 15, 2017** Accepted. A statement regarding soil contamination at monitoring well locations will be made. The following two sentences will be added to the end of the seventh paragraph in Section 2.2.1: “Soil samples collected during the installation of currently installed and serviceable monitoring wells were analyzed for a variable analytical suite including GRO, DRO, RRO, BTEX, PAHs, PCBs, metals, and TOC. None of the soil samples exceeded SSCLs (USACE 2002, 2004, 2015b)”. **ADEC-Tentatively Accepted August 15, 2017; please see and apply additional comment on the left.**
6.	2-8	2.2.1	Please revise/amend the last sentence of the first paragraph on this page to clarify whether the statement is intended to apply to the subject removed	Accepted. The text will be updated to clarify the removal and sampling of MW88-4 and

#	Page #	Section	ADEC Comment	Response
			wells only. Recommend revising/amending the last three sentences of this paragraph to better present the intended context. I.e. revise to state '…through 2012, however the wells were removed…at the MOC. [Prior to demolishing the wells during removal actions in 2013, the wells were sampled for the last time; the analytical results of which indicated neither exceeded SSCLs.] [Historical data from these wells] provide…downgradient contamination.'.	MW88-5. Please see the revised text for Section 2.2.1, eighth paragraph, at the end of this document. **ADEC-Accepted August 15, 2017**
7.	4-1	4.0	Please revise/amend the first sentence in the first bullet on this page to better clarify/emphasize that the cleanup levels were promulgated in November 2016, and not 'promulgated…by USACE request.'.	Accepted. The text of the first bullet will be revised as follows: "Analytical results from samples collected in 2016 without SSCLs were screened against 18 AAC 75 Table C levels promulgated in November 2016 (ADEC 2016b). Although the approved 2016 WP referenced using evaluation criteria from 18 AAC 75 Table C promulgated in January 2016, the USACE requested that the most recent ADEC levels be used for comparison purposes in this report." **ADEC-Partially Accepted August 15, 2017; however please revise the first part of the proposed revision, since it's not the samples that don't have SSCLs rather the COCs/analytes; i.e. revise to state 'For those groundwater samples collected in 2016, which had analytical results that indicated detections of COCs for which the 2009 DD does not specify SSCLs, the**

#	Page #	Section	ADEC Comment	Response
				2016 analytical results were screened against…'. **The first sentence of the response will be revised as follows:** Analytical results from samples collected in 2016 were screened against SSCLs and 18 AAC 75 Table C levels promulgated in November 2016 (ADEC 2016b). Although the approved 2016 WP referenced using…"
			Please revise/amend the first sentence of the second bullet on this page to specify that the purging activities and the referenced SOP were also consistent with ADEC Guidance.	Accepted. The text of the second bullet will be revised as follows: "Monitoring wells at the MOC were purged according to the field SOP, which is consistent with ADEC sampling guidance, provided in the 2016 WP (USACE 2016b) with the exception of well MW10-1." **ADEC-Accepted August 15, 2017**
8.	5-5	5.2	The data quality assessment (DQA) and other sections, including data tables, appendices, etc. include discussion of PCB analysis of groundwater, however PCBs are not mentioned anywhere in the narrative of the report. Please clarify PCBs in the applicable narrative sections of the report and amend respective sections to include discussion of and references to the PCB analysis and results.	Accepted. PCBs were part of the analytical suite for MOC monitoring well samples. Section 5.2, first sentence of eighth paragraph, will be revised to state: "…analyzed for GRO by Alaska Method 101 (AK101), DRO by AK102, RRO by AK103, polycyclic aromatic hydrocarbons

#	Page #	Section	ADEC Comment	Response
			Please revise/amend the reference to VOC analysis associated with sample from wells MW10-1 and 14MW06 to clarify that these are associated with a sub-site (presumed by ADEC to be Site 10) of the MOC as well as the greater MOC. Please amend the discussion in this and other applicable narrative sections of the report to clarify how metals samples were collected for both dissolved and total; noting the narrative only references collection of filtered samples although figures and charts include data for both.	by U.S. Environmental Protection Agency (EPA) Method SW8270-SIM, PCBs by EPA Method 8082, benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method SW8260, methane by RSK 175…” **ADEC-Tentatively Accepted August 15, 2017; per response to RTC immediately below.** The first sentence of the last paragraphs on Page 5-5 will be updated as follows: “For consistency with historic sampling events, 2016 samples from all wells were analyzed for GRO by Alaska Method 101 (AK101), …, PCBs by EPA Method 8082,… “ **ADEC - Tentatively Accepted August 15, 2017; re: this and the RTC paragraph immediately above – conditional whether analytical results of PCBs indicated neither exceedances or notable detections of applicable cleanup levels. This was also not discussed in detail during the August 10, 2017 resolution meeting.** Accepted. The reference to VOC analysis will be clarified as follows: “Samples from monitoring wells MW10-1 and 14MW06, associated with Site 10 within the MOC, were also analyzed for

#	Page #	Section	ADEC Comment	Response
				volatile organic compounds (VOC) by EPA Method 8260 and glycols by EPA Method SW8015." **ADEC-Accepted August 15, 2017** Accepted. The text of the first sentence of the second paragraph on page 5-5 will be revised as follows: "…alkalinity by SM 2320, total Resources Conservation and Recovery Act (RCRA) metals… **ADEC-Accepted August 15, 2017** The text of the last sentence of the second paragraph on page 5-5 will be revised as follows: "Additionally, filtered water samples were collected from all wells for analysis of dissolved metals (RCRA metals, manganese, nickel, vanadium, and zinc) by EPA Method SW6020A/SW7471 using a disposable 0.45 micron in-line water filter following collection for the other parameters listed above." **ADEC-Accepted August 15, 2017**
			Please elaborate on the statement 'shared between the two field teams' in the last sentence of the fourth paragraph on this page to better clarify to the reader what this is supposed to mean. Were there two separate field teams associated with the efforts conducted in association with the two different	The following bullet will be added as the last item on page 7-1: "• In general, dissolved metals concentrations obtained from field filtered samples were less than the metals

#	Page #	Section	ADEC Comment	Response
			projects implemented at NEC FUDS in 2016, namely the Suqi River/Site 8 investigation/monitoring and the MOC MNA monitoring? Or was there one primary field team, comprised of the same personnel and equipment, implementing both efforts separately but simultaneously, and combining/sharing efforts and resources for both projects?	concentrations reported in corresponding unfiltered samples." **ADEC-Accepted August 15, 2017** Accepted. The text of the second sentence of the third paragraph on page 5-5 will be revised as follows: "Additional monitoring well information was recorded in the field logbooks shared between the two 2016 Northeast Cape sample collection efforts; MOC groundwater, and Site 8 and Suqi River (Appendix D)." **ADEC-Accepted August 15, 2017**
9.	6-1	6.0	Although ADEC realizes that the primary goal of section/subsections 6 is to discuss the 2016 results, it would be helpful if the introduction of this section referenced and identified the other appendices, tables, etc. which provide other data evaluation results; noting that while the wording currently emphasizes the 2016 results, that it actually broadens its context extensively by also evaluating and discussing the historical results, SSCLs vs. 2016 revised 18AAC75 cleanup levels, Appendix C trend charts, etc.	Accepted. The introduction on Page 6-1 will be revised as follows: "The primary focus of this section is to summarize and interpret the 2016 field measurements and analytical results collected at the MOC. Some information from prior data collection efforts at the MOC is also included in Table 6-2 and Appendix C when needed for comparison purposes. The sample summary table, complete analytical results, and DQA for the 2016 data are included in Appendix B." **ADEC-Accepted August 15, 2017**
10.	6-6	6.3.1 and	Associated with the comment immediately above, ADEC notes that the reporting discussion, as it involves the SSCLs and/or the 2016 revised	Accepted. The data discussion for SSCLs exceedances and comparison with 2016

#	Page #	Section	ADEC Comment	Response
		Report in General	18AAC75 cleanup levels, is difficult for the reader to follow. Noting further that the primary objective of this section should be limited and focused on discussing the 2016 results based on the SSCLs per the 2009 DD. ADEC requests that a new section or subsection be added that accomplishes this, and then revise the existing draft narrative sections, including heading/subheading titles, etc. to better present the intended evaluation comparison between the SSCLs and the 2016 revised 18AAC75 cleanup levels. Further with re: to the comment in the paragraph immediately above, applicable tables, table notes, highlighted information, etc. should also be revised/amended to account for this; noting that i.e. some of the data tables focus solely on whether the LOD exceeded the revised cleanup level but make no indication of whether the LOD exceeded the SSCL - which could potentially result in misinformation to the reader. Please apply this rationale and revise/amend accordingly throughout the document where applicable. Please provide ADEC with a redline revision of the report (post RTC acceptance/approval), prior to finalizing the report.	ADEC levels will be separated in exclusive subsections. This will also apply to the results presented in Table 6-5. **ADEC-Accepted August 15, 2017** Discuss during comment resolution meeting. We would like to preserve the figures in their current form and would like to obtain feedback for the best way to clarify the notes. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
11.	6-6	6.3.1	Please revise/amend the three wells referenced in the first sentence of this section to specify/clarify whether the dissolved lead exceedance is also associated with one of these three wells; or clarify if the lead exceedance represents a fourth well. Please apply this rationale and revision request to other similar statements as applicable throughout the document. Similar to the comment in the paragraph immediately above, please revise/amend the second sentence of this section to specify the number of wells if the statement is referring to the same three wells discussed in the prior sentence, etc.	Accepted. The well IDs were added to the text so the reader can readily identify which wells exceed for lead. **ADEC-Accepted August 15, 2017** Accepted. The well IDs were added to the text so that it is clear which wells are being discussed. **ADEC-Accepted August 15, 2017** Accepted. The term “general standard” will be removed from the document and the text replaced with “evaluation criteria”.

#	Page #	Section	ADEC Comment	Response
			Please revise/amend the latter half of the second sentence of this section (which continues on to page 6-7) to clarify that the revised 2016 18AAC75 cleanup levels are not the stated 'general standard', rather the 2016 cleanup levels were promulgated after the NEC FUDS SSCLs were determined and approved in the 2009 DD; and that the SSCLs are the criteria which have been implemented at the NEC FUDS to date based upon the 2009 DD - even though more stringent cleanup levels for some COCs have since been promulgated by the State. Further, the presentation and transition between the narrative, tables, and back to narrative that is associated with the statement in the paragraph above is difficult to follow and potentially confusing to the reader. Noting the pause in the narrative for the 2 pages of tables and then starting the narrative with narrative that has an abrupt change in context (i.e. the low biased discussion). Recommend adding subsection headers or relocating the tables. Please also see/apply comments below; noting the comment re: the referenced '1/10 of the SSCL'.	**ADEC-Accepted August 15, 2017** An introductory paragraph will be added to section 6.4 that includes the relationship between the SSCLs from the DD and the 2016 ADEC evaluation criteria. **ADEC-Accepted August 15, 2017** Accepted. The discussion in Section 6.4.1 will be separated into two sections so that comparisons to SSCLs and 2016 ADEC evaluation criteria is more distinct. **ADEC-Accepted August 15, 2017** Accepted. Text regarding the ratio at which analytes were found below the SSCLs or evaluation criteria will be deleted from the text. **ADEC-Accepted August 15, 2017**
12.	6-8	Table 6-5	Recommend amending the depiction, table listing format, etc. for the SSCLs and '2016 ADEC' by adding a color association; and also apply this rationale/association consistently throughout all tables and other applicable references throughout the document. Some of the tables, figures, etc. become convoluted between separating and comparing and associating the respective information as is presented in the current draft format.	Accepted. As part of responding to comment #10, the comparisons to SSCLs and 2016 ADEC evaluation criteria will be in separate subsections. This separation applies to the data table, so the color scheme proposed is no longer needed. **ADEC-Accepted August 15, 2017**
13.	6-10	6.3.1	ADEC notes what appears to be a potential low bias of what is presented and understood to date to be the extent and characteristics of the groundwater contaminant plume at the MOC; both from a quantitative and qualitative perspective. Indicators of low-biased in some of the analysis	Discuss some elements of this comment during the comment resolution meeting. The discussion of the DRO qualifiers was revised. The previous statements about low

#	Page #	Section	ADEC Comment	Response
			results from the 2016 effort (including those from prior efforts), along with other factors such as monitoring well locations where historical analysis results indicate increases as well as decreases in COC concentrations in groundwater, and also locations that are or have been at the cleanup level and/or just below the cleanup level, indicate that the residual contaminant plume associated with the MOC (and adjacent sites i.e. Site 28 Drainage) is not stable, and possibly not thoroughly characterized. Further evaluation of these issues are necessary prior to developing and implementing the next monitoring/investigation effort. This issue should be addressed further in the applicable narrative sections of the report and indicated as a recommendation. Please also add a recommendation section to this report that includes important issues to consider for future efforts; i.e. well service issues, sampling, previous issues with historical and 2016 sample collection and analysis, changes in site conditions, etc. Please clarify what the last sentence of the first paragraph on this page has to do with the low biased. Making the statement that upgradient wells (which are presumed to have always been below applicable conservative cleanup levels let along the SSCLs), have less than 1/10th the applicable cleanup level has nothing to do with low bias impacts. However ADEC emphasizes that any elevated detection results that are observed in samples from the upgradient well locations would then have to either be the result of cross-contamination of the sample, or contamination that is in the groundwater at that location.	QC samples affecting the DRO results did not clearly tell the story. DRO was qualified due the results being reported from an analysis that occurred 2 days past the extract hold time. A run within extract hold time was not used since the instrument QC did not meet goals and the analysis marginally outside of the hold time provided higher DRO results. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** The DRO plume appears to be stable with the largest swings in concentration decreases associated with monitoring events that occurred just after excavations were complete at the MOC. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting. Noting further that the project team agreed that current available data indicate that there are no statistically significant trends at this time.**

#	Page #	Section	ADEC Comment	Response
			Please revise/amend the references/statements throughout the document where applicable re: whether or not sources of contaminants are considered anthropogenic to clarify (i.e. in the instance of lead) that while there are no confirmed specific sources/source areas for lead, that the concentrations of lead in groundwater at the MOC which exceed applicable cleanup levels (as compared to groundwater locations for which analysis results indicate no detection of lead), are at this time perceived by ADED to be related to anthropogenic activity. Please apply this rationale and revisions accordingly throughout the document where applicable. Please revise the reference to 'evaluation criteria' in the first sentence of the third paragraph of this section in order to be consistent with one reference to i.e. 'revised 2016 18AAC75 cleanup levels' throughout the document. Please revise the second sentence of the third paragraph of this section by stating i.e. '…are equal to the SSCLs respectively.'. Re: the statement in the second to last sentence on this page that there are no SSCLs for naphthalene and chromium, it would be helpful to also compare the 18AAC75 Table C cleanup criteria that was promulgated and applicable in 2009 to the historical site characterization results that resulted in the rationale and determination that SSCLs were not specified for those COCs, and further how these would relate to the 2016 results. Would pre-2009/DD analytical results for groundwater at the MOC have indicated that those concentrations were below or above the revised 2016 18AAC75 cleanup levels?	This statement will be removed. Additional text will be added to identify that upgradient wells did not exceed SSCLs and that exceedances were along the downgradient portion of the MOC. **ADEC-Accepted August 15, 2017** Additional text was added to the lead discussion to identify that reducing conditions are the likely reason lead in groundwater exceeds at 14MW04. **ADEC-Accepted August 15, 2017** Disagree. The agreed upon language has always been "evaluation criteria" when referring to other analytes without established SSCLs. References throughout the report to 2016 ADEC Cleanup Levels will be revised to 2016 ADEC evaluation criteria. **ADEC-Not Accepted August 15, 2017; ADEC is not aware of the stated 'agreed upon language' – please provide reference and further clarification on this issue prior to finalizing the report. The intent of ADEC's comment was to avoid potential misunderstanding re: actual promulgated cleanup levels and/or**

#	Page #	Section	ADEC Comment	Response
				approved ACLs, SSCLs, etc. vs. 'evaluation criteria' that can be easily inferred/misunderstood to be something else. ADEC's request in the original comment is unchanged. This statement no longer appears in the document. **ADEC-Accepted August 15, 2017** This assessment will be deferred until the next Five Year review. **ADEC-Accepted August 15, 2017; also per further resolution discussion and project team concurrence on August 10, 2017.**
14.	6-11	6.3.1	Please apply prior comment above to the reference to anthropogenic sources of chromium in the first paragraph on this page; and apply to other similar references/statements throughout the document where applicable.	Discuss during comment resolution meeting. The statements about anthropogenic sources are cited from previous reports. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
15.	6-11	6.3.2	Please revise the last three sentences of the second paragraph since the current wording/presentation de-emphasizes that the concentration of GRO actually increased from 2002 to 2004 along with significant spans of time that occurred between the 2004 and more recent sampling events. The third sentence is unclear if it is intended to reference all historical and current monitoring wells at the MOC or just specific wells. In the last paragraph on this page, and in other narrative section discussions	Accepted. The second paragraph in Section 6.4.3 will be revised to clarify the discussion. The revised paragraph is included at the end of this table for review. **ADEC-Accepted August 15, 2017** Discuss during comment resolution meeting. **ADEC-Tentatively Accepted August 15,**

#	Page #	Section	ADEC Comment	Response
			throughout the document where applicable, please also discuss the increases in some COC concentrations at some wells over subsequent years as compared to the monitoring event at which point analytical results have consistently indicated a decrease in concentrations over subsequent years.	**2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
16.	6-12	6.3.2	Please revise/amend the statement in the last sentence of the second paragraph on this page by also discussing the ranges of detections that have been observed since 2011. Were these well below the cleanup level, right at or just below, etc.? This should also take in to account ADEC's requests in prior comments to further evaluate and discuss what appears to be fluctuations of contaminant concentrations in groundwater at the MOC over the years. Please apply this rationale and revision to other similar applicable statements/discussions throughout the document where applicable. Please revise/amend the statements in the first and fourth sentences of the last paragraph on this page to clarify whether the statement is intended to represent 'all years of monitoring/investigation' or just 2016 results. Please apply this rationale and revision to other similar applicable statements/discussions throughout the document where applicable.	Discuss during comment resolution meeting. We would verify which statements need to be revised. **ADEC-Tentatively Accepted August 15, 2017; conditional per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
17.	6-13	6.3.2	Please revise/amend the last sentence of the third paragraph on this page to clarify whether the statement is intended to imply historically for all samples from all wells. Please elaborate on the discussion re: naphthalene concentration trend associated with 14MW01 that is stated as not having 'generally decreased'. Please also further clarify what is meant by generally decreased in this and other references/sections throughout the document.	Discuss during comment resolution meeting. We would verify which statements need to be revised. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** Accepted. Statements regarding specific analyte concentrations 'generally

#	Page #	Section	ADEC Comment	Response
			In the first sentence of the last paragraph on this page and elsewhere throughout the document where applicable, recommend revising the use of 'presented in the 2009 DD' to 'specified in the 2009 DD'. Similar to prior comments above, please provide further clarification for the decisions that resulted in SSCLs for the subject COCs not being specified in the DD. **ADEC-Tentatively Accepted August 15, 2017; ADEC notes that the**	decreasing' will be removed. **ADEC-Accepted August 15, 2017** Accepted. The usage of text in relation to the 2009 DD suggested in the comment will be incorporated in the report. Naphthalene and chromium were not identified as groundwater COCs in the 2009 Decision Document and thus a site-specific cleanup level was not specified. **ADEC-Accepted August 15, 2017** Discuss during comment resolution meeting. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** The report will be updated throughout the text, tables, and graphs to eliminate references to exceedances of chromium. In accordance with footnote 6 to Table C of the 2016 ADEC revised regulations, the appropriate comparison value for total chromium in groundwater is Chromium (III) at 22 mg/L, not Chromium(VI) at 0.00035 mg/L. All references to exceedances of chromium in comparison to the lower value will be revised. Applicable footnotes will be added which specify which 2016 ADEC

#	Page #	Section	ADEC Comment	Response
			original RTC may not be consistent with what the project team agreed on during the August 10, 2017 comment resolution meeting. ADEC recalls the project team agreeing to keep both in the report, however to focus this effort's reporting on the total Cr III, and that future assessment re: anthro- vs. non-anthropogenic sources and the applicability of Cr VI was still necessary.	evaluation criteria is being used for total chromium comparisons. **ADEC-Tentatively Accepted August 15, 2017; please see further response to RTC on the left.**
18.	6-14	6.4	Please revise/amend the last sentence of the second paragraph of this section. The number of years of observed cleanup level exceedances alone (i.e. as the narrative states in this case two years) does not impact the determination of suitability to analyze for natural attenuation, rather it's the presence of the COC coupled with having an adequate number comparable data sets over an adequate number of years. Has the attenuation evaluation and discussion taken in to account the significant quantity of contaminated overburden (although below the SSCL for DRO in soil) that exceeds the migration to groundwater level which could be continuing to contribute COCs to groundwater? Do the calculations and evaluations consider the regional and site-specific environmental conditions?	Agreed. Section 6.4 was revised to provide a clarification on the use of the small data set for in-plume wells. **ADEC-Accepted August 15, 2017** The attenuation evaluation will include a discussion of the observations that support natural attenuation is occurring (contaminant trends and geochemical parameters). **ADEC-Accepted August 15, 2017**
19.	7-1	7.0	Please revise/amend the first sentence in this section to better specify the historical data set. Is this for all years of all monitoring wells up through 2015 or specific years and/or wells? It would be helpful to include some conclusion summaries which are specific to the statements and discussions throughout the report that are related to the revised 2016 18AAC75 cleanup levels; i.e. historical vs. the 2016 results which exceeded some of the revised 2016 cleanup levels.	Accepted. The conclusions section will be revised to list conclusions specific to 2016 results separately from conclusion drawn from the historic data set. **ADEC-Accepted August 15, 2017**
20.		Figure A-	Please amend all figures to include the applicable date (2016) in the title.	Accepted. The year "2016" will be added to

#	Page #	Section	ADEC Comment	Response
		3.1		the beginning of the title for Figures A-3.1 through A-3.4. To be consistent with the comments to the Site 8 & Suqi River Report Figure A-2 will be revised to include "2016 Area of Interest" and "Remediation Site" in the legend. **ADEC-Accepted August 15, 2017**
21.		Figure A-3.3	It would be helpful to include a new figure that depicts the applicable groundwater elevation data available to date (i.e. 2014) for the two cross sections and the wells that comprise them, in order to evaluate the ranges and fluctuations over the years.	Discuss during comment resolution meeting. The historic groundwater elevations at each well are plotted as a time series graph in Appendix C. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
22.		Figure A-4.1	Has the extent of ferrous iron in groundwater at the MOC ever been evaluated based on whether or not all of it is naturally occurring vs. whether some fraction of it may be the result of anthropogenic sources i.e. ferrous metals contributions over the years and/or ongoing? Recommend revising the depiction and associated legend entries for existing wells to a color rather than depicting all of the former and existing wells in different black and white formats.	Discuss during comment resolution meeting. The 2016 ferrous metal distribution in groundwater is highest in the area of the in-plume wells (norther end of the site) and drops off rapidly towards the central portion of the MOC. No subsurface ferrous metal is suspected at the north end of the site. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** Accepted. Current Monitoring Wells symbology will be displayed in blue and

#	Page #	Section	ADEC Comment	Response
			ADEC realizes that the gray background and overall color schemes of this and other similar figures my make it difficult, but it would be helpful to depict the surface features in a sharper more contrasting color of blue to provide a better visual representation of the site features. The current format makes it difficult to discern site characteristics and features. Please add a figure note that explains the 'Site Boundary' to clarify that this is for administrative/site naming convention purposes that is based primarily on the footprint of DoD activities and structures associated with the MOC and not at all associated with any boundary(s) associated with the extent(s) of contamination that are related to the MOC.	white. This will be applied to all Figures. **ADEC-Accepted August 15, 2017** Discuss during comment resolution meeting. We do not have a higher resolution aerial image of the MOC. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** Accepted. A note will be added to clarify the purpose of the boundary. The following note will be added to all appropriate figures: "The Administrative Site Boundary is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination". **ADEC-Accepted August 15, 2017** Also, the legend will be revised to state "Administrative Site Boundary Surveyed in 2014". **ADEC-Accepted August 15, 2017**
23.		Figure A-4.8	Has the potential for impacts from the wetland conditions in the adjacent Site 28 Drainage been evaluated for how they might influence the groundwater conditions at the MOC; noting the high water table that was observed due to the precipitation from the storm event(s) which were associated with the time frame of the sampling effort as well as differences over previous years of monitoring/investigation?	Discuss during comment resolution meeting. No study of this type is part of the site activities to date. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment**

#	Page #	Section	ADEC Comment	Response
				resolution meeting.
24.		Figure A-5.1	Please revise/amend the title of the figure to clarify that it represents historical results and specify the range of years. Please apply this revision to other figure titles where applicable. Please include a figure note on this and all other applicable figures to clarify the rationale for why different years of data are listed. Does the figure represent all available historical results to date or only select years based on whether or not prior/current exceedances were observed? ADEC notes its prior comment re: the addition of a color scheme to better differentiate the information associated with the SSCLs vs. the ADEC 2016. Recommend depicting the different criteria with a different color background and depicting values which are exceedances in bold red, and those which are not in non-bold black font. It is difficult to discern the information being presented when comparing SSCLs with ADEC 2016 based on the issue(s) noted above; noting the figure titles, depictions, format and presentation of information, etc. Please clarify.	Accepted. Figure titles will be revised to include the range of years for which data was collected and presented in the tables. For example, Figure A-5.1 title will be revised to state: "DRO Results in Groundwater at the MOC from 2002 through 2016". **ADEC-Accepted August 15, 2017** Accepted. A note will be added to clarify why different years of data are listed. The following Note will be added to all A-5 Figures: "All available results are presented in tables". **ADEC-Accepted August 15, 2017** Accepted. Exceedances shown in the tables will be presented differently. For Figures A-5.1 through A-5.3 and A-5.5, SSCL exceedances and/or ADEC exceedances will be presented in red, bold font on a grey background. For Figure A-5.4, where the SSCL and ADEC criteria are not equivalent, SSCL exceedances will be presented in black, bold font on a red background and ADEC exceedances will be presented in red, bold font on a grey background. Additionally, the symbol for an SSCL exceedance will be made larger, thicker

#	Page #	Section	ADEC Comment	Response
			Please include an additional figure that is similar to A-5.1 but only depicts the 2014-2016 data as compared to the SSCLs and ADEC 2016. Please apply the comments above to all other figures in the report as applicable.	black circle. **ADEC-Accepted August 15, 2017** Accepted. An additional figure set (Figure A-6) will display results from 2014 through 2016 only. **ADEC-Accepted August 15, 2017** Accepted. Other applicable edits will be made to figures. **ADEC-Accepted August 15, 2017**
25.		Figure A-5.2	Please include figure notes and elaborate in applicable narrative sections to better specify/clarify the total vs. dissolved concentrations and whether there are two different respective SSCLs for each one; noting that the report appears to indicate that there are two different cleanup levels for all of the respective metals although the primary evaluation and discussion seems to be focused on the dissolved.	Accepted. The following text will be added to the end of Section 6.4 text: "Filtered and unfiltered groundwater samples results are presented in this report as distinct results in an effort to distinguish if soil particles in unfiltered groundwater are contributing to metals levels. There are no distinct SSCLs or 2016 ADEC evaluation criteria associated with filtered or unfiltered samples. The 2016 ADEC evaluation criteria are typically calculated considering only the water soluble fraction. Therefore, metals results from unfiltered samples overestimate metals levels." **ADEC-Partially Accepted August 15, 2017; revise to '…groundwater sample results are presented…' and also revise the references for evaluation criteria to cleanup levels, per prior comment(s)**

#	Page #	Section	ADEC Comment	Response
			The second figure note on this and other applicable figures is misleading, since it groups the LOD quality criteria together for both the SSCLs and the ADEC 2016; noting that this issue does not apply consistently for all COCs based upon the SSCLs vs. the ADEC 2016 and is potentially confusing/misleading to the reader. The note should be revised by stating 'and/or' instead of 'and', and further clarify that the LOD exceedance is respective to the criteria indicated (i.e. as indicated by the color scheme requested by ADED in other comments). This issue is not as critical for lead since there is no difference between the SSCLs and the ADEC 2016 for that COC, however it is potentially confusing when included for i.e. naphthalene in Figure A-5.3 - although there is no SSCL indicated (per the DD). This issue should be clarified in all applicable figures.	**above throughout the document where applicable.** The Evaluation Criteria note will be revised to present "Metal (Total and Dissolved)" as neither the SSCLs or the 2016 ADEC evaluation criteria differentiate between total and dissolved metals. The same criteria will be used for both. Section 6.4 will be revised to more clearly present total and dissolved metals comparisons. **ADEC-Partially Accepted August 15, 2017; revise references for evaluation criteria to cleanup levels, and apply to all other comments other applicable comment(s) in this template and throughout the report where applicable.** Accepted. Instead of having a figure specific note, the note will be changed for all appropriate figures. The note will be revised to state: "…greater than SSCL and/or 2016 ADEC evaluation criteria". **ADEC-Accepted August 15, 2017**
26.		Figure A-5.5	In the second to last figure note on this figure (and others where applicable), please clarify why the (USACE 2016b) is listed as a reference for the revised 2016 AAC75 cleanup levels.	Accepted. The reference should have been to ADEC. The reference will be revised to state: "(ADEC 2016b)". **ADEC-Accepted August 15, 2017**
27.			**Appendix B: Data Quality Assessment**	

#	Page #	Section	ADEC Comment	Response
28.	B-1-1	1.0	Please revise the sentence in the last paragraph on this page by stating ‘The attachments…contain the following: summary table and…’.	Accepted. Section 1.0, first sentence of third paragraph, will be revised to state: “…attachments to this DQA contain the following: sample summary table and analytical…”. **ADEC-Accepted August 15, 2017**
29.	B-1-3	1.1	Please revise/amend the sentence towards the bottom of this page that begins with ‘These QC parameters met…’ by revising ‘…Section 1.2 or in the…’ to ‘…Section 1.2 and in the…’ since these issues should not be identified and addressed in one or the other rather all of the issues should be adequately addressed and explained in both.	Accepted. Section 1.1, fourth sentence of second paragraph will be revised to state: “…listed in Section 1.2 and in the associated…”. **ADEC-Accepted August 15, 2017**
30.	B-1-5	1.2.2	Please revise the reference to ‘site-specific criteria’ to ‘SSCLs’ if that is what is being implied in order to maintain consistent referencing throughout the report. Please revise the statement ‘There is one exception,’ since the statement goes on to explain two examples; i.e. make one sentence out of the last two on this page by stating i.e. ‘…less than the [SSCL] with the exception of the two samples…’.	Accepted. ‘Site-specific criteria’ will be revised to state SSCL. This change will be applied throughout the document. **ADEC-Accepted August 15, 2017; and apply similarly to all other applicable uses of the word ‘criteria’ throughout the report to emphasize and differentiate between concentrations that are promulgated and/or approved cleanup levels (i.e. Method Two CLs, SSCLs, etc.) vs. other ‘criteria’.** The last two sentences will be combined into one sentence and revised to state: “Data quality is minimally affected since results were either significantly greater than or less than the site-specific cleanup level (SSCL) with the exception of two samples, 16NEC-

#	Page #	Section	ADEC Comment	Response
				14MW06-WG and 16NEC-14MW06-WG-9, that had detections for diesel-range organics (DRO) at 1.4 mg/L which is just less than the SSCL of 1.5 mg/L". **ADEC-Accepted August 15, 2017**
31.	B-1-6	1.2.3	Associated with prior comments re: PCBs above, ADEC notes that table B-1 and this narrative section (as well as others that follow in the DQA) is the first time PCBs are mentioned in the report. Please better clarify the application of PCBs as a COC and/or QC in association with the NEC FUDS monitoring effort.	Accepted. Please see the response to comment #8 for report updates associated with the PCB analysis. **ADEC- Tentatively Accepted August 15, 2017; re: this and the RTC paragraph immediately above, given that analytical results of PCBs indicated neither exceedances nor notable detections of applicable cleanup levels. This was also not discussed in detail during the August 10, 2017 resolution meeting.**
32.	B-1-8	1.2.7	Please revise/amend the last sentence of the second paragraph of this section to specify/clarify if this is intended to apply only to the results for the actual duplicates and their respective associated primary samples; and/or to also apply to all the other primary sample results (groups of results) that are represented by the high RPD values of the primary/duplicate pair.	Accepted. The last sentence of the second paragraph will be revised as follows: "The effect of using the higher of the results between the primary and field duplicate sample for trend analysis and reporting was minimal since all the QN-qualified results were less than the 2016 ADEC evaluation criteria." **ADEC-Accepted August 15, 2017**
33.	B-1-8	1.2.8	Please revise/amend the reference to 'ADEC criteria' in the first sentence of the second paragraph of this section in order to maintain consistent references to SSCLs and/or 'ADEC 2016' throughout the document. Please	Accepted. References to ADEC criteria will be revised to state "2016 ADEC evaluation criteria" to remain consistent with the main

#	**Page #**	**Section**	**ADEC Comment**	**Response**
			apply this revision to all other variations of what should be only references to SSCLs and/or 'ADEC 2016' throughout the document.	body text. **ADEC-Not Accepted August 15, 2017; please see other related comments throughout template.**
34.	B-1-9	1.2.9	Please elaborate the discussion in this section to clarify the applicability of this PCB QC criteria to the 2016 NEC FUDS MOC MNA effort.	Accepted. Please see the response to comment #8 for report updates associated with the PCB analysis. **ADEC- Tentatively Accepted August 15, 2017; re: this and the RTC paragraph immediately above, given that analytical results of PCBs indicated neither exceedances nor notable detections of applicable cleanup levels. This was also not discussed in detail during the August 10, 2017 resolution meeting.**
35.	B-1-10	1.3	Please elaborate more in the DQA re: what resulted in the 95% completeness. What issues resulted in 5% incompleteness.	Accepted. The second sentence of the first paragraph of Section 1-3 on Page B-1-10 will be revised as follows: "The completeness goal of 100 percent for all parameters was met and exceeded the work plan completeness goal of 95 percent; no sample results were rejected." **ADEC-Accepted August 15, 2017**
36.		Table B-1-1	Please clarify the multiple samplers which are listed for this effort; noting multiple sampler IDs that are listed for the same sample. **ADEC-Partially Accepted August 15, 2017; ADEC realizes that this is**	Accepted. The following text will be added as the last paragraph of Section 1.2.1 Appendix B: "Three samplers were utilized to collect groundwater samples. The daily sampling teams each consisted of two or three samplers. Because more than one field staff

#	Page #	Section	ADEC Comment	Response
			after the fact, however what was done either prior to or in the field is not considered a preferred scientific documentation practice. Was it documented who actually took the individual samples? For example, had ADEC known this was going to be the proposed method, ADEC would likely have not approved it, and even if, would have potentially required additional QCs. This should have been accurately documented in field notes, and should be indicated and summarized in the narrative. **Revised Response** We did not clarify in our initial response that only one person was responsible for setting up the equipment, purging the well, recording stabilization parameters, and recording sample containers. Other initials were recorded on the sampling forms because they help package and transport samples. The DQA sample summary (Table B-1-1) will be revised to reflect the initials of the individual sampler responsible for setting up the equipment, purging the well, recording stabilization parameters, and recording sample containers at each monitoring well. We suggest that the field forms remain unaltered.	member was involved with the collection, packaging, and transporting of samples, multiple initials appear on the sample tracking form in the sampler column and on groundwater sampling forms.” **ADEC-Partially Accepted August 15, 2017; please see additional response to RTC on the left.**
37.	Page 8 of 10	Table B-1-2	Similar to comments above please revise/amend the reference to ‘ADEC criteria’ in the table note. Please revise/amend the table notes to specify/clarify whether any LODs exceeded the SSCLs; and apply the revision similarly throughout the	Accepted. The note will be revised to state “2016 ADEC evaluation criteria”. In addition, the column headers will be revised to state “2016 ADEC evaluation criteria” and “SSCL” as appropriate. **ADEC-Partially Accepted August 15, 2017; please see other related comments throughout template.** Accepted. The table note will clarify that

#	**Page #**	**Section**	**ADEC Comment**	**Response**
			document where applicable (as also commented above) to correct instances where only the LOD is noted as exceeding either 'ADEC 2016' or both 'SSCLs and ADEC 2016' but never indicated specifically for SSCLs. Please revise what appears to be corrupted font in the table note for 'limit of detection' in this and numerous other tables. Please clarify/explain the notations of '-' in this and all other applicable tables throughout the document; both in table notes and in applicable narrative sections.	nondetect result LODs exceeded the 2016 ADEC evaluation criteria only. **ADEC-Accepted August 15, 2017** The note will be revised to state: "Nondetect results with LODs exceeding 2016 ADEC evaluation criteria; nondetect result LODs did not exceed SSCLs". **ADEC-Accepted August 15, 2017** Accepted. The next version of the pdf file will be reviewed for this table to ensure that the font is consistent with the rest of the table. **ADEC-Accepted August 15, 2017** Accepted. The notes will include "- - not provided or not analyzed". In the narrative sections, Table 6-4 will be revised; the symbol "-" will no longer be present. **ADEC-Accepted August 15, 2017**
38.			**Appendix C:**	
39.		Charts General	It would be helpful if the years that do not correlate with a sampling event could be excluded from applicable charts to better associate the year with the data points. This could also be better emphasized by applying highlight or bold font to the respective year and would simultaneously emphasize years that were not sampled.	Accepted. For Figure C-2, Only years associated with data will be shown on the trend line. **ADEC-Accepted August 15, 2017** Similarly, C-3.2 Figures will present results from 2002 through 2016 but only include years associated with data on the x-axis. **ADEC-Accepted August 15, 2017**
40.		C-1.1	Respective sections of the narrative should discuss the potential as well as confirmed impacts that the varying groundwater elevations (the greatest	Discuss during comment resolution meeting. **ADEC-Tentatively Accepted August 15,**

#	Page #	Section	ADEC Comment	Response
			being 8 ft) have on analytical results and groundwater concentrations of COCs; including general plume conditions that might be expected when the groundwater elevation is 69 ft amsl in 2010 vs. 77 ft amsl in 2011.	**2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** The requested assessment may be more meaningful when more data is available for the 15 wells in the existing network. Currently there is only one in plume well with more than 3 monitoring events. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
41.		C-2.2.3	Respective applicable narrative sections should elaborate on the fluctuations of certain groundwater constituents/analytes and any correlation between events i.e. RAs, ISCO, etc.; noting ADEC's prior comment re: instances where a decrease is followed by a general increase and vice versa.	Discuss during comment resolution meeting. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** The requested assessment may be more meaningful when more data is available for the in-plume wells in the existing network. Currently there is only one in plume well with more than 3 monitoring events. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
42.		C-3.2.2.2	For this and all other charts for COCs and/or analytes where extreme historical results skew the presentation of much of the data, it would be	We would like to review the examples of the revised charts at the comment resolution

#	Page #	Section	ADEC Comment	Response
			helpful to include an additional chart similar to the example for methane that excludes the extreme result(s) allowing for better overall evaluation of the data trend(s).	meeting. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.** Accepted. The charts will be revised to improve the presented information as follows: - All charts presented in C-3 will be revised. The y-axis will be changed to present results as a ratio of the SSCL (or 2016 ADEC evaluation criteria for analytes without SSCLs). **ADEC-Accepted August 15, 2017** - In addition to the main chart with all results, the secondary charts will be revised to present data from 2010 through the current monitoring event. This will better represent groundwater following the excavation of contaminated soil at the MOC. **ADEC-Accepted August 15, 2017** - Only the highest result from duplicate samples will be presented. **ADEC-Accepted August 15, 2017** - Points on the data plot that are actually the lab reporting limit and not a reported detection will have a different

#	Page #	Section	ADEC Comment	Response
				symbol on the charts than detected results. **ADEC-Accepted August 15, 2017**
43.		Plot C 2-4.1 Curve Data	While the two data charts are identified to each be specific to one of two wells, the two have identical chart IDs which is confusing, given that the other plot pages are specific to either C-4.1 or C-4.2. Also, with re: to the natural attenuation evaluation and plotting for the limited two wells, please see and apply comment above to clarify that these are the only two being evaluated based on extent of adequate and applicable data, and not because these are the only two wells which are relevant to ongoing attenuation monitoring.	Accepted. The chart IDs for 14MW05 will be updated to correctly state “C-4.2”. **ADEC-Accepted August 15, 2017** Accepted. Introductory text will be added to Appendix C. Please see revised text at the end of this document. **ADEC-Accepted August 15, 2017**
44.		Appendix E	<u>Photo No. 6</u>: Please always reference the well and/or site feature location with all photo descriptions. <u>General</u>: This and future reports should include more photos of the greater MOC areas, adjacent sites and transition areas associated with the MOC, as well as photos which depict site features which are specific to residual contamination and its fate and transport issues; i.e. the cross sections, the transition area between the MOC and Site 28 drainage, upgradient, cross gradient, downgradient views of the MOC, surface water conditions adjacent to and immediately downgradient of the MOC, etc.	Accepted. Well ID’s (14MW04) will be added to Photos No. 6 and 7 in Appendix E. **ADEC-Accepted August 15, 2017** Discuss during comment resolution meeting as it deals with future reporting efforts. **ADEC-Tentatively Accepted August 15, 2017; per agreed upon revisions identified and discussed during the August 10, 2017 comment resolution meeting.**
45.			**End of ADEC Comments**	
46.			Other changes needed for consistency with comment responses	**ADEC-Tentatively Accepted August 15, 2017; please see responses on the left to similar comments below.**
47.			To be consistent with the comments for Site 8 and the Suqi River, Section 6.5 Deviations will be changed to Section 6.1. All other Section 6	**ADEC-Tentatively Accepted August 15, 2017; please see response on the left.**

#	Page #	Section	ADEC Comment	Response
			references will change. **ADEC-Tentatively Accepted August 15, 2017; noting that these non-ADEC comments were not discussed during the August 10, 2017 comment resolution meeting. Please provide clarification re: why sections of the MOC report would be revised to be consistent with the other reports.** Clarification For consistency between the MOC Report, and Site 8 and Suqi River Report, sections that appear in both reports will be aligned to the same table of contents order. Therefore, Section 6.5 Deviations of this report will be changed to Section 6.1. This will also require the renumbering of the subsections.	
48.			To be consistent with the comments for Site 8 and the Suqi River, Section 5.3 will be revised to more closely match the Site 8 and Suqi River Report. **ADEC-Tentatively Accepted August 15, 2017; noting that the non-ADEC comments above were not discussed during the August 10, 2017 comment resolution meeting. Please provide clarification re: why sections of the MOC report would be revised to be consistent with the other reports; noting that ADEC does not necessarily disagree with this, rather would prefer to have this clarified further.** For consistency between the MOC Report, and Site 8 and Suqi River Report, sections that appear in both reports will be aligned to the same table of contents order. Therefore, Section 5.3 of this report will be revised to follow the organization of the Site 8 and Suqi River Report.	**ADEC-Tentatively Accepted August 15, 2017; please see response on the left.**

#	Page #	Section	ADEC Comment	Response

Section 2.2.1 Revised Paragraph 8:

Groundwater at the MOC exhibited evidence of contamination prior to the 2009 DD (USACE 2009) promulgation, COC identification, and SSCL listings. Groundwater samples collected in 2002 were analyzed for GRO, DRO, RRO, BTEX, alkalinity, sulfate, methane, ethane, and ethene (USACE 2003) while in 2004 groundwater samples were analyzed for GRO, DRO, RRO, BTEX, PAHs, TOC, and metals (USACE 2005). Groundwater samples collected in 2002 and 2004 exceeded what would be the future SSCL for GRO, DRO, RRO, benzene, and total lead in monitoring wells MW88-3, MW88-4, MW88-5, MW88-10, and 20MW-1 (Table 2-1). After implementation of the 2009 DD (USACE 2009), DRO, RRO, benzene, arsenic, and lead exceeded the SSCL. From 2010 through 2011, groundwater samples collected from monitoring wells at the MOC were analyzed for GRO, DRO, BTEX, PAHs, PCBs, methane, metals, and natural attenuation parameters including [list the parameters] (USACE 2011. 2012). Beginning in 2012, the analyte list was expanded to include RRO (USACE 2013, 2014a). In 2014 and 2015, VOCs and glycols were added to the analytical suite for monitoring well 10MW-1 (USACE 2015b, 2016a). Monitoring wells MW88-4 and MW88-5 served as source area wells from 2002 through 2012, however these wells were removed due to soil excavation at the MOC. Prior to demolishing the wells during removal actions in 2013, the wells were sampled for the last time; the analytical results of which indicated no exceedance of SSCLs. Historical data from these wells provide valuable information regarding historical downgradient contamination. **ADEC-Accepted August 15, 2017**

Section 6.4.3 Revised Paragraph 2:

GRO historically exceeded screening levels in only one NE Cape monitoring well; MW88-5. This well was located in the northern portion of the MOC in an area of soil contamination removed during 2012 MOC soil excavation activities. GRO exceedances in MW88-5 occurred in 2002 (year of installation) and again in 2003 with reported concentrations of 1.3 mg/L and 1.5 mg/L, respectively. Monitoring did not occur again at MW88-5 until 2010 and a GRO concentration of 0.19 mg/L was reported. Monitoring continued at MW88-5 in 2011 and 2012 with reported GRO concentrations of 0.25 mg/L and 0.16mg/L, respectively. The MW88-5 time series plot for GRO included in Appendix C-3.2.1 shows concentration levels for the most recent sampling events (2010, 2011, and 2012) are significantly lower than those seen in 2002 and 2003 and less than 50% of the SSCL. Due to the lack of monitoring data between 2003 and 2010, the trend line assumes that a gradual decrease occurred. However, there is no information to confirm or disprove this assumption. Similar fluctuations in GRO levels were observed at well MW88-4 located approximately 200 feet east (cross gradient) of MW88-5 suggesting similar factors were affecting both wells at the time of sample collection. Although more data points would be helpful to put the older results in perspective, both MW88-4 and MW88-5 were removed in 2012 and are no longer available for sampling. **ADEC-Accepted August 15, 2017**

Appendix C

This appendix provides summary results and measurements for MOC monitoring wells that are part of the current monitoring network and two former monitoring wells MW88-4 and MW88-5. Groundwater elevation measurements are presented in Appendix C-1, natural attenuation parameters are not included in Appendix C-2, and groundwater contaminant concentrations are presented in Appendix C-3.

Groundwater elevations, natural attenuation parameters, and contaminant concentrations were obtained from the groundwater monitoring wells that are part of the current network beginning in 2002 and continuing through 2016. Ongoing measurements occurred first in 2002, again in 2004, and then yearly since 2010. The former monitoring wells MW88-4 and MW88-5 will show results in 2002, 2004, 2010, 2011, and finally 2012 (year when decommissioned). Trend data presented in this Appendix will focus on results from 2010 through 2016 because of the gap in groundwater monitoring data form 2004 through 2010. For the data presentation of contaminants with an SSCL specified in the DD, results are presented as a ratio of the SSCL. For contaminants without an SSCL specified in the DD, results are presented as a ratio of the 2016 ADEC evaluation criteria. Using a ratio allows multiple contaminants to be displayed on one graph even though these contaminants have different SSCLs. The actual SSCL levels will be identified in the graph legends.

The trend plots that calculate a predicted DRO attenuation data at monitoring wells 14MW04 and 14MW05 are presented in Appendix C-4. Only the in-plume monitoring wells 14MW04 and 14MW05 were presented because they are the wells in the current monitoring network that continue to exceed the DRO SSCL.

ADEC-Accepted August 15, 2017

ACAT Comment and USACE Responses – 17 August 2017

Comments of Alaska Community Action on Toxics on the 2016 Monitored Natural Attenuation Groundwater Sampling Report at the Main Operations Complex and 2) Site 8 and Suqi River Surface Water and Sediment Sampling Report

Prepared by Vi Waghiyi, Environmental Health and Justice Program Director and Tribal Member, Native Village of Savoonga; and Pamela Miller, Executive Director

Submitted June 7, 2017

1) 2016 Monitored Natural Attenuation Groundwater Sampling Report at the Main Operations Complex

Executive Summary (ES)

The document states that the results are compared to clean-up levels established through the 2009 decision document. It should be noted that the tribe does not necessarily concur that these clean-up levels are health protective and that they should have been an official party to the record of decision on a government-to-government basis.

- page ES-1: Question—are there any monitoring wells still in place in addition to the fifteen from which samples were collected during this RAO?
  No
- The ES indicates that natural attenuation is occurring at the MOC. How is this measured? How is this more than a subjective, qualitative judgement? Please quantify and provide justification.
  Please refer to the detailed discussion in Section 6.0. Multiple chemical parameters were measured and analyzed to support the conclusion natural attenuation is occurring in groundwater at the site.
- The document indicates that contaminant concentrations have “generally” decreased over time. Please provide a summary here of the specific wells where concentrations have declined and to what extent. Saying that concentrations have “generally” decreased is too subjective.
  Please refer to the detailed discussion in Section 6.0. The executive summary is meant to be an overview of sampling and conclusions.
- The statement that “attenuation of DRO is predicted to be complete in 2035” is not verified. What is this prediction based on? Even if this were true (and we believe that 2035 is an underestimate of the length of time to completion), this length of time for completion of MNA is unacceptable because it allows for continuing and harmful exposures to fish, wildlife, and people. Furthermore, it is likely that the fuel-related compounds are serving as a “vehicle” for the mobilization and transport of substances such as PCBs.
  Verification of the predicated attenuation of DRO date can only occur closer to the time (2035) of predicted attenuation. Estimates of the rate of natural attenuation are based on modeling and analysis of trends over time (Appendix C-3). PCBs analyzed by SW8082 were part of the 2016 test methods, and PCBs (as Aroclors) were not

detected in any of MOC groundwater wells sampled in 2016. The protectiveness of the remedy will be evaluated in the next Five Year Review.

Introduction

- Indicate if and how the tribe was consulted on the 2016 Work Plan.
  All USACE documents are made available for review and comment at the Information Repositories. Notices were sent to stakeholders on 13 June 2016.
- The decision document does not represent the interest of the tribes or the people of St. Lawrence Island. We do not agree that clean-up levels defined in the decision document are protective of the environment or human health.
  USACE appreciates the difference in perspective as shared by ACAT and the people of St. Lawrence Island and will continue to work cooperatively with all stakeholders to implement the requirements of the Decision Document in accordance with the CERCLA requirements.
- We have concern about at least one photo (Appendix E) that shows a visible sheen.
  Results from the 2016 sampling effort for DRO and RRO in sediment and total aromatic hydrocarbons and TAqHs in surface water do not support an anthropogenic source for the sheen shown in Photo 6-5 on page 6-6 of the draft report.

Site Description and History

- Need to describe the profound influence of climate warming which is likely affecting mobilization and transport of contaminants in and around St. Lawrence Island.
  The next Five Year Review may consider the effects of climate change on potential mobilization and transport of contaminants.
- Break up is often occurring earlier than June now.
  Noted.
- Page 2-3: The document states that contractors have observed significant changes in surface water characteristics at multiple locations across the site. What are the changes that contractors are observing? How does this affect fate and transport of contaminants?
  The complete text from the Bristol report will be added to Page 2-3 as follows: "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. The drainage would flow for days at a time but would run dry later into the summer during drier periods."
  The effects of variable surface water would not have a direct effect on MOC sample results. However, the precipitation variability that manifests as surface water variability would affect groundwater elevations.
- Under the Land and Resource Use section, page 2-4: As we have said repeatedly in

prior comments, it is important to indicate that the military displaced a permanent village at NE Cape. NE Cape was and is more than a place "seasonally occupied." It is considered a village site. By describing it as merely a place that is seasonally occupied, the Corps and their contractors diminish the historical and continuing importance of the site from the cultural, and spiritual perspective of the people of the Island. By diminishing the importance of NEC, the Corps mispresents and potentially underestimates the hazards, risks and exposure pathways of contaminants associated with the area. Surface waters and springs in the area are currently used and traditional drinking water sources. Salvaged materials that are likely contaminated with lead, PCBs, asbestos and other harmful substances continue to be used for building material for homes not only at NE Cape, but throughout the Island. The significant quantities of hazardous waste on the Island were left without the free, prior and informed consent of the people of St. Lawrence Island, in violation of the 1952 agreement with the Tribe and in violation of international law.

A draft Health Consultation prepared by the Agency for Toxic Substances and Disease Registry (ATSDR) dated July 2017 concluded there is no apparent health hazard associated with the Northeast Cape site. ATSDR's assessment contained the following findings: 1) eating fish from Northeast Cape in the summer (3 months) is not expected to harm people's health; 2) eating greens and berries from Northeast Cape year-round is not expected to harm people's health; 3) accidentally ingesting soil and drinking Suqitughneq (Suqi) River surface water are not expected to harm people's health; and 4) there is not enough contact with site contaminants to suggest that exposures are contributing to cancer and birth defects. The following statements in the report are accurate: "Local subsistence hunting camp structures are located adjacent to Site 3 and are seasonally occupied", and "Currently, there are no permanent NEC residents; however, representatives of Savoonga have indicated a desire to re-establish a permanent residential community at the site in the future." Remedial actions have removed contaminated soil containing contaminants above levels identified in the 2009 Decision Document for the Northeast Cape FUDS. Groundwater sampling at the MOC has indicated natural attenuation of residual petroleum constituents is occurring in site groundwater. Surface water samples collected from the Site 28 Drainage and Suqi River have not contained contaminants above levels identified in the 2009 Decision Document. Data collected to date indicate residual contaminants in sediment at Site 28 are not migrating. Remedial actions conducted under the NALEMP have removed contaminated building materials from structures at the NVNC.

In addition to the endangered species mentioned, bowhead whale should be included.

Bowhead whale (endangered) will be added to the endangered/threatened species list on page 2-4 of the report.

- In addition to berries and reindeer as important subsistence foods, please include the fact that NE Cape is also used for other food and medicinal plants, including such plants as roseroot, coltsfoot, and willow.

  Roseroot, coltsfoot, and willow will be added to section 2.1.4 of the report.

- It is important to indicate that the habitat and subsistence resources in and around NE Cape are significantly and adversely affected by the military contamination and perturbations. Resident and anadromous fish populations and their habitats are not recovering. The people of St. Lawrence Island can no longer fish for the once abundant tomcod or salmon there, for example. The seal haul out was disturbed and has not recovered.
  The USEPA conducted an evaluation of the USACE cleanup efforts at Northeast Cape and concluded in February 2013 the cleanup is consistent with CERCLA and the National Contingency Plan. The USACE has followed the requirements of the DDs, which were developed in accordance with the CERCLA. The sand berm that naturally, periodically develops at the mouth of the Suqi River creates a barrier to fish that would otherwise migrate from the ocean and into the river. The significant and adverse effects described above are noted as a continuing concern of the tribe and community.
- The document states that materials were initially abandoned in place due to the high cost of off-island transport. It should be noted that significant quantities of equipment and hazardous materials remain at the site in the shallow subsurface, thus providing continuing sources of contaminants that affect the environment and health. From the perspective of the people of St. Lawrence Island, this contamination has contributed significantly to health disparities, including a cancer crisis. The high cost to the health and well-being of the people of St. Lawrence Island must be considered in decisions about clean up decisions as primary prevention and protective measures.
  The USACE has followed the requirements of the DDs, which were developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded remedies at Northeast Cape FUDS are currently protective.
- Page 2-6: the document indicates that remedial actions occurred through 2014. It should be noted that the tribe and ACAT assert that the cleanup is far from complete. The site is being closed prematurely without adequate characterization and clean up.
  The USACE has followed the requirements of the DDs, which were developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded remedies at Northeast Cape FUDS are currently protective.
- Page 2-6: The document indicates that the primary sources of contamination are spills and leaks of fuel products. It should also include PCBs from transformers and electrical equipment, pesticides, heavy metals, solvents.
  PCBs from transformers and electrical equipment, and vehicle maintenance fluids, such as glycol and solvent will be added to the second paragraph on Page 2-6.
- Page 2-6 bottom of para 3: although the document indicates that the northern edge of the MOC has petroleum in subsurface soils at levels below the risk-based levels identified in the decision document, we do not agree that these levels are health protective and it is incumbent upon the Corps to remove this contamination per the 1952 agreement.

The USACE has followed the requirements of the DDs, which were developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded remedies at Northeast Cape FUDS are currently protective.

- Page 2-7: this document misrepresents the ISCO by deeming it as not an effective means of remediation. As stated previously by the TAPP advisor and ACAT, the remediation was conducted improperly and against the scientific and technical methods and protocol recommended by Dr. Scrudato. It cannot be claimed in this document that the ISCO method is ineffective when it was improperly implemented. In fact, the characterization in the document of the ISCO pilot test is an outright misrepresentation!

  In situ chemical oxidation was deemed ineffective at the MOC during the 2009 pilot-scale test as a result of the presence of peat and highly organic peat soil, presence of permafrost or semi-permafrost zones, and observed preferential flow pathways.
- Page 2-7: Para 2 indicates up-, cross-, and source area monitoring wells. Several downgradient monitoring wells should be added in order to provide a more complete picture of the fate and transport of contaminants in the groundwater.

  Permanent monitoring wells cannot be constructed in the tundra downgradient of the MOC because the freeze/thaw cycle will destroy the wells. No contaminants have been detected in surface water samples collected from the Site 28 Drainage and Suqi River. This has provided evidence contaminated groundwater is not migrating into surface water downgradient of the MOC.
- Page 2-8: Monitoring wells 88-4 and 88-5 should be re-instated and included in the monitoring of groundwater at the MOC. The document acknowledges that they "provide valuable information regarding historical downgradient contamination." Given this, it is likely that they would continue to provide valuable information.

  Monitoring wells 14MW02, -04, and -05 were installed slightly downgradient of the locations of former monitoring wells MW88-4 and 88-5. Monitoring wells 14MW02, -04, and -05 are considered suitable replacements for former monitoring wells MW88-4 and 88-5.

Page 3-1: Key Field Personnel
The table should indicate qualifications of the key personnel, particularly of the Project Chemist and Analytical Laboratory PM. What laboratory was used for analyses?
Qualifications of key personnel were included in Table 4-3 on page 4-7 of the Field Sampling Plan, which was part of the Final Work Plan dated August 2016. Analytical laboratory information was included in the Work Plan and in Table 3-1 on Page 3-1 of the draft reports.

Page 4-1: Work Plan Deviations
The document should include justification for each of the deviations and how they affected data quality rather than simply claiming that they did not affect data "usability."
The second sentence of Section 4-1 will be revised as follows: "None of the deviations significantly affected data usability or data quality."

Page 5-1: Mobilization and Demobilization

The document should disclose the total costs including transportation, charter flights, lodging etc. Given all of the days when inclement weather prohibited travel to NE Cape, is this method of mobilization cost effective compared with establishing a temporary base of operations at NEC? What are the cost comparisons used to justify this method of mobilization? By doing it this way, the Corps and their contractors bypass the Native Village of Savoonga and/or Gambell and thus not making it possible to include community oversight/community monitor(s) who are present at the NE Cape site when the sampling is occurring. In the future, community oversight/monitors should be included in all sampling programs at NE Cape.

Costs for the method of mobilization utilized during 2016 fieldwork were less than if a temporary camp had been mobilized, setup, operated, and demobilized from Northeast Cape. During the Long Term Management Plan public presentation in Savoonga on 26 July 2016, a request was made by a community member for the USACE to bring community members on a site visit during the 2016 sampling event. This request was seriously evaluated, but the USACE was unable to accommodate it for the 2016 event which occurred during August 2016. Mobilizing to Northeast Cape requires a sufficient lead time to plan for transportation needs and safety considerations. In the case of the 2016 event, there was limited ground transportation available. The Contractor had only two ATV's. Visitors would have been forced to walk from the runway to the sites of interest. No USACE representatives would have been on site to lead the site visit. Our contractor did not have a camp on site, so there were no facilities available to site visitors in case of bad weather. Given the unpredictable weather and the fact daily charter flights were being used, an emergency shelter was required. Because there was insufficient time to plan for additional site visitors, adequate emergency shelter was not available. The safety of our contractors and site visitors is a high priority for the USACE, and therefore we were not able to accommodate the request for a site visit during 2016. This request will be integrated into the planning phase for 2018 activities.

Page 5-5: Sampling Activities
Additional contaminants should have been included in the sampling program and should be analyzed in future sampling programs, including TCE (and other solvents), mercury, pesticides, and PCBs.

Contaminants identified during multiple remedial investigations and subsequent sampling and remedial actions were included in the sampling program.

Page 5-6: Waste Management
The document should indicate where solid wastes were disposed. The document indicates that

wastewater and sanitary waste were disposed on site according to 2016 WP. Did the Corps receive permission for this from the landowner and tribe? If not, this is a violation of the 1952 agreement, requirements for government-government consultation, and possibly other laws that would prohibit the dumping of waste on private lands.

All solid waste was removed from the site and disposed of at the Nome Landfill. The following will be added to as the last sentence of section 5.3: "Solid wastes were disposed at the Nome Municipal Landfill located in Nome, Alaska."

Table 5-1—define the constituents of general refuse.

The following footnote will be added to Table 5-1; "General refuse included spent personal protective equipment, sanitary waste, sampling materials, and empty food containers."

Page 6-5, Table 6-4. It is incorrect to label this table "Analytical Natural Attenuation

Results from 2016" because there are no comparative data included in the table from prior years with which to assess the differences in values for these parameters and the effectiveness of natural attenuation. It would be more accurate to simply title the table "Analytical results from 2016."

The title of Table 6-4 will be revised to "2016 Analytical Natural Attenuation Parameter Results" as these results are specific to the 2016 samples. Please note that the historic results and 2016 results for these parameters can be found in Appendix C-2.1

Page 6-6 para 2: The first sentence states that "groundwater quality in samples…indicate natural attenuation is occurring. Although the parameters measured seem to indicate anaerobic petroleum degradation is occurring, there is no quantification of the direct measures of petroleum degradation in the wells that is necessary in order to substantiate this claim. These data (actual values of petroleum concentrations over time) should be presented in a succinct and clear manner in this section rather than in various, poorly designed tables and graphs in the Appendices. A quantification such as percentage of degradation and/or statistical analysis with representation of actual values/concentrations over time should be indicated for each well.

As noted in the comment evidence of natural attenuation is present based on the groundwater parameters measured in 2016. The analytical parameters selected for testing were defined in the work plan without deviation. Presentation of the time series DRO plots presented in Appendix C-3.2 will be simplified in the final report.

Page 6-6, Section 6.3: Contamination of Groundwater

The document does not demonstrate that concentrations have decreased over time with any kind of statistical analysis, so this is an unsubstantiated claim.

Section 6 of the report will be revised to separate the comparisons to SSCLs, ADEC Cleanup Levels, and analyte trends into separate subsections. Additionally, the statement about decreasing trends will be revised to be specific to DRO as follows:
"The DRO concentration in two (14MW04, and 14MW05) of the three monitoring wells (14MW02, 14MW04, and 14MW05) with 2016 SSCL exceedances have generally decreased over time since monitoring began in 2014. The DRO concentrations in monitoring well 14MW02 have slightly increased since monitoring began in 2014" Please note this statement for 14MW04 and 14MW05 is based on the geometric regressions found in Appendix C-4.1 and C-4.2. Additionally, a Mann-Kendal analysis for DRO trends will be added for 14MW02, 14MW03, and 14MW05.

The fact that there are so many exceedances of SSCLs in groundwater confirm our previous assertion that monitored natural attenuation is not an adequate method to address the contamination and prevent further harm. Additional removal of contamination sources and active remediation of groundwater is necessary in order to adequately protect environmental and human health.

The USACE has followed the requirements of the DD, which was developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded remedies at Northeast Cape FUDS are currently protective.

6.3.1—Current Contaminant Exceedances in Groundwater

Sentence 2: DRO, naphthalenes, total and dissolved arsenic, chromium, and lead exceeded 2016 ADEC levels—this does not indicate the well(s) in which these exceedances were

found.
Section 6.3.1 will be revised to separate out the comparative discussion of SSCLs versus 2016 ADEC Cleanup Levels. The wells which generated the exceedances will be identified in the text.

Table 6.5
This represents a significant number of exceedances and indicates the need for active remediation rather than passive natural attenuation to reduce levels of these contamination to safe levels.
The USACE has followed the requirements of the DD, which was developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded remedies at Northeast Cape FUDS are currently protective.

Values should be presented as ppb.
Disagree. The sample results, SSCLs, and 2016 ADEC cleanup levels were shown in milligrams per liter to make comparison of sample results with SSCLs and 2016 ADEC cleanup levels an easy task. If a result exceeded the SSCL, then the result was shown in bold text and gray highlight so it was visually apparent.

Page 6-10, para 1: we are concerned that poor QA/QC may have resulted in the low biased reporting.
The revised text in Section 6 will include a revised discussion of the QL qualified DRO results as follows:
"Samples from wells 14MW06, 14MW03, and 14MW01 were also qualified QL as the extracts were analyzed past 40 days from extraction. The QL qualifier did not affect data usability in this case since analysis within hold time produced lower results than those obtained from the out of hold time analysis which occurred 2 days past the extract hold time."

Page 6-10, para 2: the document indicates that there is no known anthropogenic source of lead at the MOC. What about lead acid batteries, ammunition, leaded gas or aviation fuel? Lead is a potent neurotoxic chemical and it has been established that there is no safe level of exposure.
This is concerning from a public health perspective since this is a potential source of drinking water.
It is unknown whether lead-acid batteries, ammunition, leaded gas and aviation fuel were present at the MOC. As a result, the source of lead is likely not anthropogenic, but instead likely a result of local geology. As stated in the Northeast Cape Long Term Management Plan, groundwater at the MOC should not be used as a drinking water source until RAOs (i.e., SSCLs) are met.

Page 6-10, para 3: the document indicates that there is no anthropogenic source of arsenic and the levels should be attributed to background concentrations. No background or control samples were taken to substantiate this assertion. There could be anthropogenic sources at the MOC such as arsenic-based pesticides, pyrotechnics, or metallurgical

applications. The document also does not substantiate the assertion that chromium levels should be attributed to background levels.
Possible sources could include electroplating, metallurgical applications.
There is no indication arsenic-based pesticides, pyrotechnics, or metallurgical applications were present at the MOC. As a result, the source of arsenic is likely not anthropogenic, but instead likely a result of local geology.

Page 6-12: Data indicate that levels of such substances as DRO in some wells are not declining and in fact show highest concentrations in 2015 and 2016. Also MW88-4 should not have been removed after the 2012 sampling program—it is necessary to evaluate the effectiveness of the POL-excavation and the well should be re-installed and sampled in future monitoring.
Only one well of the three wells with 2016 DRO SSCL exceedances, 14MW02, contained DRO levels which were higher than previous DRO results. At 14MW02, three monitoring events have occurred. The 2014 result of 1.3 mg/L obtained during the first year the well was installed is slightly lower than the 2015 result (1.6 mg/L) and 2016 result (1.6 mg/L). Monitoring well MW88-4 was removed during the course of contaminated soil excavation. It was not feasible to preserve the well because the contaminated soil surrounding the well was removed and disposed off site. Monitoring wells 14MW04 and 14MW05 were installed as replacement wells downgradient of the former location of monitoring well MW88-4.

Page 6-13: Identify possible sources/source areas for naphthalene.
Although naphthalene in 14MW01 and 14MW02 exceeded the recently lowered ADEC Groundwater Cleanup levels, the assessment of potential sources is beyond the scope of this report.

Page 6.4: The document indicates that natural attenuation is occurring based on measured groundwater parameters. However, there is no statistical substantiation of this for the actual contaminant levels.
The Section titled "Natural Attenuation of DRO" will be revised in the final report to clarify only the geometric regression plots for 14MW04 and 14MW05 and the measured geochemical parameters in the area are the basis of the statement natural attenuation is occurring.

14MW02 indicates that exceedances of DRO SSCLs are occurring, yet this well is deemed not suitable to be analyzed for natural attenuation. This is not logical. It is important to continue to monitor trends in this well.
The discussion of 14MW02 results will be added to Section 6.4 in the final report.

We do not agree that adequate justification has been provided for the prediction that attainment for SSCLs will occur with natural attenuation by 2035. This is highly speculative. And it is not acceptable that these levels will persist far into the future, posing a continuing threat to human health and the environment.
Groundwater monitoring data for most of the existing in-plume MOC wells is limited to the last three years. This will be clarified in Section 6.5 as follows:

"The three years of monitoring results for these wells were assessed for statistical trends using both the Mann-Kendal trend test and geometric regression plots. However, the low number of measurements can only provide a coarse assessment of this primary line of evidence."
As stated in the Northeast Cape Long Term Management Plan, groundwater at the MOC should not be used as a drinking water source until RAOs (i.e., SSCLs) are met.

Page 7-1, Conclusions: the assertion in para 2 that natural attenuation is occurring in some wells is more accurate that what is stated in the executive summary. However, the document does not provide convincing information or statistical analysis of the trends over time that are necessary to substantiate claims that MNA is an effective method. We are not convinced that monitored natural attenuation is adequately effective. We also find it unacceptable that attenuation will not be complete at least until 2035, a speculative date at best.
Groundwater monitoring data for most of the existing in-plume MOC wells is limited to the last three years. This will be clarified in Section 6.5 as follows:
"The three years of monitoring results for these wells were assessed for statistical trends using both the Mann-Kendal trend test and geometric regression plots. However, the low number of measurements can only provide a coarse assessment of this primary line of evidence." Additionally, the following will be added to Section 6.4: "Based on both the geometric regression plots from monitoring wells 14MW04 and 14MW05 and the results of the geochemical parameters in the area, natural attenuation is occurring."

2) 2016 Site 8 and Suqi River Surface Water and Sediment Sampling Report

Executive Summary

ES-1: more extensive sampling is needed to define the edge of the area contaminated with elevated DRO levels.
Sampling performed during 2016 at Site 8 defined the western boundary of soil containing elevated levels of DRO. The airstrip access road exists along the eastern boundary of Site 8 and acts as a cover for soil containing elevated DRO levels. There is no pathway for the petroleum constituents to adversely affect human health or the environment, so defining the eastern boundary is not necessary.
It is possible to separate biogenic from anthropogenic sources of DRO/RRO. The problem of interference indicates an inferior laboratory and/or analytical method.
Interferences observed in the soil results from Northeast Cape do not indicate laboratory inferiority in this case. Samples were processed using accepted DRO/RRO test procedures, AK102 and AK103, developed by the State of Alaska, and adopted into regulation by 18 AAC 78. The text below is the entire paragraph from Section 4.1 of the AK102 method: "Other organic compounds including, but not limited to, animal and vegetable oil and grease, chlorinated hydrocarbons, phenols, phthalate esters and biogenic terpenes are measurable under the conditions of this method."

ES-2: cannot assume that RR levels can be attributed to biogenic sources—this is not

justified.
The report assertion that biogenic sources are the primary contributing factor to chromatographic patterns generating RRO results for 2016 Northeast Cape samples is based on an interpretation. The chromatographic interpretation is reasonable based on the comparison of the patterns produced by the calibration standards versus the patterns observed in the sample.

Page 2-4, Section 2.1.5 Land and Resource Use
Please see our comments provided for this section in the previously reviewed document above. These also apply to this corresponding section.
Please see our response above.
Page 2-5, Section 2.2.1, Site 8.
We think that Eugene Toolie knows the specific location of the break.
Mr. Eugene Toolie is welcome to provide the USACE with a different location for the pipeline break. The exact location may never be known. The location of the pipeline break near Site 8 can be inferred from site data and will remain approximate.
Page 2-6. The fact that TAqH levels exceed SSCL indicates that there are continuing sources that prevent the restoration and recovery of these surface waters and biota. These source areas must be fully removed.
The TAqH levels in the surface water sample closest to the Suqi River did not exceed the SSCL. This indicted petroleum constituents were not migrating offsite. The USACE has followed and will continue to follow the requirements of the DD, which was developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded the remedy for this site is currently protective.

Regarding the “DD-selected remedy,” the tribe was not properly consulted on a government-government basis as a full party to the Record of Decision. We believe the selected remedy to be inadequate.
As the USACE has stated in the past, the USACE cannot seek tribal signatures on Records of Decision (also known as Decision Documents [DDs]) because the tribe does not have jurisdiction over the land itself. CERCLA of 1980 regulations (see 40 Code of Federal Regulations [CFR] 300.515) require Indian tribes have jurisdiction over a site in order to be afforded substantially the same treatment as states. However, the State of Alaska maintains jurisdictional authority over territory other than Native allotments or other lands set aside under the superintendence of the federal government. Therefore, it would not have been appropriate to have requested Tribal signatures on the DDs.
Page 2-7: these past exceedances are unacceptably high. It appears that no sampling was done of this area in 2016. Why was this not done?
The objective of sample collection during 2016 was to delineate the extent and magnitude of petroleum contaminated sediment at Site 8 in support of recommendations contained in the First Five-Year Review Report. These data will be used to ensure the most heavily impacted area(s) are included within Decision Unit boundaries during future incremental sampling events likely to occur during the next Five-Year Review.
The sampling effort for surface waters and sediments is far from adequate for Site 8 and the

Suqi River. Additional analytes must be included as stated in our comments on the previous document: TCE (and other solvents), PCBs, mercury, pesticides.
The objective of sampling sediment at Site 8 was to delineate the extent and magnitude of petroleum contaminated sediment at Site 8 in support of recommendations contained in the First Five-Year Review Report. These data will be used to ensure the most heavily impacted area(s) are included within Decision Unit boundaries during future incremental sampling events likely to occur during the next Five-Year Review. The objective of sampling surface water and sediment from select locations along the Suqi River was to verify Site 28 remedial actions did not affect the river. As a result, analytes were selected based on results for confirmation samples collected from Site 28 following remedial actions within Site 28.

Page 2-9. Evaluation by ATSDR was grossly insufficient and inconclusive.
Noted. USACE does not have purview over ATSDR reports.

Page 4-1, Work Plan Deviations.
Deviations are not adequately justified and we think they compromise the results and conclusions.
The second sentence of Section 4-1 will be revised as follows: "None of the deviations significantly affected data usability or data quality. Data qualifiers were assigned to the data based on the rules established in the work plan. Under those work plan rules, none of the conditions identified with the 2016 data required results to be rejected.

Page 6-3: these sediment and soil level exceedances associated with Site 8 are disturbing and indicate that further characterization and active removal is needed.
The USACE has followed and will continue to follow the requirements of the DD, which was developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded the remedy for this site is currently protective.

The claim that RRO detections/exceedances can be attributed to biogenic sources is unjustified and indicates poor analysis.
The report assertion that biogenic sources are the primary contributing factor to chromatographic patterns generating RRO results for 2016 Northeast Cape samples is based on an observation. The chromatographic interpretation is reasonable when a comparison of the patterns produced by the calibration standards versus the patterns observed in the sample.

Page 6-5. It is necessary to properly characterize the eastern extent of contamination and excavate to remove contaminated soil/sediment.
Sampling performed during 2016 at Site 8 defined the western boundary of soil containing elevated levels of DRO. The airstrip access road exists along the eastern boundary of Site 8 and acts as a cover for soil containing elevated DRO levels. The USACE has followed and will continue to follow the requirements of the DD, which was developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the

CERCLA, concluded the remedy for this site is currently protective.

Page 6-5, Section 6.3. Extent and Magnitude of Contamination at Suqi River
Five surface water and 11 sediment samples is not adequate to assess the extent of contamination in the Suqi River and estuary. Conclusions about effectiveness of prior remedies cannot be made. More comprehensive sampling is needed that includes analytes listed above.
The objective of sampling surface water and sediment from select locations along the Suqi River was to verify Site 28 remedial actions did not affect the river. As a result, analytes were selected based on results for confirmation samples collected from Site 28 following remedial actions within Site 28. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded the remedy for this site is currently protective.

Page 6-10. Biogenic interference can be attributed to poor laboratory and/or analytical procedures. This is unacceptable and compromises the integrity of this report.
Interferences observed in the soil results from Northeast Cape do not indicate laboratory inferiority in this case. Samples were processed using accepted DRO/RRO test procedures, AK102 and AK103, developed by the State of Alaska, and adopted into regulation by 18 AAC 78. The text below is the entire paragraph from Section 4.1 of the AK102 method: "Other organic compounds including, but not limited to, animal and vegetable oil and grease, chlorinated hydrocarbons, phenols, phthalate esters and biogenic terpenes are measurable under the conditions of this method."

Page 6-1—Conclusions
Cannot attribute RRO to biogenic sources—unjustified.
The report assertion that biogenic sources are the primary contributing factor to chromatographic patterns generating RRO results for 2016 Northeast Cape samples is based on an interpretation. The chromatographic interpretation is reasonable based on the comparison of the patterns produced by the calibration standards versus the patterns observed in the sample.

We concur that further removal actions are necessary. Better analytical methods are needed to discern anthropogenic sources and to remove interferences.
Although removing impacted sediment and soil at Site 8 may be an alternate remedy, the USACE has followed the requirements of the DD, which was developed in accordance with the CERCLA. The First Five-Year Review, which was performed in accordance with the CERCLA, concluded the remedy for this site is currently protective.

Samples were processed using accepted DRO/RRO test procedures, AK102 and AK103 in this case, developed by the State of Alaska and adopted into regulation by 18 AAC 78. Results from samples using the silica gel cleanup procedures typically indicated a significant reduction in DRO and RRO concentrations.

In the Suqi River, we do not believe that RRO can be attributed to biogenic interference.

Similarly to the soil samples, the report assertion biogenic sources are the primary contributing factor to chromatographic patterns generating RRO results for 2016 Northeast Cape samples is based on an interpretation. The chromatographic interpretation is reasonable based on the comparison of the patterns produced by the calibration standards versus the patterns observed in the sample.

End of comments and responses.